World Family Medicine Journal
incorporating the Middle East Journal of Family Medicine

ISSN 1839-0188

November 2022 - Volume 20, Issue 11

Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia

Awareness and attitude toward antidepressants in the population of Riyadh, Saudi Arabia

page 6

Editorial

Original Contribution

Population and Community Studies

Editorial

Chief Editor:
A. Abyad
MD, MPH, AGSF, AFCHSE
Email::
aabyad@cyberia.net.lb
Mobile: 961-3-201901

Ethics Editor and Publisher
Lesley Pocock
medi+WORLD International
AUSTRALIA
Email:
lesleypocock@mediworld.com.au
publishermwi@gmail.com

Publisher: Lesley Pocock
medi+WORLD International
Lesley Pocock

This issue has a good number of papers dealing with various issues of importance to the primary care physicians, and the rest of the medical team. El-Gamal ., et al., explored the Knowledge, Attitude and Perceptions of the population towards Vitamin D in Jeddah, Saudi Arabia. It was a cross-sectional study of 880 subjects. 373 subjects (42.4%) who consumed Vit-D supplements; the majority of them were females (70.8%). There is no relationship between Vit-D consumption and level of education. The authors concluded that the majority of participants possessed good knowledge about vitamin D and they identified sun exposure as the main source of vitamin D. However, there is a lack of consistency between knowledge and attitude towards improving vitamin D levels in their sera. This indicates the need to improve awareness among the Saudi population by providing specific guidelines about the frequency, duration, optimum season and amount of exposure to sunlight required. As well as the importance of fortification of food.

Jameel et al., did a cross sectional study to assess students' competency of the Faculty of Medicine, Makkah region Saudi Arabia in interpreting common laboratory investigations like Complete Blood Counts. A total of 1010 respondents participated in the survey, representing an overall response rate of 70%. Among all the respondents, females were 677(67%) while males were 333(33%). For most of the indices, more than 70% of students responded correctly, while for four questions, students' correct responses were not up to the mark. The authors concluded that participants' comprehension of CBC values and interpretation of the case scenarios was adequate. On the other hand, female students demonstrated better conceptual understanding than male students. We recommend improving assessment systems to help students expand their interpretation skills.

Alyazidi et al., evaluated the knowledge and attitude of college students in Jeddah, Saudi Arabia, towards COVID-19 precautionary measurements in both public and private spaces. A cross-sectional study for an epidemiological investigation in compliance to STROBE criteria was performed. The authors concluded that Middle-aged constitute the majority to the Saudi population. Therefore, measuring their knowledge is essential to understand the virus social course. Findings were encouraging in terms of their knowledge and attitude. However, a periodic training is required based on the previous experience. Social media proved to be a main source in obtaining information. Almost all institutions eventually applied a hybrid model of online/in person classes. This study also bridge the current gap in local research related to the acceptability of the COVID-19 vaccine among university students.

Jan Bhat. et al., did a descriptive cross-sectional survey was used targeting all groups of population in Aseer region for at least 6 months, aged 18 years or more and agreed to participate in the study. The aim was to assess the prevalence of constipation and its associated complications in Asser region, Saudi Arabia, by using Wexner Constipation Scoring System. 939 participants completed survey, 23.2% of participants have score (11-10) = mild constipation, and only 1.3% score (21-30) = moderate to severe constipation. The authors concluded that the chronic constipation was not a common health problem among the study population with higher severity score among old aged participants who were married and working group.

Alfadli , et al., a cross-sectional study was done on 427 participants through an electronic online questionnaire in the western region of Saudi Arabia. The study aimed to assess knowledge in about cryptorchidism and estimation of cryptorchidism in the Western region of Saudi Arabia. More than half of the participants (64.6%) age between 40 and 59 years. The prevalence of UDT was 8.4%. The mean knowledge score was 7.5 ±3,3; Out of a total score of 20 (Range 2 – 18). The authors concluded that people from the western region of Saudi Arabia showed insufficient knowledge regarding UDT. The prevalence of UDT was relatively high.

Alzbeidi, et al., reviewed vascular dementia which is the second commonest dementia occurring in the elderly above 65 years. The vascular changes within the brain are suggested to be the main etiologic factor for this type of dementia. Clinically, vascular dementia closely resembles Alzheimer's dementia. The present literature review focuses on the clinical features, diagnostic criteria, pathophysiology, risk factors and the management of vascular dementia.

Alsenaidi, et al., did a cross-sectional quantitative study where online questionnaires were distributed to 668 participants, with data collected using non-probability convenience sampling. The study aims to assess the awareness and attitude towards antidepressant drugs among the population in Riyadh. In this study, we collected data from 668 participants. In general, we found that 52.7 % of the participants had adequate knowledge, 44.6 % had inadequate knowledge, and 2.7 % did not know. The authors concluded that an inadequate knowledge of antidepressant medications was reported among residents of Riyadh. The need to increase awareness among this population is necessary.

Asiri, et al., did a cross-sectional study was carried out using self-administered questionnaire targeting all Saudi population aged 18 years or more living in Aseer region. The study aimed to assess the association between blood donation and improved sleep quality among blood donors in Aseer Region, southern of Saudi Arabia. A total of 447 participants fulfilling the inclusion criteria completed the study questionnaire. The authors concluded that the current study showed that sleep quality among Aseer residents after blood donation was much lower than reported incidence especially among participants who donated blood for more than once. Also, the attitude toward blood donation was good where nearly 1 out of each 2 participants donated blood for moral issues.

Bin Abdulrahman1, et al sent an online questionnaire to students to study their experience of the International Summer Elective Program (ISEP). Twenty-one of the participants (47.7%) they stated that their elective scientific research standards had met their expectations, while 9 out of the total participant (20.5%), the (ISEP) program was above their standards.. The authors concluded that the International Summer Elective Program (ISEP) study on Al-Imam Muhammad Bin Saud Islamic University College of Medicine students provided a positive impact on multiple areas, we recommend Saudi medical colleges consider initiating international electives courses for their students for a broadly positive effect on multiple areas to maximize the full potential of their future physicians to serve the Kingdom of Saudi Arabia.

Alam, et al., did a descriptive, cross-sectional study included interviewing participants and prompting them to fill-in a questionnaire. The aim of this study was to evaluate parental awareness of pediatric FBA in Taif, Saudi Arabia. A total of 424 individuals (parents) who participated in this study were divided into the following three study groups: illiterate, undergraduate, and postgraduates. The authors showed that a significant number of parents exhibit low knowledge about pediatric FBA. However, most parents were aware of FBA management and prevention. We recommend that parents must be informed about the risks associated with pediatric FBA using several media platforms.

Abdelrahman, et al., did a retrospective study was conducted from March 2019 to January 2020 on 499 patients who underwent abdominal surgery at two tertiary hospitals in the Taif ,city Saudi Arabia. The aim was to assess the risk factors associated with post-operative ileus, the technique of rapid diagnosis and management strategies and the overall progress of the patient. the findings showed that incidence of post-operative ileus was 12.4%. It was found that BMI>25, cardiac diseases, history of previous abdominal surgery, chemotherapy, decreased preoperative albumin levels, surgeries involving gastrointestinal area, postoperative hypokalemia, and increase hospital stay >3 days were found to be independent risk factors for post-operative ileus. The authors concluded that identification of risk factors of paralytic ileus before surgery not only help to assess the surgical risk, but also helps in improving the postoperative management. This will in turn reduce the incidence of post-operative ileus.

Saeed Al-Motawa, et al., followed a retrospective hospital-records review of all keratoectasia patients who underwent trephination and selective suture at King Khaled Eye Specialist Hospital (KKESH) during the period from 2000 to 2020. The aim of this study is to assess the effect of partial cornea trephination and selective compression suture for keratoectasia patient regarding the efficacy for this procedure and the final vision outcome as well the mean time for vision rehabilitation. The authors concluded that Motowa's trephine and selective suturing technique improves visual acuity for patients with corneal ectasia and may significantly lower the need for penetrating keratoplasty and the associated costs. However, further follow-up and more cases of this technique are necessary to determine the long-term outcomes and more definitive selection criteria.

Alsuqair, et al., did an analytical cross-sectional study done and data of the present study was collected using Philips Epiq 7 linear transducer 8-12MHZ, strain type of elastography. The objective was to see if elastography has diagnostic significance and if it may be used as a predictor of thyroid nodule malignancy. According to FINA findings, the majority of patients (96.3 percent) had a benign tumour, and 81.5 percent had soft elastography. T2 was the most common TIRADs classification (55.6 percent). The authors concluded that the elastography findings were found to have a non-significant link with both TITADs categorization and FINA results. Future studies with larger samples should be conducted to clarify the study outcomes.

Bin Abdulrahman et al., did a cross-sectional study for more than six months. This study aimed to determine the knowledge, attitudes, and practices of the community of self-ear cleaning in Riyadh. More than 42% of the participants agreed or strongly agreed that cotton buds should be used to clean the ears. The author concluded that the general population in the Riyadh region had a moderate to a good level of knowledge about self-ear cleaning and its complications. However, a low attitude towards cleaning with a cotton bud was the primary tool used to clean the ear. About two-thirds (65%) of the participants reported complications due to self-cleaning. 16.2% reported having pain due to self-cleaning ear self-cleaning.

El-Gamal, et al., did a cross sectional study looking at the magnitude, clinical aspects and correlates of dyspepsia among the population. in Jeddah, Saudi Arabia. Dyspepsia was encountered among 40% of the subjects. Majority of them had dyspepsia of the functional type. The authors concluded that Dyspepsia is a common gastrointestinal disorder among the population. It is associated with several gastrointestinal symptoms. Family history of dyspepsia, and dietary habits and intake of certain drugs were significant determinants of dyspepsia. It is significantly associated with impairment of the emotional state of the subjects. These findings may help the health care planners to consider these points when developing health education programs to combat dyspepsia among the general population.

Bin Abdulrahman, et al., did a cross-sectional study using anonymous self-administered online questionnaires. The study aims to examine the factor structure of the Toronto Empathy Questionnaire (TEQ) with a sample of Saudi medical students and to assess the differences in empathy scores by gender, year of study, and future career preference. 941 Saudi medical students enrolled in the study. 52.3% were male students, and 30.6% of the students were from the central region of Saudi Arabia. The authors concluded that different factors could influence empathy scores, such as gender, part, marital status, GPA, and study year. Female students had a higher empathy score compared to male students. Senior medical students scored lower on the scale than younger students, and could be associated with a higher level of burnout. Further empathy-based discussions should be inserted into the Saudi medical curricula.

Alamri, et al., did a retrospective study design was followed to include all diabetic patients with myocardial infarction who underwent cardiac catheterization at Prince Faisal Bin Khalid Cardiac Center, Aseer Region during the past year (n=500). The aim was to identify various post-catheterization complications in diabetic patients with myocardial infarction. The authors concluded that Post-catheterization complications are common among diabetic patients with myocardial infarction, mainly chest pain, thrombosis, dyspnea and death. Anticoagulants are the most commonly administered medications. Hospital stay is mainly for less than two weeks, but they usually need follow-up for more than four weeks. It is important to achieve strict control for diabetes before conducting coronary catheterization.

Shawabkeh, et al., conducted a cross sectional study in Aseer region using a validated scale to measure the participants' knowledge. A sample of 182 patients was conveniently selected from primary health care centres. The aim was to assess patients' knowledge and attitudes towards self-insulin administration and skin manifestation in the regions of Aseer. Regarding the study participants' knowledge of diabetes mellitus, the results showed that 53.8% of patients are diagnosed with type I diabetes compared to 46.2% diagnosed with type II. The authors concluded that the injected insulin in the lipoatrophy area may lead to inappropriate absorption of the insulin and poor blood glucose level control with unpredictable hypoglycemia.

Assiri, et al., Several databases were used to search for recent studies to evaluate the efficacy of postoperative dienogest for prevention of endometriosis recurrence. The included studies comprised of three retrospective cohort studies, and two prospective cohort studies. These studies included 608 patients, 216 were managed in the Dienogest Group, while 392 were managed in the Control Group (163 received hormonal suppression, and 228 received no treatment). The authors concluded that Endometriosis patients who receive dienogest following conservative surgery have a significantly lower rate of recurrence, better pain control, and less side effects than their control counterparts.

AL Jallal et al., evaluated the role of MR in Evaluating Multiple Sclerosis. Multiple sclerosis is an inflammatory disease attacks central nervous system CNS (brain and spinal cord). Specifically, it attacks the myeline sheath of the neuron cells (1-3). Up to now there is no known pathophysiological cause of the MS disease but believed to be autoimmune. Autoimmune means the immunity system attack normal tissues without obvious cause. It results in progressive neurological deficits leading to accumulating disabilities. The wide distribution of plaques (name of MS lesion) produces variety of clinical symptoms.

Alqahtani, et al., follow an observational cross-sectional research design, this study included 405 elderly patients attending the primary healthcare centers (PHCCs). The aim wass to explore quality of life (QOL) among elderly population and to identify the factors associated with their QOL. About half of participants (53.3%) were males, 65.7% was less than 70 years old, 89.4% were Saudi, and 68.1% were currently married. Regular exercise was practiced by 19.3% of participants, while 8.4% were smokers. The authors concluded that elderly people attending PHC centers in Aseer Region have suboptimal overall QOL, with their physical health being the lowest manifestation.

Awareness and attitude toward antidepressants in the population of Riyadh, Saudi Arabia

Yasir Ibrahim Alsenaidi[1], Omar Dawas AlDawas[2], Abdullah Ahmad AlFihaid[2], Mohammed Sultan AlZimami[2], Rayan Faleh AlQahtani[2] , Khalid A. Bin Abdulrahman[3]

(1) Department of Family Medicine, College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia
(2) College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia
(3) Department of Medical Education, College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia

Corresponding author:
Khalid Bin Abdulrahman, MD
Professor of Family Medicine & Medical Education
College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU)
P.O. Box: 7544 – Othman Bin Affan Rd, Al-Nada, Riyadh 13317 – 4233, Saudi Arabia
Mobile: +966 505445384
Email: kab@imamu.edu.sa

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Yasir Ibrahim Alsenaidi et al. Awareness and attitude toward antidepressants in the population of Riyadh, Saudi Arabia. World Family Medicine. 2022; 20(11): 6-14. DOI: 10.5742/MEWFM.2022.95251360

Abstract

Background: The growing prevalence of depression is a public health concern, and lack of awareness contributes to nonadherence to medications. Antidepressant awareness is, therefore, critical to the mental health and well-being of those with depression. The study aims to assess the awareness and attitude toward antidepressant drugs among the population in Riyadh.

Method: A design of the cross-sectional quantitative study was adopted. Online questionnaires were distributed to 668 participants, with data collected using non-probability convenience sampling. The questionnaire comprised demographic data for the patient and perspectives on the use of antidepressants, including gender, age, education status, awareness of antidepressants, and attitudes. Awareness and attitudes were concerned with different parameters related to the use of antidepressants.

Results: In this study, we collected data from 668 participants. Among the sample, 55.1 % of the participants were females, and 46.1 % were between 16 and 25 years old. In general, we found that 52.7 % of the participants had adequate knowledge, 44.6 % had inadequate knowledge, and 2.7 % did not know. The educational level of the participants appeared to be the only factor that significantly affected the level of knowledge (P=0.039); the higher the educational level, the higher the level of knowledge. Furthermore, we found that most participants had a positive attitude towards antidepressant medications (80.5%), while 19.5 % had a negative attitude.

Conclusion: An inadequate knowledge of antidepressant medications was reported among residents of Riyadh. The need to increase awareness among this population is necessary.

Keywords: Antidepressant, Awareness, Depression, Public health, Saudi Arabia

Introduction

According to the World Health Organization (WHO), mental health is an indispensable aspect and a key predictor of general health (1). This condition has also contributed to physical and social disability and decreased productivity. According to the WHO, approximately 332 million people are affected by depression worldwide. Furthermore, it is expected that by 2030, depression will be the second leading cause of disability (2). Therefore, depression is considered a life-threatening condition that requires rapid management initiatives from public health stakeholders.

Similar to other countries, Saudi Arabia has registered an increase in mental health cases, with the progressive increase in the incidence of depression being of significant concern. In 2015, there were approximately 1.4 million cases of depression, representing 4.8% of the population (3). According to the Diagnostic and Statistical Manual (DSM) of mental disorders, depressive disorders include irritable mood, sadness, emptiness, and significant changes in cognition that affect an individual's physiological functioning (4). However, depressive symptoms are often undiagnosed. This has resulted in limited medical interventions being advanced in this regard. Therefore, understanding the dynamics of managing depressive symptoms will largely contribute to reducing the number of positive cases in the country.

According to the American Psychiatric Association (APA), depression is a serious but prevalent medical disease that affects an individual's behavior and thinking (5). The rationale for focusing on major depressive disorder is the negative implication for the patient, as it causes a feeling of sadness and loss of interest in previously enjoyed activities. A significant correlation between the two parameters was observed in a study in 2019 that determined the association between depression and multiple sclerosis. Furthermore, depression contributes to other comorbidities, including cardiovascular complications such as cardiac arrhythmias, chronic kidney disease, and hypertension. In contrast, depression is one of the most treatable mental disorders, with statistics indicating that 80-90% of all people with depression respond positively to treatment. Likewise, the majority of people obtain some form of relief from their depressive symptoms (6).

Since depression has emerged as a public health problem, the development of novel interventions has been the focus of current research, including antidepressants. Antidepressants are widely prescribed to manage major depressive disorders and enable users to resume daily activities (7). Typically, antidepressants function by increasing neurotransmitters, such as noradrenaline and serotonin, associated with emotions and mood (8). These neurotransmitters also affect pain signaling, relieving pain in the long term (9). However, efficacy depends on an individual's understanding and awareness of their condition and its management (10). This aspect may significantly impact the use of antidepressants, regardless of their availability.

Several studies have explored the influence of public perceptions of antidepressants in the successful management of depressive symptoms. A recent survey of the British female population observed that 79% of the respondents believed that antidepressants lead to addiction, and 85% were against their use (11). A similar study conducted in Ankara, Turkey, among sixth-year students found that participants had fewer stigmatizing views toward antidepressants than first-year students (12). Although the importance of depression on general health and quality of life is well documented, there are shortcomings in the current literature regarding its use and awareness in Saudi Arabia. Therefore, the present study aimed to determine the awareness and attitude towardantidepressant drugs among the population of Riyadh. The study aims to determine people's attitudes and awareness about antidepressant medications in Riyadh.

Subjects and Methods

This quantitative cross-sectional study distributed a self-made online questionnaire to obtain participant data for analysis.

Participant Selection

The study was carried out in Riyadh, Saudi Arabia. The sample area is the country's capital and a significant financial hub. This location enabled a sample of a diverse urban population to be obtained, considering that Riyadh is centrally located with a population of approximately 7.3 million as of 2022.

In total, 668 participants were included, comprising 368 women and 300 men. The inclusion criteria for participation were adults, 16 years and older, and residents of Riyadh. Participants under 16 years of age and who lived outside the city were excluded from this study.

Variables

This study investigated categorical and continuous variables. This included gender, age, education status, awareness of antidepressants, and participants' attitudes. Awareness and attitudes were concerned with different parameters related to the use of antidepressants. All variables were independently evaluated. Participant education was considered a potential confounding variable when interpreting the results.

Participant responses were used to collect all data included in this study. Non-probability sampling enabled all variables to be controlled as a predefined proportion of male and female participants were included.

Bias

The current study used non-probability convenience sampling. This process has been attributed to the introduction of bias in scientific research (13). The practical application of this approach is that the respondents were selected from various groups, which makes them a good representation of the population. Furthermore, the questionnaire was designed to be short and precise, enhancing accessibility and understanding.

The sample size was calculated using the Raosoft online calculator at a 99% confidence interval (CI). The expected response for the outcome variables was maintained at 50%, implying that the minimum sample size for a 1% margin of error was estimated to be 664.

Quantitative variables
All quantitative variables were grouped according to the responses of the participants. This included the participants' demographics, with each response independently analyzed to obtain participant feedback. The demographic variables' minimum, maximum, and percentile values were calculated, and a frequency distribution analysis was conducted.

Statistical Analysis
Data collected from participants were entered, coded, and analyzed using SPSS, version 26. The output data for the categorical variables were frequency and percentages. These data were for continuous variables: mean, median, standard deviations (SD), and interquartile ranges. There were no missing data.

Results

In this study, we were able to collect data from 668 participants. Among the sample, 55.1 % of the participants were women (N = 368), 46.1 % were aged between 16 and 25 years old (N=308), and 30.5 % were between 26 and 35 years old (N=204).

Taking into account the educational level of the participants, we found that 43.6 % of the participants reported having a bachelor's degree. Compared to 2004, 41.0% reported having a high school graduate or lower educational level (Table 1).

Taking into account the knowledge about depression, the results of the questions are reported in Table 2. The results showed that 38.2 % of the participants were unsure if depression could go away independently; however, 32.2 % disagreed with this statement, and 8.2 % did not know. Furthermore, participants in this study were uncertain whether antidepressants are addictive, where 29.9 % disagreed, 28.6 % agreed, and 28.6 % said maybe, while 12.9 % reported that they did not know. Furthermore, we found that 44.2 % of the participants knew that starting antidepressants did not mean that patients would be on them for life. Furthermore, 36.2 % of the participants knew that stopping taking antidepressants would lead to horrible withdrawal symptoms, and 48.5 % disagree that antidepressants are ineffective. Moreover, we found uncertainty among participants considering that antidepressants have awful long-lasting side effects where 27.8%, 27.4%, and 29 % disagree, agree, and think maybe, respectively. Among the participants, 36.4 % knew that antidepressants are not a short-term fix, and 41 % knew that the drug's effect would not be seen immediately after taking it (Table 2).

In general, we found that 52.7 % of the participants had adequate knowledge considering that depression could answer more than 60 % of the questions correctly. In comparison, 44.6 % of the participants had inadequate knowledge, and 2.7 % did not have any correct knowledge about antidepressants (Figure 1).

Table 1: Demographic factors of the participants

		Count	Column N %
Gender	Male	300	44.9%
	Female	368	55.1%
Age	(16-25)	308	46.1%
	(26-35)	204	30.5%
	(36 –45)	112	16.8%
	> 45	44	6.6%
Education	High school graduate or less	274	41.0%
	Bachelor's degree	291	43.6%
	Master's degree	88	13.2%
	Doctorate	15	2.2%

Table 2: The response of the participants considering questions of knowledge about depression

	I do not know		Agree		Maybe		Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Depression can go away on its own	55	8.2%	143	21.4%	255	38.2%	215	32.2%
Antidepressants are addictive	86	12.9%	191	28.6%	191	28.6%	200	29.9%
Starting with antidepressants means you'll be on them for life	76	11.4%	150	22.5%	147	22.0%	295	44.2%
If the patient chooses to stop taking antidepressants, he will have horrible withdrawal symptoms	82	12.3%	242	36.2%	184	27.5%	160	24.0%
Antidepressants are ineffective	93	13.9%	129	19.3%	122	18.3%	324	48.5%
Antidepressants have awful long-lasting side effects.	105	15.7%	183	27.4%	194	29.0%	186	27.8%
Antidepressants are a short-term fix	83	12.4%	163	24.4%	179	26.8%	243	36.4%
The effect of the drug will be seen immediately after taking it, and if not, that means that the patient has to change the medication	98	14.7%	175	26.2%	121	18.1%	274	41.0%

In general, we found that 52.7 % of the participants had adequate knowledge considering that depression could answer more than 60 % of the questions correctly. In comparison, 44.6 % of the participants had inadequate knowledge, and 2.7 % did not have any correct knowledge about antidepressants (Figure 1).

In this study, we did not recognize a significant difference between the sexes considering their knowledge (P = 0.067); however, it was noticed that the female participants had a higher percentage of inadequate knowledge (44.8 % compared to 40% of males). Age did not significantly impact the level of knowledge (P=0.754). The educational level of the participants appeared to be the only factor that significantly affected the level of knowledge (P=0.039); the higher the level of education, the higher the level of knowledge (Table 3).

Taking into account the attitude towards depression and antidepressant medications, we found that 44.3 % of the participants disagreed, believing that the use of antidepressants could negatively affect the person's reputation and career, while 25.9 % agreed. Furthermore, 40.1 % of the participants disagreed that the use of antidepressants could affect the chances of marriage and 53.0 % refused to believe that taking an antidepressant is a sign of weakness, and 32.0 % of the participants agreed that antidepressants will change personality (Table 4).

We found that most participants had a positive attitude towards antidepressant medications (80.5 %), while 19.5 % had a negative attitude (Figure 2).

No demographic factors of the participants were found to have a significant impact on the attitude of the participants toward antidepressant medications, as reported in Table 5. Females appear to have higher levels of positive attitude than males (83.2 % vs. 77.3 %). Furthermore, we found that higher education was slightly associated with a more positive attitude among the participants.

Figure 1: The distribution of the participants according to their level of knowledge

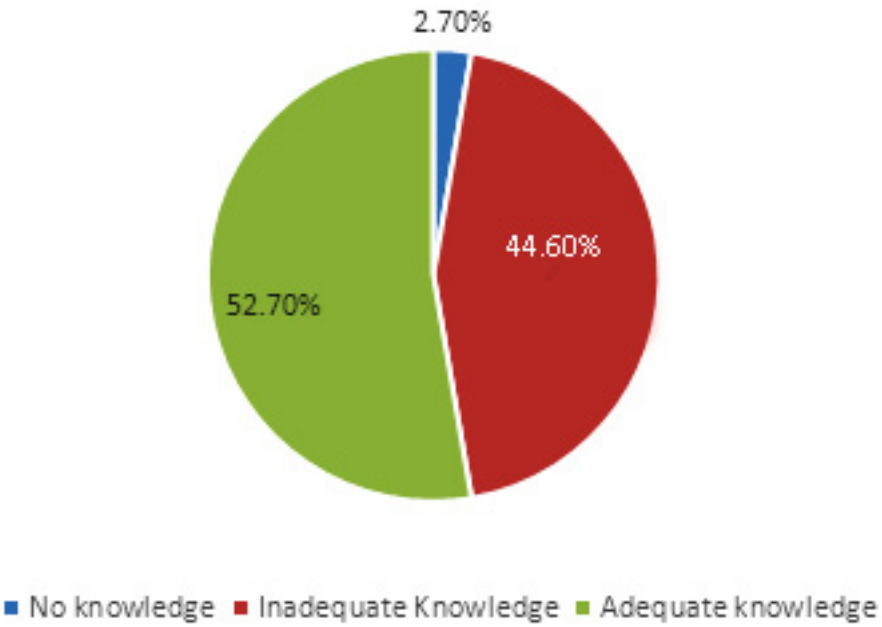


Table 3: The relationship between the demographic factors of the participants and their level of knowledge about depression.

Variable		Level of knowledge						P-value
		No knowledge		Inadequate Knowledge		Adequate knowledge		
		Count	Row N %	Count	Row N %	Count	Row N %	
Gender	Male	7	2.3%	120	40.0%	173	57.7%	0.067
	Female	11	3.0%	178	48.4%	179	48.6%	
Age	(16-25)	10	3.2%	136	44.2%	162	52.6%	0.754
	(26-35)	4	2.0%	97	47.5%	103	50.5%	
	(36 – 45)	2	1.8%	45	40.2%	65	58.0%	
	> 45	2	4.5%	20	45.5%	22	50.0%	
Education	High school graduate or less	11	4.0%	128	46.7%	135	49.3%	0.039*
	Bachelor's degree	4	1.4%	130	44.7%	157	54.0%	
	Master's degree	1	1.1%	35	39.8%	52	59.1%	
	Doctorate	2	13.3%	5	33.3%	8	53.3%	

* Significant if the p-value is lower or equal to 0.05

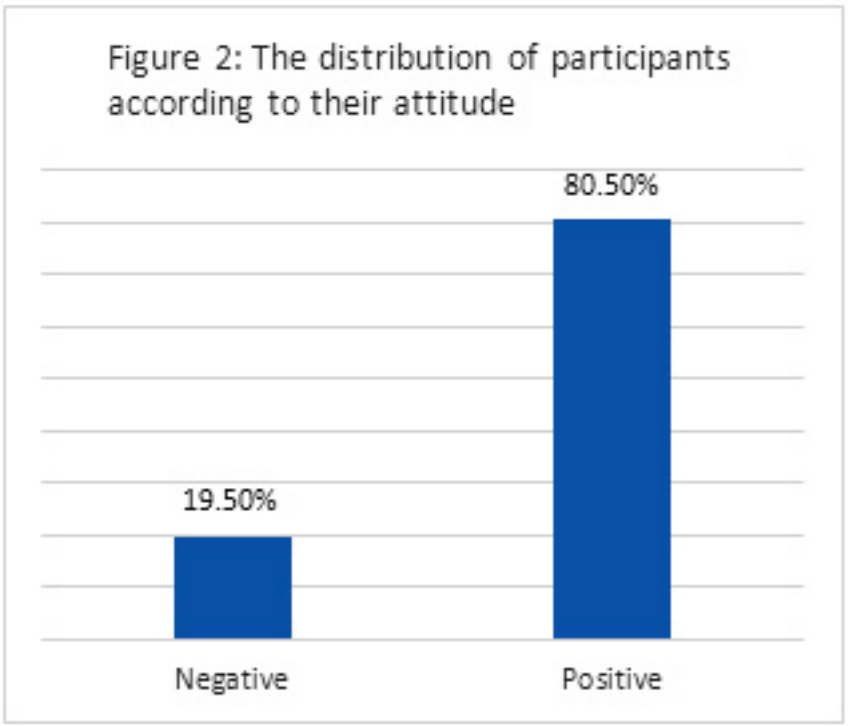


Table 4: The attitude toward antidepressant medications

	I do not know		Disagree		Maybe		Agree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
The use of antidepressants can negatively affect a person's reputation and career	42	6.4%	292	44.3%	154	23.4%	171	25.9%
The use of antidepressants can affect a patient's chances of marriage	59	9.0%	264	40.1%	170	25.8%	166	25.2%
Taking an antidepressant is a sign of weakness	58	8.8%	349	53.0%	106	16.1%	146	22.2%
Antidepressants will change the patient's personality	74	11.2%	195	29.6%	179	27.2%	211	32.0%

Table 5: Relation between the demographic factors and their attitudes.

		Attitude				
		Negative		Positive		
		Count	Row N %	Count	Row N %	
Gender	Male	68	22.7%	232	77.3%	0.059
	Female	62	16.8%	306	83.2%	
Age	(16-25)	54	17.5%	254	82.5%	0.351
	(26-35)	48	23.5%	156	76.5%	
	(36 – 45)	21	18.8%	91	81.3%	
	> 45	7	15.9%	37	84.1%	
Education	High school graduate or less	62	22.6%	212	77.4%	0.335
	Bachelor's degree	49	16.8%	242	83.2%	
	Master's degree	17	19.3%	71	80.7%	
	Doctorate	2	13.3%	13	86.7%	

Discussion

This study aimed to determine attitudes and awareness toward antidepressant drugs among the Riyadh population. Collectively, the findings demonstrate that slightly more than half of the study population has sufficient knowledge about depression and the role of antidepressants in the management of symptoms. In another recent study conducted in Saudi Arabia, the authors showed that 65.6 % of the participants had a good level of awareness about depression disorders; however, only 15.7 % of the participants had a good level of knowledge regarding antidepressant medications (14). In another study, the authors also reported low levels of awareness of the management of depression (15). These studies differ due to different methodologies for determining knowledge.

The current literature also presents contradictory results, highlighting the existing misconception (16,17). Our findings suggest that the participants were uncertain about the addictive nature of antidepressants. The pharmacodynamic profile, paired with the lack of acute 'desirable' effects of most of the antidepressants currently available, substantiates the unlikely occurrence of addiction (18). In a study conducted by (14), the authors reported that 45.98 % of the participants believed that antidepressant medication could cause addiction. This is similar to another study conducted by (19), who reported that 46 % of the participants thought antidepressant medication could lead to addiction. These results may underscore anxiety about the emerging substance abuse problem in Saudi Arabia and other Gulf countries (20). Furthermore, our study found that participants were uncertain whether depressive symptoms would dissipate without intervention. Research suggests that depression may improve with time but is not guaranteed (21). A 2002 comparative study exclusively investigated the results of depressive disorders with and without medication for one year. The findings showed that patients treated with antidepressants showed a mild improvement, while those treated without drugs deteriorated slightly during the study period (22). Therefore, people experiencing symptoms of depression must be encouraged to seek treatment.

The participants said that starting antidepressants does not mean one will be on them for life. This is true for several patients; however, in some cases, depressive symptoms can reoccur, requiring long-term medication (22). Our study also recorded the perception that if patients choose to stop taking antidepressants, they will experience severe withdrawal symptoms. Like any other medication, failure to follow the prescribed treatment can cause withdrawal symptoms and adverse reactions. The discontinuation syndrome is widely reported and includes symptoms like flu, nausea, imbalance, sensory disturbances, insomnia, and hyperarousal (23). However, this condition develops only in 20% of patients after an abrupt stoppage or significant reduction in the antidepressant dose. It is relieved between one and two weeks after the onset of symptoms (24). Participants in our study agreed that antidepressants are effective and do not have long-lasting side effects. Current research validates these perspectives and provides evidence that side effects are negligible and manageable (25).

We found that the participants disagreed that antidepressants affect a patient's personality and that their use is a sign of weakness. The stigma associated with antidepressants is a significant cause of non-adherence (26). However, the findings of our study suggest that Riyadh's population has sufficient knowledge of depression and is less likely to discriminate against those who need antidepressants. This is also reflected in the participants' familiarity that antidepressant medication is not a short-term fix and can be combined with other interventions, such as behavioral therapy, to achieve more remarkable positive results.

Conclusion

Knowledge of depression and antidepressant medications among Riyadh residents is inadequate, with some misconceptions including the negative impact of antidepressants on the personality of patients, prospects, and careers. The need for country stakeholders to employ interventions such as mental health education and awareness campaigns among public populations that would help improve awareness of mental health is necessary.

Limitations

The limitations must be considered when interpreting the findings. The primary limitation was the small sample size, which limited the generalizability of the findings. Furthermore, a single geographical location within Saudi Arabia was chosen to obtain the study sample, which hinders the external validity of the results, as the views and perspectives of the people of Riyadh may differ from those of the entire population of Saudi Arabia. The methodology must also be appraised, as we adopted a questionnaire to obtain our results. This introduces bias within our findings, as the responses to each question cannot be validated. Furthermore, those who opted to participate in this study may have prior knowledge of depression and its management, influencing their responses. Future research should address these shortcomings to produce external validity results more representative of the Saudi Arabian population and their views on antidepressants.

Ethical Considerations:

The IMSIU research ethics committee approved the study (project number 234 / 2022. approval date, 8/5/2022). All writing is done according to the ethical principles of the Declaration of Helsinki. A brief description of the study was included with the survey link, with a full explanation on the survey's front page. Participants were told that consent was given by filling out the survey. Throughout the study, the consent of all participants and the data were collected in complete confidence.

References

1. Cuijpers P, Auerbach RP, Benjet C, Bruffaerts R, Ebert D, Karyotaki E, et al. The World Health Organization World Mental Health International College Student initiative: An overview. International Journal of Methods in Psychiatric Research. 2019 Jun 6;28(2):e1761.
2. Weinberger AH, Gbedemah M, Martinez AM, Nash D, Galea S, Goodwin RD. Trends in depression prevalence in the US from 2005 to 2015: widening disparities in vulnerable groups. Psychological medicine. 2018 Jun 12;48(8):1308–15.
3. Taleb H. Screening for Depression in the Primary Care Clinics in Saudi Arabia. Doctor of Nursing Practice (DNP) Projects. 2016;
4. Park SC, Kim YK. Diagnostic Issues of Depressive Disorders from Kraepelinian Dualism to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Psychiatry Investigation. 2019 Sep 25;16(9):636–44.
5. Sanacora G, Frye MA, McDonald W, Mathew SJ, Turner MS, Schatzberg AF, et al. A Consensus Statement on the Use of Ketamine in the Treatment of Mood Disorders. JAMA Psychiatry. 2017 Apr 1;74(4):399.
6. Corallo F, Lo Buono V, Genovese R, Palmeri R, Di Cara M, Rifici C, et al. A complex relation between depression and multiple sclerosis: a descriptive review. Neurological Sciences. 2019 Aug 18;40(8):1551–8.
7. Sivolap YuP. Antidepressants: the goals and possibilities of therapy. Zhurnal nevrologii i psikhiatrii im SS Korsakova. 2018;118(12):120.
8. Harmer CJ, Duman RS, Cowen PJ. How do antidepressants work? New perspectives for refining future treatment approaches. The Lancet Psychiatry. 2017 May;4(5):409–18.
9. Paredes S, Cantillo S, Candido KD, Knezevic NN. An Association of Serotonin with Pain Disorders and Its Modulation by Estrogens. International Journal of Molecular Sciences. 2019 Nov 15;20(22):5729.
10. Hansson M, Bodlund O, Chotai J. Patient education and group counseling to improve the treatment of depression in primary care: A randomized controlled trial. Journal of Affective Disorders. 2008 Jan;105(1–3):235–40.
11. Parkin L, Balkwill A, Sweetland S, Reeves GK, Green J, Beral V, et al. Antidepressants, Depression, and Venous Thromboembolism Risk: Large Prospective Study of UK Women. Journal of the American Heart Association. 2017 May 5;6(5).
12. Nalçakan AD, Şahin EA, Yalcinkaya OK, Ak S. Antidepressant awareness and stigmatizing attitudes toward depression and antidepressants, a comparison between first and sixth-year medical students. International Journal of Social Psychiatry. 2022 Mar 5;68(2):316–23.
13. Vehovar V, Toepoel V, Steinmetz S. Non-probability sampling. In 2016. p. 329–46.
14. ALJadani AH, Alshammari SN, Alshammari KA, Althagafi AA, AlHarbi MM. Public awareness, beliefs, and attitude towards depressive disorders in Saudi Arabia. Saudi Medical Journal. 2021 Oct 4;42(10):1117–24.
15. Alenazi MSN, M Alenezi MM, Alenezi NSJ, Alenzi HSK. Awareness of the Saudi population about causes, diagnosis, and management of Depression. Journal of Clinical Images and Medical Case Reports. 2021 Dec 10;2(6).
16. Balon R, Silberman EK, Starcevic V, Cosci F, Freire RC, Nardi AE, et al. Benzodiazepines, antidepressants and addiction: A plea for conceptual rigor and consistency. Journal of Psychopharmacology. 2019 Nov 26;33(11):1467–70.
17. Jauhar S, Hayes J, Goodwin GM, Baldwin DS, Cowen PJ, Nutt DJ. Antidepressants, withdrawal, and addiction; where are we now? Journal of Psychopharmacology. 2019 Jun 21;33(6):655–9.
18. Haddad P. Do antidepressants have any potential to cause addiction? Journal of Psychopharmacology. 1999 May 2;13(3):300–7.
19. Alrahili N, Almatham F, Bin Haamed H, Ghaziuddin M. Attitudes to depression in Saudi Arabia: a preliminary study. International Journal of Culture and Mental Health. 2016 Jul 2;9(3):255–60.
20. AbuMadini MS, Rahim SIA, Al-Zahrani MA, Al-Johi AO. Two decades of treatment-seeking for substance use disorders in Saudi Arabia: Trends and patterns in a rehabilitation facility in Dammam. Drug and Alcohol Dependence. 2008 Oct;97(3):231–6.
21. Bernaras E, Jaureguizar J, Garaigordobil M. Child, and Adolescent Depression: A Review of Theories, Evaluation Instruments, Prevention Programs, and Treatments. Frontiers in Psychology. 2019 Mar 20;10.
22. Hasler G, Schnyder U, Klaghofer R, Angst J. Treatment of Depressive Disorders with and without Medication - A Naturalistic Study. Pharmacopsychiatry. 2002 Nov;35(6):235–8.
23. Henssler J, Heinz A, Brandt L, Bschor T. Antidepressant Withdrawal and Rebound Phenomena. Deutsches Ärzteblatt international. 2019 May 17;
24. Gabriel M, Sharma V. Antidepressant discontinuation syndrome. Canadian Medical Association Journal. 2017 May 29;189(21):E747–E747.
25. Hengartner MP. How effective are antidepressants for depression over the long term? A critical review of relapse prevention trials and the issue of withdrawal confounding. Therapeutic Advances in Psychopharmacology. 2020 Jan 8;10:204512532092169.
26. Feingold JH, Drossman DA. Deconstructing stigma as a barrier to treating DGBI: Lessons for clinicians. Neurogastroenterology & Motility. 2021 Feb 23;33(2).

Predictive factors of postoperative paralytic ileus following abdominal surgery: a clinical study

Tamer M. Abdelrahman [1, 2], Ahmed K. Alharthi [3], Salem S. Alamri [4], Amer M. Alnefaie[5], Baraa A. Omar [6], Mohammed A. Alzahrani [7]

(1) Assistant Professor, Department of Surgery, College of Medicine, Taif University, Taif city, Saudi Arabia
(2) Consultant of General Surgery, General Organization for Teaching Hospitals and Institutes, (Benha) Egypt
(3) MD, North West Armed Forces Hospital, Saudi Arabia
(4) MD, King Abdul Aziz Hospital, Taif city, Saudi Arabia
(5) MD, Taif Armed Forces Hospital, Taif city, Saudi Arabia
(6) MD, King Faisal Hospital, Taif city, Saudi Arabia
(7) MD, Children Hospital, Taif city, Saudi Arabia

Corresponding author:
Dr. Ahmed K. Alharthi
Taif city, Saudi Arabia
Phone number: 0543312717
Email: a7mad.k.h@hotmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Tamer M. Abdelrahman et al. Predictive factors of postoperative paralytic ileus following abdominal surgery: a clinical study. World Family Medicine. 2022; 20(11): 15-22. DOI: 10.5742/MEWFM.2022.95251361

Abstract

Background: Post-operative ileus is a surgical complication caused by impairment in the gastrointestinal motility with incidence range from 10 to 30%. The exact pathophysiology is not well understood although many authors suggested multifactorial relations that include surgical stress response electrolyte imbalances, and fluid overload.

Objectives: to assess the risk factors associated with post-operative ileus, the technique of rapid diagnosis and management strategies and the overall progress of the patient. Methods: a retrospective study was conducted from March 2019 to January 2020 on 499 patients who underwent abdominal surgery at two tertiary hospitals in the Taif city, Saudi Arabia. The data included baseline patient characteristics, history of previous surgeries, ASA classification, operative characteristics and postoperative outcomes and care patients received.

Results: The findings showed that incidence of post-operative ileus was 12.4%. It was found that BMI>25, cardiac diseases, history of previous abdominal surgery, chemotherapy, decreased preoperative albumin levels, surgeries involving gastrointestinal are a postoperative hypokalemia, and increased hospital stay >3 days were found to be independent risk factors for post-operative ileus.

Conclusion: Identification of risk factors of paralytic ileus before surgery not only helps to assess the surgical risk, but also helps in improving the post-operative management. This will in turn reduce the incidence of post-operative ileus.

Keywords: predictive, postoperative, ileus, abdominal, surgery, Taif

Introduction

Patients who have had abdominal surgeries, particularly colon and rectal surgeries, are at risk for developing post-operative ileus (POI), a surgical complication that impairs gastrointestinal (GI) motility (1).

Between 10% and 30% of patients who undergo abdominal surgery develop POI (2). According to the systematic review of Wolthuis et al and meta-analysis of randomized control trials, individuals who underwent abdominal surgery had an incidence of 10.2% (3). The precise pathophysiology of POI is not fully understood, despite the fact that many authors have suggested multifactorial relationships that include surgical stress response manifested as spinal-intestinal neural reflexes, agonism of gut opioid receptors brought on by opiate use, sympathetic hyperactivity, electrolyte imbalances, and fluid overload that worsens the condition (4,5).

Researchers have found a number of predictors and risk factors for POI in patients who had colon and rectal surgery. Evidence suggests that factors such as advancing age, operating difficulty (type), length of surgery, decline in pre-to-postoperative hemoglobin, use of opioids for a longer period of time, use of nasogastric drainage for a longer period of time, excessive surgical bowel handling, etc (6,7,8).

The sympathetic nervous system, which is typically inhibitory to the gastrointestinal tract during the postoperative period, becomes hyperactive and contributes to POI (9,10). Longer hospital stays are linked to an increased risk of other complications, such as nosocomial infections, hernia formation, slowed healing, and wound dehiscence, as well as pulmonary thromboembolic complications and higher postoperative mortality. POI has significant financial effects on patients as well as the healthcare system (11).

The incidence of postoperative ileus normally varies by procedure type, peaking in abdominal surgery at between 9.1 and 10.4% of all surgical patients and being lowest in orthopedic surgery at around 2.1% (3).

There is very limited data available regarding the incidence of POI and so far no prospective studies have been conducted in the Kingdom of Saudi Arabia. From a clinical perspective, there is still a need to identify and predict patients who are at risk of developing postoperative ileus. Thus, this study aimed to analyze the incidence and risk factors associated with POI in patients who underwent surgeries related to the abdomen.

Subjects and Methods

Study design, location and time frame: a retrospective analytical observational study was conducted at King Abdulaziz Specialist Hospital and King Faisal Medical Complex in Taif city, Saudi Arabia from March 2019 to January 2020.

Study participants: The study included 499 patients. The inclusion criteria were adults aged more than 18 years who had undergone surgeries related to the abdomen. The exclusion criteria were patients having surgeries related to other sites and patients who had confirmed anastomotic leak, peritonitis or abdominal abscess, as these complications can have a confounding bias in the association of causation of POI.

Data collection: Data was retrieved from the database of the two hospitals. A pre-designed checklist was prepared to collect data about baseline patient characteristics (sociodemographic, body mass index, smoking status and other co-morbidities), history of previous surgeries, ASA classification, factors related to and type of surgery performed, operative characteristics, medical management and postoperative outcomes and care patients received. The incidence rate of POI was recorded if two or more of the following factors [a) nausea or vomiting, b) inability to tolerate an oral diet over the last 24 hours, c) absence of flatus over the last 24 hours, d) abdominal distension, e) radiologic confirmation] were present on or after the 4th day of surgery. For the aim of ruling out an intestinal obstruction, a plain radiography of the abdominal cavity in the supine and upright views was performed in all patients with signs of POI.

Ethical considerations: The research was approved by Research Ethics Committee of Research and Studies Department, Directorate of Health Affairs Taif (approval letter number 222 and date 7-4-2019). The confidentiality of participants was preserved by not including their names or any details that may identify them.

Data analysis: Data collected were entered and tabulated in Microsoft Excel first and transferred to SPSS Ver. 23 for statistical analysis. An independent statistician carried out statistical analysis. We used numerical figures and percentages for categorical variables and Pearson's Chi-Square test ($\chi 2$) or Fisher's exact test was used to compare them. Continuous variables were measured using mean and standard deviation and comparisons were done using the student's t-test. Multivariate analysis was performed to identify predictive factors for POI and variables that showed statistical significance ($p<0.05$) were entered into the logistic regression model for multivariate analysis. Odd's ratio (OR) at 95% confidence interval was calculated for each variable and those that showed statistical significance ($p<0.05$) showing an OR>1, were predicted as independent risk factors for POI.

Results

Our prospective study included 288 male and 211 female patients with a mean age of 42.6 ± 19.5 years. The incidence rate of POI was 12.4% (n=62) and the rate was comparatively more in females than males (p<0.05), Of whom, 45.5% had one or more systemic diseases, with pulmonary diseases the most common comorbidity (8.2% (n=41)).

Table 1 shows the comparison of socio-demographic characteristics between POI and non-POI patients. It was found that POI patients had a significantly higher percent of those of older age above 65 years, had a history of previous surgery, had class 3 or more category on the ASA Physical Status classification system, and were chronic users of steroids (P=< 0.05). At the same time, POI patients had a significantly higher percentage of having chemotherapy and having lower pre-operative albumin levels (1.80 ±0.40 g/dL vs. 1.98 ±0.23) g/dL (p=< 0.05).

Table 2 shows the comparison of operative and post-operative variables between the two groups. The most common type of surgery performed in our study population was gastrointestinal (GIT) related (84.3%) surgeries. The incidence of POI was statistically higher in patients who underwent GIT surgery, and who had emergency surgeries (p=< 0.05). A non-significant relationship was found between the two groups according to the post-operative blood parameters including sodium levels (p=<0.05).

POI group had a significant longer duration of operation (108 ± 59.1 min. vs. 100±54.3), and a higher percentage of staying in hospital more than 72 hours (p=< 0.05).

The univariate logistic regression analysis showed that female gender, age >65 years, BMI>25, cardiac diseases, type 2 Diabetes Mellitus, hypertension, history of previous abdominal surgery, ASA class>3, chronic use of steroids, history of chemotherapy, hypoalbuminemia, surgeries of GIT, appendectomy, emergency surgery, post-operative parameters like Hyponatremia, hypokalemia, Hyperchloremia and patients who stayed in the hospital for more than 72 hours were potential predictive factors of POI (Table 3).

Subsequent multivariate logistic regression showed that BMI>25 [OR 2.07, 95% CI 1.24-3.47, p=0.006], Cardiac disease [OR 7.98, 95% CI 1.46-43.75, p=0.017], history of previous surgery [OR 1.89, 95% CI 1.07-3.32, p=0.028], ASA class>3 [OR 2.34, 95% CI 1.12-4.58, p=0.013], history of chemotherapy [OR 370.4, 95% CI 33.3-5802.4, p<0.001], preoperative hypoalbuminemia [OR 4.02, 95% CI 1.81-8.91, p=0.001], GIT surgery [OR 6.45, 95% CI 2.04-20.35, p=0.001], emergency surgery [OR 2.64, 95% CI 1.47-4.75, p<0.001], postoperative hypokalemia [OR 2.38, 95% CI 1.04-4.22, p=0.010] and postoperative length of stay more than 72 hours [OR 2.73, 95% CI 1.63-4.60, p<0.001] were independent predictive factors for POI (Table 3).

In our study 96.7% of cases with POI resolved with conservative measures with a median duration for POI of 4.5 days.

Table 1: Comparison of socio-demographic characteristics between the groups

Variables	Group of Patients		*P value* *
	POI	Non-POI	
Gender (Female/Male)	32/30	160/277	0.002
Age (≤65 years / >65 years)	45/17	406/31	<0.001
BMI (≤25 / >25)	25/37	279/158	<0.001
Smoking history	8 (12.9%)	124(28.3%)	<0.001
Chronic diseases	26 (41.9%)	285(65.2%)	<0.001
Pulmonary disease	6 (9.67%)	35 (8%)	0.605
Cardiac diseases	4 (6.45%)	3(0.7%)	<0.001
Diabetes Mellitus	19 (30.6%)	65(14.8%)	<0.001
Hypertension	16 (25.8%)	79 (18.1%)	0.023
Previous surgery	33 (53.2%)	127 (29.1%)	<0.001
Previous paralytic ileus	2(3.2%)	5(1.1%)	0.580
ASA status (>class 3)	20 (32.25%)	50 (11.4%)	<0.001
Chronic use of opioids	5(8.1%)	29 (6.6%)	0.615
Chronic use of steroids	3 (4.8%)	6 (1.4%)	0.017
Antibiotic use	10 (16.1%)	88 (20.1%)	0.218
Chemotherapy	3 (4.8%)	1(0.2%)	<0.001
Pre-operative albumin	1.80 (1.74-1.85)	1.98(1.97-2.0)	<0.001

* p<0.05 is considered as statistically significant; * BMI = Body Mass Index, ASA= American Society of Anesthesiologists Physical Status classification system,

Table 2: Comparison of operative characteristics between the groups

Variables		Group of Patients		*P value**
		POI	Non-POI	
Type of surgery	Bariatric	2 (3.2%)	4(0.9%)	0.093
	Colorectal	3 (4.8%)	45 (10.3%)	0.028
	GIT	57 (91.9%)	364 (83.2%)	0.003
	OBG/GYN	0 (0%)	24(5.5%)	<0.001
Nature of surgery	Emergency	37 (59.6%)	200(45.7%)	<0.001
	Elective	25 (30.4%)	237 (54.3%)	<0.001
Post-operative blood parameters	Estimated Blood Loss (ml)	177.7 (135.8-219.4)	209.39 (160.4-258.3)	0.109
	Postoperative hemoglobin level (g/dL)	26.19 (20.7-31.7)	20.4 (16.9-23.9)	<0.001
	Postoperative Sodium level (mEq/L)	138.7 (138.1-139.3)	138.6 (138.2-138.9)	<0.001
	Postoperative potassium level (mmol/l)	3.89 (3.80-3.95)	4.48 (4.02-4.95)	0.060
	Postoperative Chlorine level(mEq/L)	105.3 (104.5-105.9)	102.7 (101.5-103.9)	0.342
Length of operation (minutes)		108.5(100.3-116.7)	100.1(93.9-106.3)	0.045
Wound infection		3 (4.8%)	41 (9.4%)	0.287
Sepsis		0(0%)	6 (1.3%)	0.098
Length of stay >3days)		31 (50 %)	106 (24.2%)	<0.001

*p<0.05 is considered as statistically significant
*GIT= Gastrointestinal, OBG/GYN= Obstetrics and gynecology

Table 3: Logistic regression analysis of Predictive risk factors of Postoperative ileus

	Univariate analysis				Multivariate analysis			
Variables	OR	95% CI		*P value**	OR	95% CI		*P value**
		Lower	Upper			Lower	Upper	
Female Gender	1.76	1.22	2.53	0.002	1.52	0.87	2.36	0.375
Age (≤65 years / >65 years)	5.21	2.97	9.12	<0.001	1.63	0.63	4.20	0.312
BMI (≤25 / >25)	2.49	1.73	3.60	<0.001	2.07	1.24	3.47	0.006
Smoking history	0.40	0.24	0.63	<0.001				
Pulmonary disease	0.85	0.45	1.60	0.605				
Cardiac diseases	10.9	2.47	48.88	<0.001	7.98	1.46	43.75	0.017
Diabetes Mellitus	2.61	1.68	4.04	<0.001	1.04	0.47	2.30	0.933
Hypertension	1.64	1.07	2.52	0.023	0.62	0.27	1.43	0.260
Previous surgery	2.82	1.94	4.09	<0.001	1.89	1.07	3.32	0.028
Previous paralytic ileus	1.48	0.37	5.99	0.580				
ASA status (>class 3)	3.67	2.31	5.83	<0.001	2.34	1.12	4.58	0.013
Chronic use of opioids	1.19	0.60	2.36	0.615				
Chronic use of steroids	3.82	1.18	12.34	0.017	2.308	0.61	11.46	0.259
Antibiotic use	0.74	0.46	1.19	0.218				
Chemotherapy	15.4	1.96	121.4	<0.001	370.4	33.3	5802.4	<0.001
Preoperative Hypoalbuminemia	6.05	3.09	11.84	<0.001	4.02	1.81	8.91	0.001
Bariatric surgery	0.27	0.05	1.39	0.12				
Colorectal surgery	0.45	0.21	0.93	0.03				
GIT surgery	2.46	1.34	4.53	<0.001	6.45	2.04	20.35	0.001
OBG/GYN surgery	0.08	0.01	0.58	0.010				
Cholecystectomy	0.57	0.32	1.01	0.06				
Appendectomy	2.28	1.47	3.53	<0.001	0.69	0.36	1.37	0.301
Emergency surgery	1.81	1.25	2.59	<0.001	2.64	1.47	4.75	0.001
Laparoscopy	0.71	0.49	1.03	0.073				
Open surgery	1.41	0.97	2.05	0.073				
Estimated Blood Loss (<500/ >500ml)	0.74	0.46	1.18	0.21				
Postoperative anemia	0.45	0.30	0.67	<0.001				
Hyponatremia	2.24	1.32	4.10	<0.001	1.04	0.43	2.51	0.918
Hypokalemia	2.14	1.39	3.33	<0.001	2.38	1.08	4.22	0.010
Hyperchloremia	3.81	1.94	7.51	<0.001	1.53	0.61	3.95	0.355
Length of operation	0.99	0.98	1.59	0.92				
Wound infection	1.69	1.69	4.44	0.29				
Length of stay >3 days	3.19	2.17	4.67	<0.001	2.73	1.63	4.60	<0.001

*p<0.05 is considered as statistically significant
*OR=Odds Ratio, BMI = Body Mass Index, ASA= American Society of Anesthesiologists Physical Status classification system, GIT= Gastrointestinal, OBG/GYN= Obstetrics and gynecology.

Discussion

Our study included a total of 499 patients who have undergone surgery related to the abdominal area in two hospitals in the city of Taif. To date there have been no studies done in the Kingdom of Saudi Arabia that assessed the predictive factors of POI. The findings of our study showed that the incidence of Postoperative ileus (POI) was 12.4%. Internationally there is a lack of standardized definition for POI and different studies have defined POI based on different diagnostic criteria and we have followed the definition suggested by Vather et al due to its wide acceptability around the world (8).

Comparing the incidence to other studies conducted in various parts of the world, it is relatively similar (3). In contrast to our analysis in various abdominal procedures, a Canadian study (12) that included 323 patients who had colon surgery revealed a 19% incidence.

The gastrointestinal motility is altered in patients with POI due to surgical stress, and the inflammatory mediators released also play a role in this pathophysiology (13).

The present work found 10 independent predictive risk factors for POI such as BMI>25, Cardiac disease, history of previous surgery, ASA class>3, history of chemotherapy, preoperative hypoalbuminemia, GIT, emergency surgery, postoperative hypokalemia and post operative length of stay more than 72 hours.

Visceral adipose tissue can deposit heavily in obese or BM1>25 individuals, which might result in surgical complications including POI (14). Visceral obesity is also clearly linked to a number of cardiovascular and metabolic co-morbidities, including type 2 diabetes mellitus, hypertension, ischemic heart disease, and stroke (15,16). Higher BMI has been found in other studies to be a predictor of POI, which is consistent with our findings (17,18). Patients having a history of prior abdominal surgery were found to have an independent risk factor for POI in our study. After surgery, GI motility is lowered because the sympathetic nervous system is more activated than the parasympathetic nervous system, and this could get worse if the patient has another surgery at the same site (19).

Increased age has been identified as an independent risk factor for POI in numerous investigations (20-23). Even while our Univariate analysis indicated that advanced age (>65 years) was a risk factor, it lost its significance when it was added in the multivariate analysis. Elderly individuals typically have less functional and nutritional deficiencies, and there may also be an imbalance in the levels of inflammatory mediators (24).

Additionally, the multivariate analysis revealed that characteristics including hypoalbuminemia and ASA>3 were independent risk factors for POI. Patients who are elderly frequently have hypoalbuminemia or other nutritional deficits and may also fall under the ASA>3 category. Therefore, the interaction of these factors may be the cause of the insignificant relationship of advanced age (20, 25, 26).

Among surgical procedures, GIT surgery was identified as a standalone risk factor for POI. In contrast to previous abdominal surgeries, total gastrectomy involves the surgical removal of the vagus (vasectomy) (27). The vagus nerve is frequently preserved during various abdominal procedures, which may facilitate a quicker recovery of gastrointestinal motility (28).

Chemotherapy was a substantial additional predicted risk factor in our analysis. Patients with any type of cancer who take chemotherapy drugs like vincristine and vinblastine or opioids may experience decreased intestinal motility (29). The toxicity of other medications that affect vincristine's metabolism can also be increased (30). Additionally, medications like opioids, which are used to treat cancer patients' pain, may sometimes spontaneously cause ileus (31, 32). Emergency surgery has worse outcomes than elective surgery, and it poses a significant risk of POI (33).

This study also showed that emergency surgery is also a separate risk factor for development of POI. The cause of this may be that patients receiving emergency abdominal surgery are frequently not adequately prepped or examined, unlike those undergoing elective surgery, and/or that other risk factors connected with it were not identified in advance due to a lack of time.

In the current study's univariate analysis, the postoperative blood parameters haemoglobin (Hb), sodium (Na+), potassium (K+), and chloride (Cl_) levels were found to be significant independent risk factors except for postoperative hypokalemia, however, which appeared as non-significant in multivariate analysis. Studies have indicated that risk factors for hypokalemia include advanced age, ASA>3, diabetes, hypertension, antihypertensive medications, diuretic drugs, laxative misuse, etc (34, 35, 36).

Although hypokalemia is linked to symptoms including mental depression, weakness, and more severe deficits result in muscle paralysis impairing gastrointestinal motility frequently leading to POI, the precise mechanism by which it causes POI is unknown (37). LOS >72 hours was the second important independent risk factor in our analysis. LOS is a significant health economic metric that depends on preoperative, surgical, and postoperative circumstances (38).

LOS >72 hours has also been linked to characteristics including advanced age, an ASA score of 3 or higher, the presence of chronic conditions, and the type of operation, among others (38, 40). According to studies, LOS has a stronger association with intraoperative and postoperative parameters than preoperative ones (41, 42).

The fact that this was a multi-center study and we evaluated approximately 33 variables is one of the study's strong points. Before interpreting our findings, it is important to take into account the study's numerous limitations.

Gender is a recognised independent risk factor for POI, according to numerous research (22, 43). However, outside of a univariate study that identified female gender as a risk factor, we did not find gender to be particularly relevant in our research. This may be because studies have shown that less severe POI has no association with gender whereas severe POI does, suggesting that the male gender association relies on the degree of the POI (44).

Limitations

One of the present study limitations was that patients were not categorized based on severity. This could be a reason for the non-significant association of gender. Having a retrospective study design encountered biases, as such it is also difficult to control the nuisance variables when conducting a retrospective hospital-based study.

Conclusion

Our study findings showed that incidence of POI was 12.4% in patients who underwent abdominal surgery. It was found that BMI>25, cardiac diseases, history of previous abdominal surgery, chemotherapy, decreased preoperative albumin levels, surgeries involving gastrointestinal area, postoperative hypokalemia, and increase hospital stay >3 days were found to be independent risk factors for POI. Prior to surgery, it is crucial that the medical team (internists, pulmonologists, cardiologists, and anesthetists, among others) identify these risk factors. This will not only assist in determining the surgical risk but also enhance postoperative care, lowering the incidence of POI.

Acknowledgment:
The authors would like to thank and acknowledge king Abdul Aziz specialist hospital and King Faisal medical complex who facilitated the conduction of the study. We would like to extend special acknowledgment to the data collectors; Khaled Fahad Alsolami, Yousef Abdulghafoor Neyaz, Saad awwad alotaibi, Amjad Abdullah Alhazmi, Sultan Mosa Daghas, Abdulrhman Softah and Esraa hammad alnemari.

References

1. Carroll J, Alavi K. Pathogenesis and management of postoperative ileus. Clin Colon Rectal Surg. 2009; 22(1):47-50.
2. Venara A, Neunlist M, Slim K, et al. Postoperative ileus: pathophysiology, incidence, and prevention. J ViscSurg 2016;153(06): 439–446
3. Wolthuis AM, Bislenghi G, Fieuws S, de Buck van Overstraeten A, Boeckxstaens G, D'Hoore A. Incidence of prolonged postoperative ileus after colorectal surgery: a systematic review and meta-analysis. Colorectal Dis 2016;18(01):O1–O9
4. Behm B, Stollman N. Postoperative ileus: etiologies and interventions. ClinGastroenterolHepatol 2003;1(2):71–80
5. Artinyan A, Nunoo-Mensah JW, Balasubramaniam S, et al. Prolonged postoperative ileus-definition, risk factors, and predictors after surgery. World J Surg 2008;32(07):1495–1500.
6. Ay AA, Kutun S, Ulucanlar H, Tarcan O, Demir A, Cetin A. Risk factors for postoperative ileus. J Korean Surg Soc. 2011 Oct;81(4):242-9.
7. Grass F, Slieker J, Jurt J, et al. Postoperative ileus in an enhanced recovery pathway - a retrospective cohort study. Int J Colorectal Dis 2017;32(05):675–681
8. Vather R, Bissett IP. Risk factors for the development of prolonged post-operative ileus following elective colorectal surgery. Int J Colorectal Dis 2013;28(10):1385–1391
9. Miedema BW, Johnson JO. Methods for decreasing postoperative gut dysmotility. Lancet Oncol 2003;4(6):365–372
10. Person B, Wexner SD. The management of postoperative ileus. CurrProblSurg 2006;43(1):6–65
11. Iyer S, Saunders WB, Stemkowski S. Economic burden of postoperative ileus associated with colectomy in the United States. J Manag Care Pharm. 2009 Jul-Aug;15(6):485-94.
12. Alhashemi M, Fiore JF, Safa N, Al Mahroos M, Mata J, Pecorelli N, Baldini G, Dendukuri N, Stein BL, Liberman AS, Charlebois P. Incidence and predictors of prolonged postoperative ileus after colorectal surgery in the context of an enhanced recovery pathway. Colorectal Dis. 2016 Jan;18(1):O1-9.
13. Baig, Mirza K. M.D.1; Wexner, Steven D. M.D.1,a. Postoperative Ileus: A Review. Diseases of the Colon & Rectum: April 2004 - Volume 47 - Issue 4 - p 516-526 https://doi.org/10.1007/s10350-003-0067-9
14. Ishii Y, Hasegawa H, Nishibori H, Watanabe M, Kitajima M. Impact of visceral obesity on surgical outcome after laparoscopic surgery for rectal cancer. Br J Surg. 2005 ;92(10):1261-2.
15. Bosello O, Zamboni M. Visceral obesity and metabolic syndrome. Obes Rev 2000; 1: 47–56.
16. Ruan Y, Guo Y, Zheng Y, Huang Z, Sun S, Kowal P, Shi Y, Wu F. Cardiovascular disease (CVD) and associated risk factors among older adults in six low-and middle-income countries: results from SAGE Wave 1. BMC Public Health. 2018 Jun 20;18(1):778.
17. He Y, Wang J, Bian H, Deng X, Wang Z. BMI as a predictor for perioperative outcome of laparoscopic colorectal surgery: a pooled analysis of comparative studies. Dis Colon Rectum. 2017;60(4):433–45.
18. Morimoto Y, Takahashi H, Fujii M, Miyoshi N, Uemura M, Matsuda C, Yamamoto H, Mizushima T, Mori M, Doki Y. Visceral obesity is a preoperative risk factor for postoperative ileus after surgery for colorectal cancer: Single-institution retrospective analysis. Ann Gastroenterol Surg. 2019 Oct 16;3(6):657-666.
19. Luckey A, Livingston E, Taché Y. Mechanisms and treatment of postoperative ileus. Arch Surg. 2003;138(2):206-14.
20. Kronberg U, Kiran RP, Soliman MS, Hammel JP, Galway U, Coffey JC, Fazio VW. A characterization of factors determining postoperative ileus after laparoscopic colectomy enables the generation of a novel predictive score. Ann Surg. 2011;253(1):78-81.
21. Svatek RS, Fisher MB, Williams MB, et al. Age and body mass index are independent risk factors for the development of postoperative paralytic ileus after radical cystectomy. Urology 2010; 76:1419–1424.

22. Huang DD, Zhuang CL, Wang SL, Pang WY, Lou N, Zhou CJ, Chen FF, Shen X, Yu Z. Prediction of prolonged postoperative ileus after radical gastrectomy for gastric cancer: a scoring system obtained from a prospective study. Medicine. 2015 Dec;94(51):e2242
23. Patti R, Picone E, Aiello P, Sparacello M, Migliore G, Di Vita G. Post-operative ileus in elderly patients. BMC Geriatr. 2009 Apr 1;9(Suppl 1):A74.
24. Moore BA, Albers KM, Davis BM, et al. Altered inflammatory gene expression underlies increased susceptibility to murine postoperative ileus with advancing age. Am J PhysiolGastrointest Liver Physiol 2007;292: G1650–1659.
25. Chapuis PH, Bokey L, Keshava A, et al. Risk factors for prolonged ileus after resection of colorectal cancer: an observational study of 2400 consecutive patients. Ann Surg 2013; 257:909–915.
26. Vather R, Josephson R, Jaung R, et al. Development of a risk stratification system for the occurrence of prolonged postoperative ileus after colorectal surgery: a prospective risk factor analysis. Surgery 2015; 157:764–773.
27. Duthie HL, Kwong NK. Vagotomy or gastrectomy for gastric ulcer. Br Med J. 1973 Oct 13;4(5884):79-81.
28. Ando H, Mochiki E, Ohno T, et al. Effect of distal subtotal gastrectomy with preservation of the celiac branch of the vagus nerve to gastrointestinal function: an experimental study in conscious dogs. AnSurg 2008; 247:976–986.
29. Carraro F, Rivetti E, Romano E, Fagioli F. Two cases of paralitic ileus in onco-hematologic patients. Pediatr Rep. 2012 Jan 2;4(1):e3.
30. Bermudez M, Fuster JL, Llinares E, et al. Itraconazole-related increased vincristine neurotoxicity: case report and review of literature. J PediatrHematolOncol. 2005;27:389–92.
31. Candrilli SD, Davis KL, Iyer S. Impact of constipation on opioid use patterns, health care resource utilization, and costs in cancer patients on opioid therapy. J Pain Palliat Care Pharmacother. 2009;23:231–24
32. Traut U, Brugger L, Kunz R, et al. Systemic prokinetic pharmacologic treatment for postoperative adynamic ileus following abdominal surgery in adults. Cochrane Database Syst Rev. 2008;1CD004930.
33. Tengberg LT, Cihoric M, Foss NB, Bay-Nielsen M, Gögenur I, Henriksen R, et al. Complications after emergency laparotomy beyond the immediate postoperative period—a retrospective, observational cohort study of 1139 patients. Anaesthesia. 2017;72:309–16.
34. Kardalas E, Paschou SA, Anagnostis P, Muscogiuri G, Siasos G, Vryonidou A. Hypokalemia: a clinical update. Endocr Connect. 2018 Apr;7(4):R135-R146.
35. Lu G, Yan Q, Huang Y, Zhong Y, Shi P. Prevention and control system of hypokalemia in fast recovery after abdominal surgery. CurrTher Res Clin Exp. 2013;74:68–73.
36. Zhu Q, Li X, Tan F, Deng Y, Gong C, Hu J, Huang P, Zhou S. Prevalence and risk factors for hypokalemia in patients scheduled for laparoscopic colorectal resection and its association with post-operative recovery. BMC Gastroenterol. 2018 Oct 19;18(1):152.
37. Brigode WM, Jones C, Vazquez DE, Evans DC. Scrutinizing the evidence linking hypokalemia and ileus: A commentary on fact and dogma. Int J Acad Med 2015;1:21-6
38. Collins TC, Daley J, Henderson WH, Khuri SF. Risk factors for prolonged length of stay after major elective surgery. Ann Surg. 1999 Aug;230(2):251-9.
39. Greenfield S, Apolone G, McNeil BJ, Cleary PD. The importance of co-existent disease in the occurrence of postoperative complications and one-year recovery in patients undergoing total hip replacement. Med Care 1993; 31: 141–154
40. Cleary PD, Greenfield S, Mulley AG, et al. Variations in length of stay and outcomes for six medical and surgical conditions in Massachusetts and California. JAMA 1991; 266: 73–79.
41. Daley J, Khuri SK, Henderson WH, et al. Comparative assessment of thirty-day morbidity following major surgery: Results of the National VA Surgical Risk Study. J Am CollSurg 1997; 185: 328–340.
42. Detsky AS, Abrams HB, McLaughlin JR, et al. Predicting cardiac complications in patients undergoing non-cardiac surgery. J Gen Intern Med 1986; 1: 211–219.
43. Sugawara K, Kawaguchi Y, Nomura Y, Suka Y, Kawasaki K, Uemura Y, Koike D, Nagai M, Furuya T, Tanaka N. Perioperative factors predicting prolonged postoperative ileus after major abdominal surgery. Journal of Gastrointestinal Surgery. 2018 Mar 1;22(3):508-15.
44. Venara A, Meillat H, Cotte E, Ouaissi M, Duchalais E, Mor-Martinez C, Wolthuis A, Regimbeau JM, Ostermann S, Hamel JF, Joris J. Incidence and Risk Factors for Severity of Postoperative Ileus After Colorectal Surgery: A Prospective Registry Data Analysis. World J Surg. 2020;44(3):957-66.

Burden, clinical aspects and correlates of dyspepsia among the population in Jeddah, Saudi Arabia

Fathi El-Gamal[1], Lujain Baajajah[2] , Ghufran Katib[2], Shaima aljohani [2], Ghada aljuhani [2], Huda Zahra[2]

(1) Professor and Chairman of Family Medicine Department, Ibnsina National College for medical studies, Jeddah , KSA
(2) Ibnsina National College for medical studies, Jeddah, KSA

Corresponding author:
Prof. Fathi M. El-Gamal,
Department of Family Medicine,
Ibn Sina National College. Al Mahjer Street. Jeddah,
Kingdom of Saudi Arabia.
Tel: 6356555-6355882 / Fax: 6375344
P.O. Box 31906 Jeddah 21418
Email: drfathimhelgamal1996@hotmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Fathi M. El-Gamal et al. Burden, clinical aspects and correlates of dyspepsia among the population in Jeddah, Saudi Arabia. World Family Medicine. 2022; 20(11): 23-34. DOI:10.5742/MEWFM.2022.95251362

Abstract

Background: Dyspepsia is a common medical disorder affecting the gastrointestinal system. It is common among the population, and contributes to a considerable impairment in quality of life by affecting the person's social and emotional functioning.
Objectives: To study the magnitude, clinical aspects and correlates of dyspepsia among the population in Jeddah, Saudi Arabia.

Method: This was a cross sectional study; the non-probability convenient sampling method was used to collect data on 248 subjects from 5 May 2021 to 26 August 2022 via online-Google form questionnaire on the population in Jeddah, Saudi Arabia. This questionnaire provided information on personal, sociodemographic characteristics, clinical aspects and eating habits. In addition, the Rome IV criteria for classifying functional GI disorders, and the Depression Anxiety Stress Scales-21 (DASS-21) questionnaires were used.

Statistical analysis: data were analyzed using SPSS version 23. The Chi square test of significance was used. The level of significance was 0.05.

Results: Dyspepsia was encountered among 40% of the subjects. The majority of them had dyspepsia of the functional type. Early satiation, upper abdominal pain, nausea, constipation and diarrhea were the significant symptoms associated with dyspepsia. The significant correlates of dyspepsia were using Aspirin and pain killers, eating heavy meals, particularly at night, and family history of dyspepsia. Also not drinking plenty of water and not eating vegetable and fruits were significant determinants of dyspepsia. Dyspepsia was significantly associated with increased score for anxiety ($p < 0.05$), and was significantly associated with extremely severe depression ($p < 0.05$).

Conclusion: Dyspepsia is a common gastrointestinal disorder among the population. It is associated with several gastrointestinal symptoms. Family history of dyspepsia, and dietary habits and intake of certain drugs were significant determinants of dyspepsia. It is significantly associated with impairment of the emotional state of the subjects. These findings may help the health care planners to consider these points when developing health education programs to combat dyspepsia among the general population.

Keywords: Dyspepsia, Jeddah,
anxiety and depression, dietary habits

Introduction

Dyspepsia frequently occurs more often in women than in men (1,2). Marital status and economic status and educational level were associated with dyspepsia (3). Women smokers were more likely than non-smokers to experience dyspepsia. Hypertension is frequently present in patients with reflux esophagitis or Barrett's esophagus but not in those with non-ulcer dyspepsia. Insulin- or non-insulin-dependent diabetics have delayed gastric emptying (diabetic gastroparesis). Some of them complain of epigastric pain, nausea, vomiting or postprandial fullness (diabetic dyspepsia). Asthma was significantly associated with dyspepsia (4). Endoscopy is recommended as the first investigation in the work up of a patient with dyspeptic symptoms and is essential in the classification of the patient's condition as organic or functional dyspepsia (5).

The most common symptoms of functional dyspepsia include upset stomach, discomfort or pain in the belly , bloating , and feeling full quickly when eating (6 - 8). Dyspepsia was strongly associated and often coincident in onset with generalized anxiety disorder and major depressive episodes in the community and with chronic morbidity, and smoking (9-15). Dietary habits, type of food and drinks as well as having irritable bowel syndrome were significantly associated with dyspepsia and its aggravation (16 - 24). Patients with functional dyspepsia are a heterogeneous group in whom psychological and environmental factors and stress may contribute to aggravation of their dyspeptic symptoms (24-27). The aim of the present study was to study the impact of dietary habit and lifestyle as determinants of dyspepsia among Medical Students in Jeddah Saudi Arabia.

Methodology

This was a cross sectional study; the non-probability convenient sampling method was used to collect data through online-Google forms. Sample size: Using the G*Power statistical power analysis to calculate the sample size; it was found that the minimum sample size according to Effect size = 0.3, alpha = 0.05, and Power = 95%,, and 5 degrees of freedom was 227 (27). Thus the present study enrolled 248 adult subjects from Jeddah city, in Saudi Arabia. Information on the studied subjects was collected using a structured questionnaire which provided information on personal and sociodemographic characteristics as well as information on the morbid characteristics, and dietary habits of the respondents. Also the ROME IV questionnaire on criteria for diagnosis and classification of dyspepsia was used (28). The DASS21-Depression Anxiety Stress Scales was also used (29).
Statistical analysis: data was analyzed using SPSS version 23. The Chi Square test of significance was used to assess the different associations. The level of significance was 0.05.

Results

Table 1 displays that dyspepsia was not significantly associated with age, gender, educational level or occupation and income, in the studied subjects ($p > 0.05$). Dyspepsia was also irrelevant to smoking habit and was not significantly associated with hypertension, diabetes mellitus or asthma ($p > 0.05$) Table 2 reveals that subjects with dyspepsia were significantly more likely to undergo abdominal endoscopy compared to those without dyspepsia ($p<0.05$). However only

4% had abnormal results. Table 3 displays that subjects with dyspepsia tended significantly to feel satiation after eating regular size meal, and were significantly more likely to have pain in the upper part of the stomach or burning sensation ($p <0.05$). Subjects with dyspepsia significantly felt that pain radiate to the chest ($p<0.05$). The majority of the subjects with dyspepsia felt the pain in the upper middle part of the epigastrium, and the pain was moderate to severe ($p <0.05$).

Subjects with dyspepsia, had significantly increased abdominal distension and nausea ($p<0.04$). Table 3 shows subjects with dyspepsia significantly use pain killers and aspirin ($p<0.05$). Table 4 shows subjects with dyspepsia had significantly higher incidence of family history of dyspepsia ($p<0.05$). Table 5 reveals that subjects with dyspepsia significantly feel burning pain in the abdomen in the morning ($p<0.05$); they significantly had heavy meals, and did not drink water or eat fruits and vegetables ($p <0.05$).

Table 1: Distribution of the subjects according to dyspepsia and personal, sociodemographic, and morbidity conditions

		Dyspepsia						X^2
		No		Yes				
Variable	Categories	N	%	N	%	Total		p-value
Gender	Female	78	71.6%	99	71.2%	177	71.4%	.003 .954
	Male	31	28.4%	40	28.8%	71	28.6%	
Social status	Married	40	36.7%	48	34.5%	88	35.5%	.330 .848
	Single	64	58.7%	86	61.9%	150	60.5%	
	Divorced	5	4.6%	5	3.6%	10	4.0%	
Income per month	0 0.0%	0	0.0%	6	4.5%	6	2.5%	5.418 .144
	Less than 2000	40	37.4%	53	39.8%	93	38.8%	
	2000-5000	15	14.0%	17	12.8%	32	13.3%	
	more than 5000	52	48.6%	57	42.9%	109	45.4%	
Smoking habit	Yes	0	0.0%	1	5.0%	1	2.9%	.772 .380
	No	15	100.0%	19	95.0%	34	97.1%	
History of hypertension	Yes	8	7.3%	7	5.0%	15	6.0%	.570 .450
	No	101	92.7%	132	95.0%	233	94.0%	
History of DM	Yes	9	8.3%	7	5.0%	16	6.5%	1.050 .305
	No	100	91.7%	132	95.0%	232	93.5%	
History of Asthma	Yes	6	5.5%	10	7.2%	16	6.5%	.289 .591
	No	103	94.5%	129	92.8%	232	93.5%	

Table 2: Distribution of the subjects according to dyspepsia and abdominal clinical aspects

Variable	Categories	Dyspepsia		Total	p-value
		No	Yes		
Had Endoscopy in the last 3 months	Yes	0 0.0%	4 3.7%	4 1.6%	5.185* .023
	No	139 100.0%	105 96.3%	244 98.4%	
Abnormal in endoscopy	Yes	0 0.0%	2 4.0%	2 2.1%	1.798 .180
	No	44 100.0%	48 96.0%	92 97.9%	
Feel satiation after eating regular size meal	Yes	95 68.3%	89 81.7%	184 74.2%	5.649 .017
	No	44 31.7%	20 18.3%	64 25.8%	
Have pain in upper part of stomach or burning	Yes	38 27.3%	74 67.9%	112 45.2%	40.565 .000
	No	101 72.7%	35 32.1%	136 54.8%	
Pattern of pain	Continuous	8 17.4%	21 25.9%	29 22.8%	1.213 .271
	Intermittent	38 82.6%	60 74.1%	98 77.2%	
Feel the pain moves to another part of the stomach or chest	Yes	19 28.4%	45 47.4%	64 39.5%	5.941 .015
	No	48 71.6%	50 52.6%	98 60.5%	
The pain disappears after defecation	Yes	29 47.5%	34 36.2%	63 40.6%	1.983 .159
	No	32 52.5%	60 63.8%	92 59.4%	

(continued next page)

Table 2: Distribution of the subjects according to dyspepsia and abdominal clinical aspects **(continued)**

Site of the pain	Upper right part of the stomach	10 6.7%	10 9.2%	20 7.8%	62.723 .000
	Upper middle part of the stomach	39 26.2%	75 68.8%	114 44.2%	
	Upper left part of thestomach	100 67.1%	24 22%	124 48.1%	
Severity of the pain	Mild	23 39.0%	16 17.2%	39 25.7%	13.598 .001
	Moderate	35 59.3%	63 67.7%	98 64.5%	
	Severe	1 1.7%	14 15.1%	15 9.9%	
What aggravates pain?	After food	33 60.0%	57 62.0%	90 61.2%	.546 .761
	The food	8 14.5%	16 17.4%	24 16.3%	
	Hunger	14 25.5%	19 20.7%	33 22.4%	
Abdominal distension	Yes	57 41.0%	68 62.4%	125 50.4%	11.169 .001
	No	82 59.0%	41 37.6%	123 49.6%	
Nausea	Yes	34 24.5%	46 42.2%	80 32.3%	8.800 .003
	No	105 75.5%	63 57.8%	168 67.7%	

Table 3: Distribution of the subjects according to dyspepsia and investigations and medication history

Variable	Categories	Dyspepsia						X2 (p- value)
		Yes		No		Total		
Have allergy to Food	Yes	14	12.8%	17	12.2%	31	12.5%	.021
	No	95	87.2%	122	87.8%	217	87.5%	.885
Had H pylori before	YES	17	12.2%	22	20.2%	39	15.7%	2.916
	No	122	87.8%	87	79.8%	209	84.3%	.088
Use pain killers	YES	13	9.4%	22	20.02%	35	14.1%	5.913
	NO	126	90.6%	87	79.8%	214	85.9%	.015
Take aspirin	YES	9	6.5%	15	13.8%	24	9.7%	3.711
	NO	130	93.5%	94	86.2%	224	90.3%	.045
Feel depression or stress in your life	YES	75	54.0%	72	66.1%	147	59.3%	3.704
	NO	64	46.0%	37	33.9%	101	40.7%	.054
Similar condition in the family	YES	51	36.7%	65	59.6%	116	46.8%	12.916
	NO	88	63.3%	44	40.4%	132	53.2%	.000

Table 4: Distribution of the subjects according to having dyspepsia and psychological life

Variable	Categories	Dyspepsia		Total	X^2 (p- value)
		No	Yes		
		N %	N %	N %	
Activity during day	Little bit	2719.4%	28 25.7%	55 22.2%	3.962 .138
	Middle	13 9.4%	4 3.7%	17 6.9%	
	High	99 71.2%	77 70.6%	176 71.0%	
Feel full early while eating	Yes	92 61.7%	78 71.6%	170 65.9%	6.218 .045
	No	47 31.5%	30 27.5%	77 29.8%	
Feel the urge to defecate	Yes	45 32.4%	47 43.1%	92 37.1%	3.023 .082
	No	94 67.6%	62 56.9%	156 62.9%	
Many times urge to defecate after eating	0	0 0.0%	1 0.9%	1 0.4%	8.947 .062
	Less than 3 times	59 39.6%	49 45.0%	108 41.9%	
	More than 3 times	10 6.7%	16 14.7%	26 10.1%	
Type of stool	Normal	115 82.7%	77 70.6%	192 77.4%	7.554 .023
	Constipation	17 12.2%	16 14.7%	33 13.3%	
	Diarrhea	7 5.0%	16 14.7%	23 9.3%	
Eat in place of low hygiene	Yes	10 7 .2%	14 12.8%	24 9.7%	2.231 .135
	No	129 92.8%	95 87.2%	224 90.3%	
Eat chocolate	Yes	40 28.8%	32 29.4%	72 29.0%	.010 .920
	No	99 71.2%	77 70.6%	176 71.0%	

(continued next page)

Table 4: Distribution of the subjects according to having dyspepsia and psychological life (continued ...)

	No	129 92.8%	95 87.2%	224 90.3%	
Eat chocolate	Yes	40 28.8%	32 29.4%	72 29.0%	.010 .920
	No	99 71.2%	77 70.6%	176 71.0%	
Categories of stress	Normal	84 60.4%	46 42.2%	130 52.4%	9.393 .052
	Mild	26 18.7%	28 25.7%	54 21.8%	
	Moderate	17 12.2%	16 14.7%	33 13.3%	
	Severe	7 5.0%	10 9.2%	17 6.9%	
	Extremely severe	5 3.6%	9 8.3%	14 5.6%	
Categories of anxiety	Normal	82 59.4%	50 45.9%	132 53.4%	11.455 .022
	Mild	6 4.3%	6 5.5%	12 4.9%	
	Moderate	23 16.7%	15 13.8%	38 15.4%	
	Severe	14 10.1%	11 10.1%	25 10.1%	
	Extremely severe	13 9.4%	27 24.8%	40 16.2%	
Categories of depression	Normal	87 63.0%	47 43.1%	134 54.3%	12.332 .015
	Mild	15 10.9%	16 14.7%	31 12.6%	
	Moderate	22 15.9%	21 19.3%	43 17.4%	
	Severe	4 2.9%	10 9.2%	14 5.7%	
	Extremely severe	10 7.2%	15 13.8%	25 10.1%	

Table 5: Distribution of the subject according to having dyspepsia and daily habit

Variable	Categories	Dyspepsia		Total	X^2 (p-value)
		NO	YES		
Eat heavy meals before bed	Yes	41 29.5%	46 42.2%	87 35.1%	4.330 .037
	No	63 57.8%	98 70.5%	161 64.9%	
Suffer from burning in the morning	Yes	16 11.5%	47 43.1%	63 25.4%	32.210 .000
	No	123 88.5%	62 56.9%	185 74.6%	
How many meals do you eat	Less than 3	71 53.8%	57 53.8%	128 53.8%	.745 .689
	3 meals	47 35.6%	41 38.7%	88 37.0%	
	4 meals	41 10.6%	8 7.5%	22 9.2%	
Type of meals	Snack	85 57.0%	53 48.6%	138 53.5%	11.532 .003
	Heavy	64 42.9%	56 51.4%	120 46.5%	
Eat fast food	Yes	57 41.0%	50 45.95	107 43.1%	.589 .443
	No	82 59.0%	59 54.1%	141 56.9%	
Times eat fast food	0	59 39.6%	39 35.8	98 38%	6.493 261
	1	30 20.1%	22 20.2%	52 20.2%	
	2	34 22.8%	19 17.4%	53 20.5%	
	3	13 8.7%	10 9.2%	23 8.9%	
	More than 3	13 8.7%	19 17.4%	32 12.4%	
Habit drinking fluid with food	Yes	103 74.1%	74 67.9%	177 71.4	1.153 .283
	No	36 25.9%	35 32.1%	71 28.6%	
Type of drink	Fruit juice	6 5.1%	10 11.2%	16 7.7%	11.769 019
	Soft drink	38 32.2%	34 38.2%	72 34.8%	
	Water	62 52.5%	31 34.8%	93 44.9%	
	Coffee or tea	11 9.3%	8 9.0%	19 9.2%	
	Milk	1 0.8%	6 6.7%	7 3.4%	
Eat vegetables and fruits	Yes	54 38.8%	29 26.6%	83 33.5%	4.113 .043
	No	85 61.2%	80 73.4%	165 66.5%	
Eat spicy food	YES	86 61.9%	73 67.0%	159 64.1%	.691 .406
	NO	53 38.1%	36 33.0%	89 35.9%	
Eat spicy food	YES	93 62.4%	68 62.4%	161 62.4%	8.164 .017
	NO	46 30.9%	41 37.6%	87 33.7%	
Eat fatty food	YES	73 52.5%	62 56.9%	135 54.4%	.469 .494
	NO	66 47.5%	47 43.1%	113 45.6%	

Table 5: Distribution of the subject according to having dyspepsia and daily habit (continued ...)

Like salty food	YES	75	54.0%	65	59.6%	140	56.5%	.801
	NO	64	46.0%	44	40.0%	108	43.5%	.371
Drink coffee and tea	YES	115	82.7%	94	86.2%	209	84.3%	.566
	NO	24	17.3%	15	13.8%	39	15.7%	.452
The time of drinking coffee and tea	Morning before breakfast	26	21.1%	21	21.4%	47	21.3%	1.276 .735
	After lunch	8	6.5%	6	6.1%	14	6.3%	
	Not have certain time	89	72.4%	70	71.4%	159	71.9%	
Eat sour foods and drink	YES	67	48.2%	58	53.2%	125	50.4%	.613 .434
	NO	72	51.8%	51	46.8%	123	49.6%	
Smoker	YES	13	9.4%	17	15.6%	30	12.1%	2.240 .134
	NO	126	90.6%	92	84.4%	218	87.9%	
Habit smoke after eating	YES	15	10.1%	15	13,8%	30	11.6%	1.391a .499
	NO	38	25.5%	31	28.4%	69	26.7%	

Discussion

The present study was carried out to determine the magnitude of the problem of Dyspepsia among the population in Jeddah city, in Saudi Arabia and to study its manifestations and its impact on the psychological aspects of the subjects.

Previous studies revealed that dyspepsia was frequently more common among women compared to men (1, 2). This was not in line with findings from the present study.

Several studies reported that married status and unemployment seemed to increase the risk of functional dyspepsia (4,5). These findings contradict the findings of the present study. Job stress has been reported as a risk factor of psychological changes, which have been shown to be related to gastrointestinal diseases and symptoms such as functional dyspepsia (10). This is not in line with the findings from the present study. In the present study, smoking was not significantly associated with occurrence of dyspepsia. This is not in line with findings of previous studies (4.8)

Previous study found that hypertension was frequently present in patients with reflux esophagitis or Barrett's esophagus, but not in those with non-ulcer dyspepsia (4). In the present study we also found no significant association between hypertension and dyspepsia. Previous study revealed that patients with diabetes mellitus suffered from diabetic dyspepsia (9). However in the present study no such association between diabetes mellitus and dyspepsia was found. Endoscopy is recommended as the first investigation in the work up of a patient with dyspeptic symptoms and is essential in the classification of the patient's condition as organic or functional dyspepsia. Although the correlation between mucosal alterations and symptom pattern is difficult, endoscopy will remain the initial investigation of choice for clinically relevant abnormalities that need proper detection and biopsy (5). In the present study a very low percentage of the population with dyspepsia had endoscopy done (4%). Early satiety was significantly associated with dyspepsia in the studied subjects. This is in line with findings from previous studies (13, 15). In dyspepsia the patient suffers from pain or discomfort, in the upper middle part of the stomach area. The pain might come and go, but it is there most of the time with distention and nausea (5). This is in line with findings from the present study. H. pylori infection may cause dyspeptic symptoms through other mechanisms such as: (1) alterations of gastric acid secretion; (2) persistent and active inflammation of gastric mucosa; and (7) post-infective changes in gastroduodenal mucosa (6). This was not in line with findings from the present study, as H. pylori infection was not significantly associated with dyspepsia. Opioid analgesics are commonly and in most cases effectively used to manage chronic pain of moderate to severe intensity. Apart from analgesia, opioids exert numerous adverse effects, several of which affect the gastrointestinal tract (7). In the present study, intake of painkillers were significantly associated with occurrence of dyspnea. Aspirin can lead also, to adverse gastrointestinal effects ranging from dyspepsia with endoscopically normal gastric mucosa, asymptomatic and symptomatic lesions such as erosions and ulcers, and complications of ulcers

including bleeding and perforation (8,14). This is in line with the present study where intake of aspirin was significantly associated with occurrence of dyspepsia.

Independent risk factors for dyspepsia adjusted for age, sex, body mass index and anti- secretory therapy were a positive family history of abdominal pain (10). This is in line with findings from the present study, where family history of dyspepsia was significantly associated with having dyspepsia. Functional dyspepsia is a chronic disease that is frequently encountered in everyday clinical practice and is characterized by four epigastric symptoms: epigastric pain, epigastric burning, early satiety, and postprandial fullness (11). In the daily lives of patients, abnormal eating, such as rapid or large volume behavior meal ingestion (conditions that are reproduced during the rapid drinking test), may overload the gastric accommodation process, thus generating symptoms (17). This is in line with findings from the present study. A previous study described an impaired drinking capacity for both water and nutrient liquid meal in functional dyspepsia patients compared to healthy volunteers, even though no association with specific symptoms pattern had emerged (18). Similar findings were observed in the present study. High consumption of spicy foods is associated with greater odds of frequent postprandial fullness and epigastric pain (13). Spicy food ingestion was significantly associated with dyspepsia in the present study. Exercise is being widely recommended as part of the first-line treatment for functional dyspepsia by some experts (20). This is not in line with the present study. Previous studies found that patients with functional dyspepsia have a higher rate of anxiety and depression (25,26). In the present study we found that severe anxiety and extremely severe depression scores were significantly associated with dyspepsia.

Limitations

There are some limitations to this study: as this study is cross-sectional, the causal relationship remains unknown, and we do not know if the effects of these variables on dyspepsia during the COVID-19 pandemic will persist in the long term. It is also a nonprobability convenient sample, and its generalization to the population may be defective; however, it is an exploratory study.

Acknowledgments

We thank all the participants for their cooperation throughout the study.

Conclusion

Dyspepsia is a common gastrointestinal disorder among the population of Jeddah city in Saudi Arabia. It is associated with several gastrointestinal symptoms, namely pain and satiation. It is significantly common among those with family history of dyspepsia, and among those who did not drink enough water or commonly used painkillers and aspirin. It was significantly associated with severe anxiety and depression. These findings may help the health care planners to consider these points when developing health education programs to combat dyspepsia among the general population.

References

1-Kim YS, Kim N. Sex-gender differences in irritable bowel syndrome. J Neurogastroenterol Motil. 2018;24:544–558. doi: 10.5056/jnm18082. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

2-Mahadeva S, Goh KL. Epidemiology of functional dyspepsia: a global perspective. World J Gastroenterol. 2006;12:2661–6. [PMC free article] [PubMed] [Google Scholar]

3-Younghyeon Nam, Soon-Chan Kwon, Yong-Jin Lee, Eun-Chul Jang, Seung-hwan Ahn Annals of occupational and environmental medicine. 2018; 30 (1), 1-9

4-Kusano M, Shimoyama Y, Sugimoto S, et al. Development and evaluation of FSSG: frequency scale for the symptoms of GERD. J Gastroenterol. 2004;39(9):888–891. [PubMed] [Google Scholar]

5-Stanghellini V, Chan FK, Hasler WL, Malagelada JR, Suzuki H, Tack J, et al. Gastroduodenal Disorders. Gastroenterology 2016;150:1380-92. Available from: https://doi.org/10.1053/ j.gastro.2016.02.011 10.1053/ j.gastro.2016.02.011 [PubMed] [CrossRef] [Google Scholar]

6-el-Omar EM, Penman ID, Ardill JE, Chittajallu RS, Howie C, McColl KE. Helicobacter pylori infection and abnormalities of acid secretion in patients with duodenal ulcer disease. Gastroenterology. 1995;109:681–691.

7-Ueberral MA, Mueller–Schwefe G. Opioid–induced constipation – a frequent and distressing side effect in daily practice affecting oral and transdermal opioid applications. Eur J Pain 2006; 10: S172

8-Serrano P, Lanas A, Arroyo MT, et al. Risk of upper gastrointestinal bleeding in patients taking low dose aspirin for the prevention of cardiovascular diseases. Aliment Pharmacol Ther.
2002;16:1945-53

9-Henningsen P, Zimmermann T, Sattel H. Medically unexplained physical symptoms, anxiety, and depression: a meta-analytic review. Psychosom Med 2003; 65: 528– 33

10-Tack J, Talley NJ, Camilleri M, Holtmann G, Hu P, Malagelada JR, Stanghellini V. Functional gastroduodenal disorders. Gastroenterology. 2006;130(5):1466–79

11-Stanghellini V, Chan FK, Hasler WL, et al. Gastroduodenal disorders. Gastroenterology 150: 1380-1392, 2016. [PubMed] [Google Scholar]

12-Feinle-Bisset C, Azpiroz F. Dietary and lifestyle factors in functional dyspepsia. Nat Rev Gastroenterol Hepatol 2013; 10: 150–157. [PubMed] [Google Scholar]

Göktaş Z, Köklü S, Dikmen D, et al. Nutritional habits in functional dyspepsia and its subgroups: a comparative study. Scand J Gastroenterol 2016; 51: 903–907. [PubMed] [Google Scholar]

13-Sobczak M, Ciok J. Evaluation of nutritional habits in patients with functional dyspepsia before and after Helicobacter pylori eradiaction. Gastroenterol Pol. 2006;13:443–8.

14-Mahadeva S, Goh KL. Epidemiology of functional dyspepsia: A global perspective. World J Gastroenterol. 2006;12(17):2661–2666. [PMC free article] [PubMed] [Google Scholar]

15- Talley NJ, Ford AC. Functional dyspepsia. N Engl J Med. 2015;373:1853-1863
16-Akhondi-Meybodi M, Aghaei MA, Hashemian Z. The role of diet in the management of non- ulcer dyspepsia. Middle East journal of digestive diseases. 2015;7(1):19–24. [PMC free article] [PubMed] [Google Scholar]
17-Filipovic BF, Randjelovic T, Kovacevic N, Milinic N, Markovic O, Gajic M, et al. Laboratory parameters and nutritional status in patients with functional dyspepsia. Eur J Intern Med 2011; 22:300−4. 10.1016/j.ejim.2011.01.012 [PubMed] [CrossRef] [Google Scholar]
18-Boeckxstaens GE, Hirsch DP, van den Elzen BD, Heisterkamp SH, Tytgat GN. Impaired drinking capacity in patients with functional dyspepsia: relationship with proximal stomach function. Gastroenterology. 2001;121:1054–1063. [PubMed] [Google Scholar]
19-Feinle-Bisset C, Vozzo R, Horowitz M, Talley NJ. Diet, food intake, and disturbed physiology in the pathogenesis of symptoms in functional dyspepsia. Am J Gastroenterol. 2004;99:170–81. [PubMed] [Google Scholar]
20-Mönkemüller K, Malfertheiner P World J Gastroenterol. 2006 May 7; 12(17):2694-700.
21- Stanghellini V, Chan FK, Hasler WL, Malagelada JR, Suzuki H, Tack J, Talley NJ Gastroenterology. 2016 May; 150(6):1380-92.
22- Sun YF, Li YQ, Wang YP. The feature of clinical symptoms and health-related quality of life in patients with overlapping functional dyspepsia and irritable bowel syndrome. Chin J Gastroenterol. 2006;11:492–494
23-Vargas M, Talledo-Ulfe L, Samaniego RO, Heredia P, Rodríguez CA, Mogollón CA, Enríquez WF, Mejía CR. Dispepsia funcional en estudiantes de ocho facultades de medicina peruanas. Influencia de los hábitos. Acta Gastroenterológica Latinoam. 2016;46(2):95-101.
24-Carvalho RV, Lorena SL, Almeida JR, Mesquita MA. Food intolerance, diet composition, and eating patterns in functional dyspepsia patients. Dig Dis Sci 2010; 55: 60-65 [PMID: 19160046 DOI:10.1007/s10620-008-0698-8]
25-Correlation between social factors and anxiety-depression in function dyspepsia: do relationships exist? Huang ZP, Yang XF, Lan LS, Liu T, Liu CL, Li JL, Liang ZH. Prz Gastroenterol. 2014;9:348–353
26-Van Oudenhove L, Vandenberghe J, Geeraerts B, Vos R, Persoons P, Fischler B, et al. Determinants of symptoms in functional dyspepsia: gastric sensorimotor function, psychosocial factors or somatisation? Gut. 2008;57(12):1666-73
27-Faul F, Erdfelder E, Lang A-G, Buchner A. G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods. 2007; 39 (2): 175-191.
28-Rome criteria and a diagnostic approach to irritable bowel syndrome. Lacy BE, Patel NK. J Clin Med. 2017; 6: 99.
29-Lovibond SH, Lovibond PF: Manual for the Depression Anxiety Stress Scales. Sydney Psy- chology Foundation Australia 1995.

Medical students' understanding and interpreting abilities for Complete Blood Counts (CBC) in clinical practice

Tahir Jameel [1], Mukhtiar Baig [2], Mohammed Ibrahim Mohammed Albejad [3], Taha Mohammed Abdullah Aljifri [3], Bander Abdualziz Taher Almaghrabi [3], Raneem Yousef Qashqari [3]

1. Department of Internal Medicine, Faculty of Medicine Rabigh. KAU Jeddah
2. Department of Clinical Biochemistry Faculty of Medicine Rabigh. KAU
3. Doctor, Faculty of Medicine Rabigh. KAU Jeddah

Corresponding author:
Tahir Jameel.
Department of Internal Medicine, Faculty of Medicine Rabigh.
KAU Jeddah
Kingdom of Saudi Arabia
Email: tjahmed@kau.edu.sa

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Tahir Jameel et al. Medical students' understanding and interpreting abilities for Complete Blood Counts (CBC) in clinical practice. World Family Medicine. 2022; 20(11): 35-43. DOI: 10.5742/MEWFM.2022.95251363

Abstract

Introduction: The current study aimed to assess students' competency of the Faculty of Medicine, Makkah region Saudi Arabia in interpreting common laboratory investigations like Complete Blood Counts.

Methods: The current cross-sectional, quantitative and exploratory study was carried out at the Faculty of Medicine, Rabigh, King Abdulaziz University (KAU), Jeddah, from April 1 to April 20, 2022. An online questionnaire was circulated via various social media like Facebook, Twitter, and WhatsApp.

Results: A total of 1,010 respondents participated in the survey, representing an overall response rate of 70%. Among all the respondents, females were 677 (67%) while males were 333 (33%). There were 277 (27.4%), 479 (47.4%), and 254 (25.1%) students from the fourth, fifth, and sixth years, respectively. For most of the statements, more than 70% of students responded correctly, but particularly for three of the questions, students' correct responses were 561 (55.5%), 518 (51.3%), and 491 (48.6%), which were not up to the mark. A gender-wise comparison showed that the percentage of correct answers given by female students was significantly higher than that of male students for all statements ($p < 0.001$). For most of the indices, more than 70% of students responded correctly, while for four questions, students' correct responses were not up to the mark. Comparison between students' gender revealed that, apart from two, the percentage of female students who correctly interpreted the indices was significantly higher than that of male students ($p\ 0.001$). In the results of all participants' responses to the clinical scenario interpretation the female students performed significantly better in scenarios 1 and 2 ($p\ 0.001$).

Conclusions: Overall, our study participants' comprehension of CBC values and interpretation of the case scenarios was adequate. On the other hand, female students demonstrated better conceptual understanding than male students. We recommend improving assessment systems to help students expand their interpretation skills.

Key words: Complete Blood Count, interpretation, medical students, Saudi Arabia

Introduction

Medicine is one of the most demanding professions since it involves dedication, passion, and concentration. Usually, medical education focuses little on understanding patients' different investigation results (1). Instructors primarily focus on the pathophysiology, sign symptoms, and treatment. However, different investigations are involved in understanding patients' problems such as blood, CSF, urine, and body tissues. Biochemistry, hematology, histopathology microbiology, and radio diagnostic units are involved. Students' mentalities toward learning are directly related to their level of subject-matter competence (1).

Blood Complete Counts (CBC) including differential WBCs, and reticulocyte counts are the time-tested laboratory studies in almost all the patients attending hospitals, either for outdoor or indoor facilities. CBC interpretation is key in diagnosing a number of commonly encountered clinical problems (2). CBC is beneficial in the differential diagnosis of anemia, hemoglobinopathy/Thalassemia, bleeding disorders, infections, metabolic disorders and in other clinical conditions (2). In their initial academic years, medical students are taught the utility of CBC in different clinical situations. In clinical years they get exposure to patients with various diseases and during bedside teaching, relevant investigations and their interpretation are discussed with the teachers (3).

This exposure to laboratory medicine during student life provides an educational background for future physicians, ensuring proper diagnosis and management of their patients. Pozdnyakova et al. pointed out recently that CBC findings were of immense value in the pandemic of COVD-19 (3). But one must be trained to acknowledge the developing drift in the parameters of CBC. In two studies conducted in different countries, May JE recently pointed out certain parameters of CBC, which clinicians mostly ignored during their consultations (2,4).

A couple of studies investigating the usefulness of CBC in general medical patients reporting in the emergency department, revealed significant value in early diagnosis of the patients (5,6,7). Its predictive value was greatly enhanced if the differential WBC count was taken in isolation in conditions requiring urgent management measures like neonatal sepsis and early detection of infections like occult focal bacterial infections (8, 9,10).

Wilson et al. stressed the need to train future physicians in laboratory medicine services to utilize the essential tool of routine investigations effectively (11). A recent study revealed that young physicians use laboratory facilities very effectively if they get sufficient exposure to interpretations of day-to-day laboratory facilities during their training time (11). The main purpose of this study was to assess the competency of medical students of the Faculty of Medicine Rabigh, KAU Jeddah along with other colleges of Makkah region Saudi Arabia, in the interpretation of common laboratory investigations like CBC. This study will provide information about students' understanding of this common and mostly carried out laboratory test so that one knows the areas to be stressed in the future.

Material and Methods

The current cross-sectional, quantitative and exploratory study was carried out at the Faculty of Medicine, Rabigh, King Abdulaziz University (KAU), Jeddah from April 1 to April 20, 2022. Ethical approval was obtained from the Unit of Biomedical Ethics, KAU, Jeddah, SA. Our study participants were clinical students from different medical colleges in the Mecca Region. An online questionnaire was prepared with the help of the WHO myth-buster document and already published literature (12, 13). The questionnaire was converted to a Google form, and the link was sent to the students via various means like Facebook, Twitter, and WhatsApp.

Two senior faculty members validated the questionnaire for substance and intelligibility, and it was further updated based on their recommendations. A pilot study with 40 students was carried out to ensure the content validity. Cronbach's alpha was discovered to be 80.

The sample size was estimated using the Raosoft sample size calculator, with a population size of 2,500 medical students, a response rate of 50%, a confidence level of 95%, a margin of error of 5%, and statistical power of 80%. The calculated sample size was 334; it was inflated due to expected incomplete and missing questionnaires and non-responses and to increase the generalizability of the results. The data was coded and entered into the Statistical Package for Social Sciences (SPSS, IBM, USA) software version 22.0 for data entry and analysis. Both descriptive statistics and analytic statistics were examined. Categorical variables were compared by Chi-square test, and the scores were compared by Student t-test or ANOVA test. The level of statistical significance was set at $p<0.05$.

Results

A total of 1,010 respondents participated in the survey, representing an overall response rate of 70%. Among all the respondents, females were 677 (67%) while males were 333 (33%). The mean age of students was 23.15±1.3 years. There were 277 (27.4%), 479 (47.4%), and 254 (25.1%) students from the fourth, fifth, and sixth years, respectively. More than half of the students, 539 (53.4%), were from the Faculty of Medicine, King Abdulaziz University, Jeddah, while 471 (46.6%) were from other universities in Mecca region. Table 1 also shows other general characteristics.

Several statements were provided in the survey questionnaire, and the participants selected the correct option from the list of four. For most of the statements, more than 70% of students responded correctly, but particularly for three of the questions, students' correct responses were 561 (55.5%), 518 (51.3%), and 491 (48.6%), which were not up to the mark (Table 2). A gender-wise comparison

showed that the percentage of correct answers given by female students was significantly higher than that of male students for all statements (p< 0.001) (Table 2).

Several indices were interpreted, and participants chose the correct interpretation from four options. For most of the indices, more than 70% of students responded correctly, while for four questions, students' correct responses were not up to the mark. The correct response to a question about the normal range of MCH in an adult was 642 (63.6%). The correct answer for the question, normal range of RDW in an adult female, was 390 (38.6%), and the correct answers for questions, the value of RDW in Iron deficiency anemia and β Thalassemia, were 570 (54.4%) and 547 (54.2%), respectively (Table 3). Comparison between students' gender revealed that, apart from two, the percentage of female students who correctly interpreted the indices was significantly higher than that of male students (p 0.001) (Table 3). Additionally, for the normal range of reticulocytes, more males than females got the correct answer (0.0018) (Table 3).

The results of participants' responses to the clinical scenario's interpretation were 818 (81%), 807 (79.9%), and 590 (58.4%), respectively, for scenarios 1, 2, and 3. In the scenario related to pallor and moderate jaundice, the student's performance was not up to the mark 590 (58.4%). For the same question, there was no difference between male and female responses (p=0.4671). Female students performed significantly better in scenarios 1 and 2 (p 0.001) (Table 4).

Table 1: Participants' general characteristics (N=1010)

Characteristics	Mean ±SD	
Age	23.15±1.3	
Gender	Frequency	Percent
Female	677	67
Male	333	33
Place of study		
KAU	539	53.4
Others	471	46.6
Year of study		
Fourth year	277	27.4
Fifth year	479	47.4
Sixth year	254	25.1
GPA in last semester		
3-3.5	64	6.3
3.5-4	223	22.1
4-4.5	391	38.7
4.5-5	330	32.7
Lessthan 2	2	0.2
Failed in any previous module		
No	825	81.7
Yes	185	18.3

Table 2: All participants' correct responses to each statement and gender-wise comparison of correct answers (Total =1010, Female=677, Male=333)

Statements	Total correct responses n (%)	Female Responses n (%)	Male Responses n (%)	95% CI		p-value
				Low	High	
What does the White blood cell (WBC) count indicate?	799(79.1)	573(84.6)	226(67.9)	11.1%	22.4%	< 0.001
What does the WBC differential count indicate?	802(79.4)	582(86)	220(66.1)	14.2%	25.6%	< 0.001
What does the Red blood cell (RBC) count indicate?	799(79.1)	581(85.8)	218(65.5)	14.6%	26.1%	< 0.001
What does Hematocrit (Hct) indicate?	788(78)	564(83.3)	224(67.3)	10.3%	21.8%	< 0.001
What does Hemoglobin (Hb) indicate?	753(74.6)	547(80.8)	206(61.9)	12.9%	24.9%	< 0.001
What does Mean corpuscular volume (MCV) indicate?	813(80.5)	578(85.5)	235(70.6)	9.4%	20.5%	< 0.001
What does Mean corpuscular hemoglobin concentration (MCHC) indicate?	561 (55.5	409(60.4)	152(45.6)	8.2%	21.1%	< 0.001
What does Red cell distribution width (RDW) indicate?	518 (51.3	414(61.2)	104(31.2)	23.6%	35.9%	< 0.001
What does Platelet count indicate?	734(72.7)	543(80.2)	191(57.4)	16.7%	28.8%	< 0.001
What does Mean platelet volume (MPV) indicate?	491 (48.6)	398(58.8)	93(27.9)	24.6%	36.7%	< 0.001
What does the term reticulocyte indicate?	796(78.8)	569(84)	227(68.2)	10.2%	21.5%	< 0.001

Table 3: All participants, correct interpretation of indices and gender-wise comparison of the correct answer (Total =1010, Female=677, Male=333)

Statements	Total correct interpretation n (%)	Female Responses n (%)	Male Responses n (%)	95% CI		p-value
				Low	High	
WBC differential in a new born is…….x10^9/l	746(73.9)	550(81.2)	196(58.9)	6.2%	28.3%	< 0.001
WBC differential in an adult is ……x10^9/l	829(82.1)	580(85.7)	249(74.8)	5.6%	16.4%	< 0.001
WBC Differential in an in pyogenic infection is ……x10^9/l	832(82.4)	584(86.3)	248(74.5)	6.6%	17.2%	< 0.001
Morphological classification of anemia is dependent on:	834(82.6)	582(86)	252(75.7)	5.1%	15.7%	< 0.001
Average Hb in an adult male is……. g/dl	821(81.3)	578(85.4)	243(73)	7.1%	17.9%	< 0.001
Average Hb in a pregnant female is---------- g/dl	750(74.3)	552(81.5)	198(59.5)	16%	28%	< 0.001
Normal range of MCV in an adult is …… femtoliters	752(74.4)	544(80.4)	208(62.5)	11.9%	23.9%	< 0.001
Normal range of MCH in an adult is …… picogram/cell	642 (63.6)	493(72.8)	149(44.7)	21.7%	34.2%	< 0.001
Normal range of MCHC in an adult is …… grams/dl	730(72.3)	548(80.9)	182(54.7)	20.1%	32.2%	< 0.001
Normal range of RDW in an adult male is ……%	733(72.6)	545(80.5)	188(56.4)	17.9%	30.1%	< 0.001
RDW range in an adult female is ……%	390 (38.6)	263(38.8)	127(38.1)	-5.7%	6.9%	P=0.8300
The value of RDW in Iron deficiency anemia is:	570(54.4)	446(65.9)	124(37.2)	22.2%	34.8%	< 0.001
The value of RDW in β Thalassemia is:	547(54.2)	435(64.3)	112(33.6)	24.3%	36.7%	< 0.001
The normal range of MPV in an adult is …… femtoliters	563(55.7)	439(64.8)	124(37.2)	21.1%	33.7%	< 0.001
The normal range of reticulocytes is?	565(55.9)	423(62.5)	141(72.4)	3.7%	15.7%	0.0018

Table 4: Responses of all participants to the interpretation of clinical scenario and gender-wise comparison of correct interpretation of clinical scenario (Total =1010, Female=677, Male=333)

Clinical Scenario	Total correct interpretation n(%)	Female Responses n(%)	Male Responses n(%)	95% CI		p-value
				Low	High	
A 32-year-old female presented for a routine checkup. Her CBC showed the following: Hb 9 g/dl, MCV 56 fl, RBC count 6.4x10^{12}/l, RDW 12.8%. Which one of the following is the possible explanation for this CBC report?	818(81)	577(85.2)	241(72.4)	7.4%	18.4%	< 0.001
A 66-year-old male was presented with pallor and mild jaundice. He complained of extreme tiredness. Blood CBC showed: Hgb 9.2g/dL, RBC 2.8x10^{12}/l, MCV 98 fl, WBC: 02x10^{9}/l, Platelet count 55x10^{9}/l. Reticulocyte counts 0.1 % (0.2-2%). Which one of the following is the possible explanation for his symptoms and blood counts?	807(79.9)	572(84.5)	235(70.6)	8.4%	19.5%	< 0.001
A 45-year-old male was presented with pallor and moderate jaundice. He complained of extreme tiredness and on examination, he had mild jaundice, and moderately enlarged spleen. Blood CBC showed: Hb 9.2g/dL, RBC 2.8x1012/l, MCV 88 fl, WBC: 8x109/l, platelet count 355x109/l and reticulocyte counts 5.8 %. Which one of the following is the possible explanation for his symptoms and blood counts?	590(58.4)	410(59.2)	189(56.8)	-4%	8.8%	0.4671

Discussion

CBC is the most advised test among outdoor and admitted patients. Quite deceptively, it is thought to be a simple test. It contains both simple quantitative results and the calculated complex results. One needs training to understand the message in the report (14,15). The present study concentrated on the students of clinical years, i.e., fourth, fifth, and sixth years. The response to a couple of the questions like MCH values and RDW interpretation was not up to the mark by our study cohort. Furthermore, the results showed that the senior medical students mainly concentrated on selected parameters of CBC, such as RBC count, Hemoglobin, MCV, total leukocyte count, platelets, differential WBC count, and reticulocyte count. Histograms and other parameters were at times ignored during the report interpretation. Similar trends were observed in a study concentrating on junior doctors (16). MCH (Mean Corpuscular Hemoglobin) and MCHC (Mean Corpuscular Hemoglobin Concentration), critical red cell indices, were mostly ignored by observers. MCH and MCHC values should be interpreted in conjunction with the MCV values. RDW (Red Cell Distribution Width), in conjunction with the MCH, is mainly among the neglected parameters of CBC (17). RDW values mostly reflect the distribution of RBC size, and it is considered a reliable indicator of anisocytosis, mostly used in the diagnosis of hypochromic microcytic and normochromic normocytic anemias. The RDW parameter helps to differentiate among the causes of anemia; a high RDW value indicates the possibility of Iron deficiency anemia, whereas normal RDW in the presence of low hemoglobin and low MCV suggests the presence of thalassemia state/disease (17).

A Brazilian study regarding knowledge of CBC interpretation by health professionals, especially concerning various clinical states, mentioned poor interpretations by many doctors despite having post-graduate qualifications. Most of these doctors were confident in being knowledgeable in CBC interpretations. It has been suggested that along with two other parameters in CBC, RDW is the most neglected finding among clinicians during the interpretation of CBC (18).

Our study revealed an interesting finding: female medical students responded to the survey with greater attention and with a thoughtful mind compared to their male counterparts. This fact has been noted in several previous studies carried out at KAU and other centers (19, 20, 21 & 22). In one study, it was pointed out that male students have many outdoor interests whereas female students being at home or in a hostel can spare more time for curricular activities (23). Statistical analysis revealed that in all the questions except in a couple of queries (26 out 28), a strong statistical significance (<0.001) was observed in the responses of male and female students. It showed that the female students' conceptual understanding was better than males. The male students need to give more time to their studies.

We presented a few clinical scenarios with relevant hematological findings to access the applied clinical knowledge. The Overall response was encouraging except in an odd scenario where the response was not up to the mark. Female students performed much better as compared to male students. It indicated that the female students' knowledge and interpretation skills are better than males. Therefore, it is suggested that male students should be more focused while interpreting the CBC reports. To improve their understanding and interpretation skills, they should discuss all their misconceptions with their teachers.

Rosenberg W stressed that evidence-based learning practice could improve the problem-solving capabilities among medical students (24). Burgess A et al. in a recent study emphasized that team-based learning and case-based learning modalities are strong instruments for polishing the problem-solving capabilities of medical students (25). It has been stressed that adopting layered analysis of self-explanation and structured reflection to support clinical reasoning helps medical students in clinical problem-solving.

A recent study reported that most medical students perceived case-based learning (CBL) as a tool that facilitates their transformation from fact, and memorizers into problem solvers, provides insight into real-life experiences, promotes deep learning, and keeps them engaged during the sessions (1). Therefore, CBL's importance in deeper learning is undeniable.

Students' continuous evaluation is essential to encourage their learning motives (26), hence, it has been proposed to link the assessments with CBL like activities so that students can focus more on conceptual knowledge. Such an approach will assist them in remembering the material for a more extended period and using it in real-life scenarios while interacting with patients (27, 28).

Khalid et al. have advocated that clinical exposure for medical students be included early in their MBBS programs to improve collaborative skills and self-directed learning (1).

A study reported that specific modes of training, such as CBL, and PBL, require medical students to search on the net and open their textbooks in order to obtain necessary knowledge (19).

CBC plays a crucial role in diagnosing several clinical conditions and patient management. The current practical knowledge among medical students regarding its interpretation needs attention. Medical students should be encouraged to interpret laboratory investigations concerning the clinical presentation of their patients (28, 29).

Limitations of the study: Our study was carried out in the immediate post COVID-19 era. We relied on the online questionnaire and couldn't arrange face-to-face sessions. There was a possibility that students may consult literature while answering the questions. But the authors were of the idea that we didn't ask our study cohort to reveal their identity so it would minimize the chances of taking help either online or through books.

Conclusion

Overall, our study participants' understanding regarding CBC values and their interpretation of the case scenarios was up to the mark. However, female students had better conceptual understanding compared to males. It is recommended that for further enhancing their skills of interpretation there should be an improvement in assessment tools.

References

1. Khalid A, Ali Jaffar M, Khan T, Abbas Lail R, Ali S, Aktas G, Waris A, Javaid A, Ijaz N, Muhammad N. Hematological and biochemical parameters as diagnostic and prognostic markers in SARS-COV-2 infected patients of Pakistan: a retrospective comparative analysis. Hematology. 2021 Jan 1;26(1):529-42. doi:10.1080/16078454.2021.1950898.
2. May JE, Marques MB, Reddy VV, Gangaraju R. Three neglected numbers in the CBC: the RDW, MPV, and NRBC count. Cleve Clin J Med. 2019 Mar 1;86(3):167-72. doi:10.3949/ccjm.86a.18072
3. Pozdnyakova O, Connell NT, Battinelli EM, Connors JM, Fell G, Kim AS. Clinical significance of CBC and WBC morphology in the diagnosis and clinical course of COVID-19 infection. American journal of clinical pathology. 2021 Mar;155(3):364-75. doi: 10.1093/ajcp/aqaa231
4. Birhaneselassie M, Birhanu A, Gebremedhin A, Tsegaye A. How useful are complete blood count and reticulocyte reports to clinicians in Addis Ababa hospitals, Ethiopia? BMC Blood Disorders. 2013 Dec;13(1):1-7. doi:10.1186/2052-1839-13-11
5. Almeida BS, Alves BD, de Sousa Gehrke F, Adami F, Fonseca FL. Complete Blood Count Interpretation: A Survey of Health Professional in Brazil. International Archives of Medicine. 2017 Aug 3;10. DOI: https://doi.org/10.3823/2499
6. Jazima Sulaiha S. Screening Tools for Early Prediction of Bacteremia in Febrile Children aged 3-36 Months (Doctoral dissertation, Madras Medical College, Chennai). DOI: 10.1111/j.1742-6723.2007.00981.x
7. Nithya M. Study on Thrombocytosis as a Predictor of Serious Bacterial Infection in Young Infants (Doctoral dissertation, Madurai Medical College, Madurai).
8. Cantey JB, Lee JH. Biomarkers for the diagnosis of neonatal sepsis. Clinics in Perinatology. 2021 Jun 1;48(2):215-27.
9. Mohankumar MK, Paulose S. MEAN PLATELET VOLUME IN NEONATAL SEPSIS-A CASE CONTROL STUDY. Journal of Evolution of Medical and Dental Sciences. 2019 Jun 3;8(22):1808-13. DOI: 10.14260/jemds/2019/397
10. Shoukry LR, Mohamed AN, Sharaf AE, Osman OB. Diagnostic markers for early detection of neonatal sepsis. Journal of Scientific Research in Medical and Biological Sciences. 2021 Aug 12;2(3):13-26. DOI: https://doi.org/10.47631/jsrmbs.v2i3.319
11. Wilson ML, Fleming KA, Kuti MA, Looi LM, Lago N, Ru K. Access to pathology and laboratory medicine services: a crucial gap. The Lancet. 2018 May 12;391(10133):1927-38. doi: 10.1016/S0140-6736(18)30458-6.
12. Schumacher LD, Jäger L, Meier R, Rachamin Y, Senn O, Rosemann T, Markun S. Trends and between-physician variation in laboratory testing: A retrospective longitudinal study in general practice. Journal of clinical medicine. 2020 Jun;9(6):1787. doi: 10.3390/jcm9061787
13. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, Li Y. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. International journal of biological sciences. 2020;16(10):1745. doi: 10.7150/ijbs.45221
14. Sandhaus LM, Meyer P. How useful are CBC and reticulocyte reports to clinicians?. American journal of clinical pathology. 2002 Nov 1;118(5):787-93. doi: 10.1186/2052-1839-13-11
15. Sharma M. Applying feminist theory to medical education. The Lancet. 2019 Feb 9;393(10171):570-8. doi: 10.1016/S0140-6736(18)32595-9.
16. Tefferi A, Hanson CA, Inwards DJ. How to interpret and pursue an abnormal complete blood cell count in adults. In Mayo Clinic Proceedings 2005 Jul 1 (Vol. 80, No. 7, pp. 923-936). Elsevier. doi: 10.4065/80.7.923.
17. Hoffmann JJ, Urrechaga E. Role of RDW in mathematical formulas aiding the differential diagnosis of microcytic anemia. Scandinavian Journal of Clinical and Laboratory Investigation. 2020 Oct 1;80(6):464-9. doi:10.1080/00365513.2020.1774800.
18. Almeida BS, Alves BD, de Sousa Gehrke F, Adami F, Fonseca FL. Complete Blood Count Interpretation: A Survey of Health Professional in Brazil. International Archives of Medicine. 2017 Aug 3;1. DOI: https://doi.org/10.3823/2499
19. Nuzhat A, Salem RO, Hamdan NA, Ashour N. Gender differences in learning styles and academic performance of medical students in Saudi Arabia. Medical teacher. 2013 Apr 1;35(sup1):S78-82. doi: 10.3109/0142159X.2013.765545.
20. Jameel T, Gazzaz ZJ, Baig M, Tashkandi JM, Alharenth NS, Butt NS, et al. Medical students' preferences towards learning resources and their study habits at King Abdulaziz University, Jeddah, Saudi Arabia. BMC Res Notes 2019; 12(1): 30. https://doi.org/10.1186/s13104-019-4052-3.
21. Sayedalamin Z, Alshuaibi A, Almutairi O, Baghaffar M, Jameel T, Baig M. Utilization of smart phones related medical applications among medical students at King Abdulaziz University, Jeddah: a cross-sectional study. Journal of infection and public health. 2016 Nov 1;9(6):691-7. doi: 10.1016/j.jiph.2016.08.006.
22. Jameel T, Baig M, Tariq S, Gazzaz ZJ, Butt NS, Althagafi NK, Hazazi EY, Alsayed RS. Psychosocial, cultural, and academic challenges to Saudi Arabian students in Australia. PloS one. 2022 Jan 31;17(1):e0262585. https://doi.org/10.1371/journal.pone.0262585

23. Jameel T, Baig M, Gazzaz ZJ, Tashkandi JM, Al Alhareth NS, Khan SA, Butt NS. Approaches towards professional studies and spare-time activities among preclinical and clinical year medical students. Cureus. 2019 Jun 14;11(6). doi: 10.7759/cureus.4905
24. Rosenberg W, Donald A. Evidence based medicine: an approach to clinical problem-solving. BMJ. 1995 Apr 29;310(6987):1122-6. doi: 10.1136/bmj.310.6987.1122.
25. Burgess A, Matar E, Roberts C, Haq I, Wynter L, Singer J, Kalman E, Bleasel J. Scaffolding medical student knowledge and skills: team-based learning (TBL) and case-based learning (CBL). BMC Medical Education. 2021 Dec;21(1):1-4. doi: 10.1186/s12909-021-02638-3.
26. Mehmood MS, Baig WS, Khan SA, Khan F, Awan SA, Babar A. Students perspective on online Medical education during lockdown as a result of COVID- 19 Pandemic. Journal of University Medical & Dental College. 2021 May 28;12(2):111-8. doi: 10.33314/jnhrc.v18i3.2851.
27. Chamberland M, Mamede S, Bergeron L, Varpio L. A layered analysis of self-explanation and structured reflection to support clinical reasoning in medical students. Perspectives on medical education. 2021 Jun;10(3):171-9. doi: 10.1007/s40037-020-00603-2
28. Chibnall JT, Blaskiewicz RJ, Detrick P. Are medical students agreeable? An exploration of personality in relation to clinical skills training. Medical teacher. 2009 Jan 1;31(7):e311-5. doi: 10.1080/01421590802638006.
29. Baig M. Assessment: a strategic tool for teaching and learning in medicine. Journal of University Medical & Dental College. 2020;11(1):v-i. DOI:https://doi.org/10.37723/jumdc.v11i1.413.

Post-catheterization complications in diabetic patients with myocardial infarction

Ali Mohammed Alamri [1], Mohammed Dafer Alahmari [2], Amar Abdullah A. Al Qahtani [3], Amjad Abdulrahman H. Al Qahtani [3], Sabah Mubarak H. Alshahrani [3], Lujain Saleh A. Alamri [3], Walaa Muteb D Alahmari [3], Amnah Saad H Alharthi [3], Manar Abdullah S Alqahtani [3]

(1) Family medicine & diabetes consultant, Ministry of Health, Joint Program of Family Medicine, Abha, Saudi Arabia
(2) Consultant & Interventional Cardiologist, Prince Faisal Bin Khaled Cardiac Center, Abha, Saudi Arabia
(3) Medical students, College of Medicine, King Khalid University, Abha, Saudi Arabia

Corresponding Author
Amar Abdullah A. Al Qahtani
Email: ammar_17_17@hotmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Ali Mohammed Alamri et al. Post-catheterization complications in diabetic patients with myocardial infarction. World Family Medicine. 2022; 20(11): 44-50. DOI:10.5742/MEWFM.2022.95251374

Abstract

Objective: To identify various post-catheterization complications in diabetic patients with myocardial infarction.

Methods: A retrospective study design was followed to include all diabetic patients with myocardial infarction who underwent cardiac catheterization at Prince Faisal Bin Khalid Cardiac Center, Aseer Region, Saudi Arabia, during the past year (n=500). Data were obtained from the center's medical record system. A data sheet was designed by the researchers and was used for data collection.

Results: Most patients were males (81.4%), aged 50 years or more (78.4%), Saudi (88.8%), married (94.2%), 26% were overweight, 15.3% were obese, and 17% were current smokers. Commonly associated comorbidities mainly included dyslipidemia (63.6%), and hypertension (52%). Anticoagulants were received by almost all cases (98.8%), while 98.2% were hospitalized for 2 weeks, and 55.2% were followed up for more than 4 weeks. Most participants underwent catheterization of one or two arteries (64.8% and 25.2%, respectively). Post-catheterization complications affected 65 patients (13%), but these complications did not differ significantly according to patients' characteristics.

Conclusions: Post-catheterization complications are common among diabetic patients with myocardial infarction, mainly chest pain, thrombosis, dyspnea and death. Anticoagulants are the most commonly administered medications. Hospital stay is mainly for less than two weeks, but they usually need follow-up for more than four weeks. It is important to achieve strict control for diabetes before conducting coronary catheterization.

Keywords: Myocardial infarction, diabetes, catheterization, complications.

Introduction

Diabetes mellitus is a metabolic illness caused by the pancreas' inability to produce sufficient insulin or the body's inability to use it effectively, resulting in hyperglycemia. Diabetes affects 23.7% of the Saudi population. Its diagnosis is based on symptoms and laboratory results, e.g., glycated hemoglobin (HbA1c) scores higher than 6.5% on two distinct occasions. End-organ damage can occur as a result of diabetes (1).

Diabetes has a greater impact on the outcome of coronary artery disease. Hence, early prevention is important (2). For patients with myocardial infarction, percutaneous coronary intervention is a common treatment option. Those with poor HbA1c management had a greater mortality and morbidity rates (3).

In recent years, prevalence of diabetes mellitus has been increasing in developing countries, due to changes in lifestyle and diet. Diabetes is a major cardiovascular risk factor for coronary artery disease, with the risk of coronary artery disease occurrence being 2-5 times higher in diabetics than non-diabetics (4).

Cardiac catheterization is a common procedure that is conducted for the diagnosis or treatment of several cardiac problems. However, it has some risks, while major complications are quite rare (5).

Prevalence of diabetes among the Saudi population is quite high (23.7%) (1). Therefore, it is important to explore the common complications among diabetic patients undergoing cardiac catheterization.

Objective

The present study aimed to identify various post-catheterization complications in diabetic patients with myocardial infarction.

Methodology

A retrospective cohort study design was followed to include all diabetic patients with myocardial infarction who underwent cardiac catheterization at Prince Faisal Bin Khalid Cardiac Center (PFBKCC) during the past year (2021).

Prince Faisal Bin Khalid Cardiac Center (PFBKCC) is a governmental 78-bed tertiary care hospital, under the General Directorate of Health in Abha City, Aseer Region, Saudi Arabia. It is a specialized center that provides healthcare services for cardiac patients.

Inclusion criteria were adult (aged above 18 years) diabetic patients (type 1 or 2), with myocardial infarction who underwent cardiac catheterization at PFBKCC during 2021. Patients who were recently diagnosed as diabetics (within the last 6 months) were not included.

Data were obtained from the center's medical record system. Based on relevant literature, a data file (in Excel sheet) was designed by the researchers and was used for data collection. It included patients' personal characteristics (gender, age groups, nationality, and marital status); risk factors for ischemic heart disease (body mass index, and smoking status); associated comorbidities (dyslipidemia, hypertension, other heart diseases, and renal disease); received medications, number of catheterized arteries, hospital stay, duration of follow-up and recorded post-catheterization complications.

The relevant data of 500 diabetic patients fulfilling the inclusion criteria were enrolled in the present study. Data were collected during the period from January 2022 to March 2022. Collected data were statistically analyzed using the Statistical Package for the Social Sciences (IBM, SPSS, version 28). Descriptive statistics (frequencies and percentages) were calculated. Chi square (X^2) test was applied to test significance of differences regarding post-catheterization complications among diabetic patients according to their personal characteristics.

The official ethical approval was obtained from the General Directorate of Health in Aseer Region. During data collection, anonymity was fully considered. No personal or identifying data (e.g., names or mobile phone numbers) were used. However, since this is a record-based study, no consent was requested from patients.

Results

Table (1) shows that most patients were males (81.4%), aged 50 years or more (78.4%), Saudi (88.8%), married (94.2%), 26% were overweight, 15.3% were obese, and 17% were current smokers.

Table (2) shows that 63.6% had dyslipidemia, 52% were hypertensive, and 13.4% had past history of angina pectoris. Anticoagulants were received by almost all cases (98.8%). Most participants underwent catheterization of one artery (64.8%), while 35.2% underwent the catheterization of two or more arteries, as shown in Figure (1). Post-catheterization complications affected 65 patients (13%), as shown in Figure (2); they were mainly chest pain (16, 3.2%), thrombosis (5, 1%), dyspnea (4, 0.8%) and death (3, 0.6%).

Table (3) shows that incidence of post-catheterization complications were higher among males than females (14% vs. 8.6%, respectively), was highest among those aged 50 years or more (14.3%), almost equal among single and married patients (13.8% vs. 13.0%, respectively), highest among obese patients (19.6%), higher among cigarette smokers than non-smokers (17.6% vs. 12.0%, respectively), higher among patients with dyslipidemia than those without dyslipidemia (13.8% vs. 11.5%, respectively), and was higher among those who underwent more than one artery catheterization than those who underwent a single artery catheterization (14.8% vs. 12%, respectively). However, post-catheterization complications did not differ significantly according to participants' characteristics.

Table 1: Personal characteristics of study sample

Personal characteristics	No.	%
Gender		
• Male	407	81.4
• Female	93	18.6
Age groups		
• ≤30 years	2	0.4
• 31-40 years	23	4.6
• 41-50 years	83	16.6
• 50+ years	392	78.4
Marital status		
• Married	471	94.2
• Not married	29	5.8
Body mass index (n=334)		
• Normal weight	196	58.7
• Overweight	87	26.0
• Obese	51	15.3
Cigarette smoking status		
• Current smoker	85	17.0
• Non-smoker	415	83.0

Table 2: Medical history of study sample (n=500)

Medical history	No.	%
Associated comorbidities		
• Dyslipidemia	318	63.6
• Hypertension	260	52.0
• Other heart diseases	134	26.8
• Renal disease	35	7.0
Received medications		
• Anticoagulants	494	98.8
• Antibiotics	21	4.2
• Other drugs	492	98.4
Number of catheterized arteries		
• 1	324	64.8
• 2+	176	35.2
Post-catheterization complications:	46	9.2
• Chest pain	16	3.2
• Thrombosis	5	1.0
• Decompensated heart failure	5	1.0
• Cough	5	1.0
• Dyspnea	4	0.8
• Atrial fibrillation	4	0.8
• Death	3	0.6
• Heart block	2	0.4
• Others	2	0.4

Table 3: Post-catheterization complications according to personal characteristics of study sample

Personal characteristics	Yes		No		P Value
	No.	%	No.	%	
Gender					
• Male	57	14.0	350	86.0	
• Female	8	8.6	85	91.4	0.162
Age groups					
• ≤30 years	0	0.0	2	100.0	
• 31-40 years	3	13.0	20	87.0	
• 41-50 years	6	7.2	77	92.8	0.345
• 50+ years	56	14.3	336	85.7	
Nationality					
• Saudi	57	12.7	392	87.3	
• Non-Saudi	8	15.7	43	84.3	0.547
Marital status					
• Married	61	13.0	410	87.0	
• Single	4	13.8	25	86.2	0.896
Body mass index (n=334)					
• Normal weight	21	10.7	175	89.3	
• Overweight	10	11.5	77	88.5	0.219
• Obese	10	19.6	41	80.4	
Smoking status					
• Smoker	15	17.6	70	82.4	
• Non-smoker	50	12.0	365	88.0	0.160
Dyslipidemia					
• Yes	44	13.8	274	86.2	
• No	21	11.5	161	88.5	0.493
Number of catheterized arteries					
• 1	39	12.0	285	88.0	
• 2+	26	14.8	150	85.2	0.673

Figure 1: Number of catheterized arteries among diabetic patients with myocardial infarction

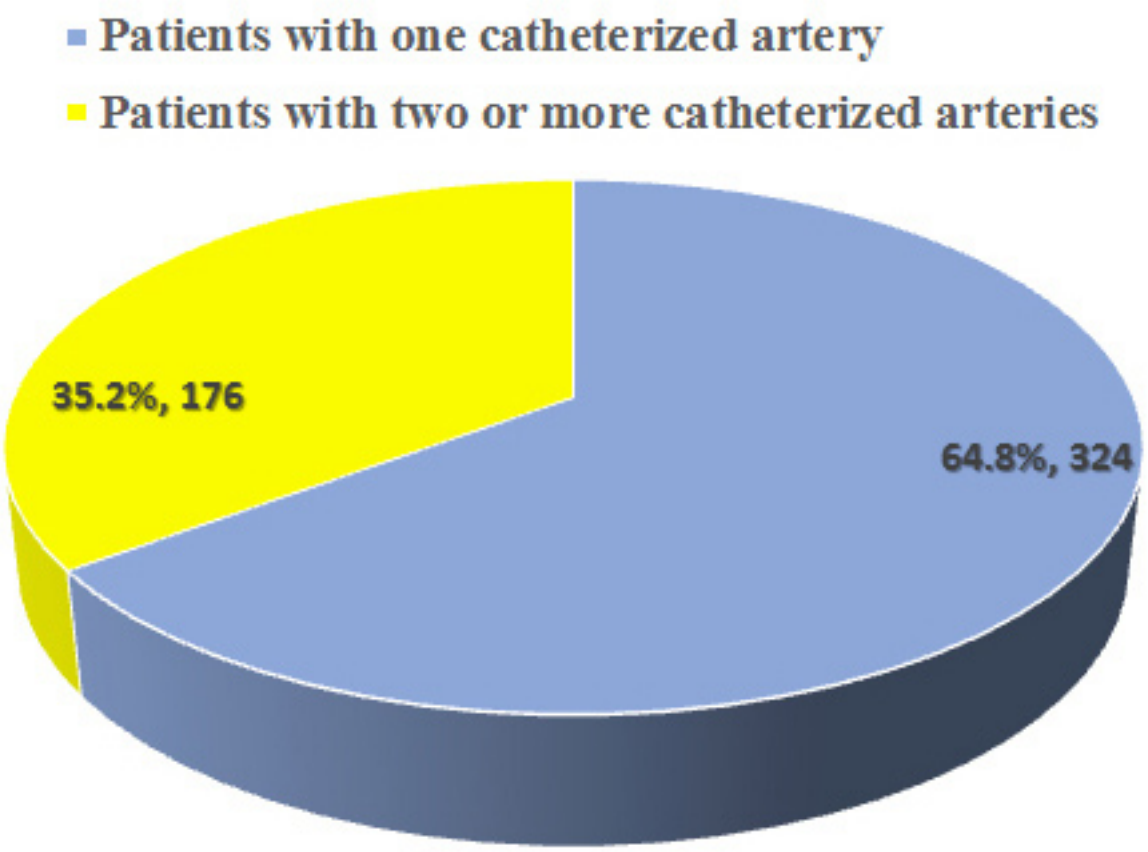
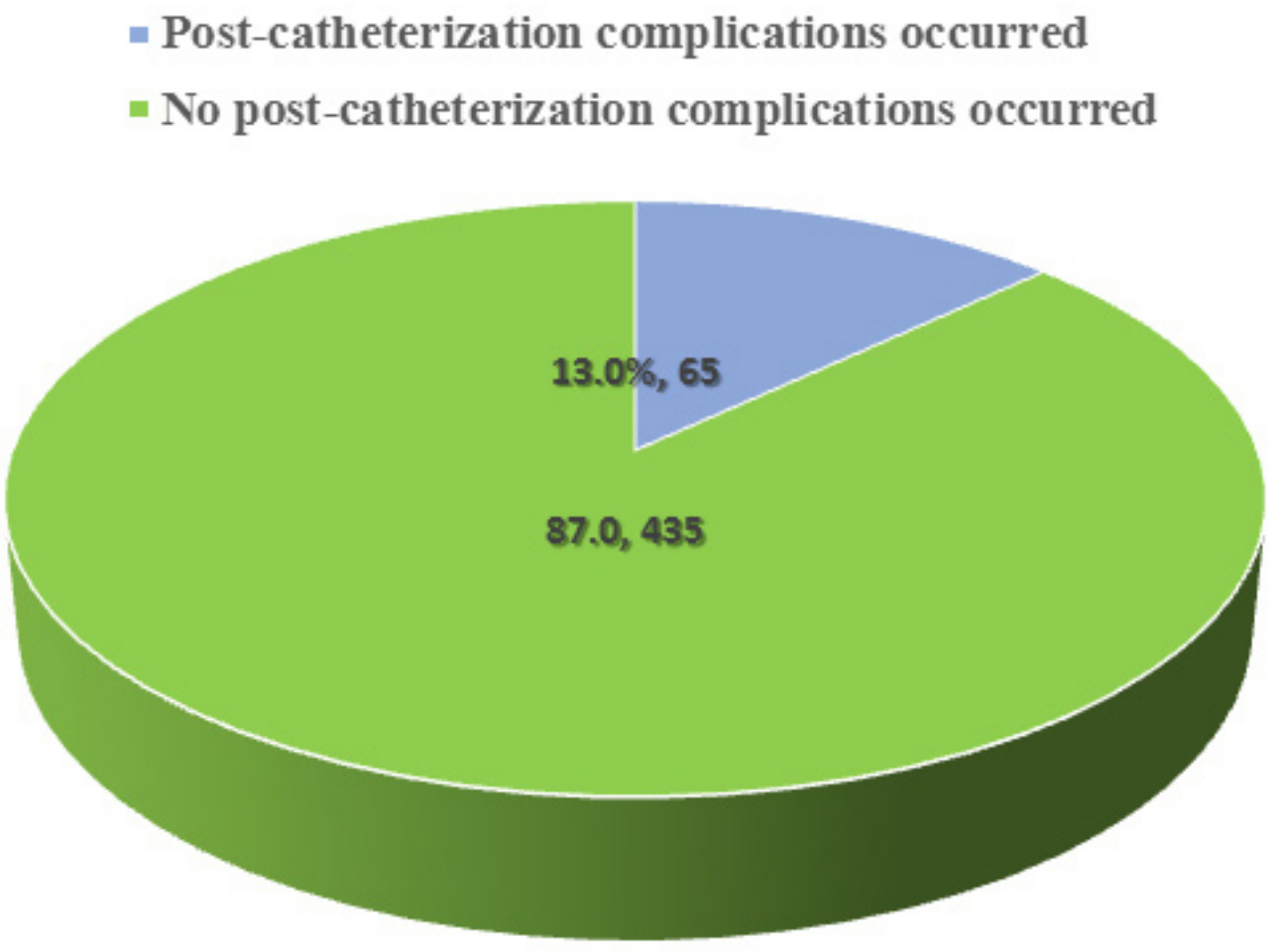


Figure 2: Incidence of post-catheterization complications among diabetic patients with myocardial infarction



Discussion

Diabetic patients are at a higher risk of cardiovascular disease than non-diabetics. In general, this was associated with a 3-fold to 4-fold increase in all diabetic patients, but may rise to up to 40-fold increase in diabetes associated with chronic renal impairment (6).

The present study aimed to identify most frequently encountered post-catheterization complications among diabetic patients with myocardial infarction, admitted to Prince Faisal Bin Khalid Cardiac Center, Aseer Region, Saudi Arabia.

The present study showed that most patients were males, aged 50 years or more, either overweight, or obese, with 17% being cigarette smokers. Moreover, commonly associated comorbidities included dyslipidemia and hypertension.

These findings underline the characteristic risk factors for myocardial infarction, repeatedly reported in literature. Rathore et al. (7) argued that since type 2 diabetes shares several risk factors in common with coronary artery disease, (e.g., older age, hypertension, dyslipidemia, obesity), the increasing prevalence of diabetes indirectly implicates an escalating risk of coronary artery disease as well.

Furthermore, it is well-known that men tend to have heart attacks earlier in life than women, whose heart attacks increase after menopause. In addition, smoking is a strong risk factor of myocardial infarction, premature atherosclerosis and sudden cardiac death (8). Infarction is also greatly enhanced by increased body mass index (9).

Our study indicated that about one-third of patients underwent catheterization of two or more arteries. Anticoagulants were received by almost all cases.

Saito and Kobayashi argued that percutaneous coronary intervention has become a standard of care procedure in the setting of angina or acute coronary syndrome, and anticoagulation therapy is the cornerstone of pharmacological treatment aiming at preventing ischemic events following this intervention. Dual antiplatelet therapy as the combination of aspirin and anti-platelet drugs has been proven to decrease stent-related thrombotic risks (10).

Craig et al. concluded that, compared to clopidogrel and low-dose aspirin, the use of rivaroxaban and low-dose aspirin reduced the risk of major adverse cardiovascular events, cardiovascular death and stroke including ischemic stroke in patients with or at high risk for chronic coronary artery disease. These benefits of rivaroxaban and low-dose aspirin compared to clopidogrel and low-dose aspirin appear to be achieved without significantly increasing patients' risk of moderate-to-severe bleeding, including intracranial hemorrhage or fatal bleeding (11).

Moreover, findings of the double blind randomized clinical trial of Eikelboom et al. (12) revealed that, in patients with atherosclerotic vascular disease, the outcome of anticoagulant therapy with rivaroxaban-plus-aspirin was better than in the aspirin-alone group (hazard ratio: 0.76; 95% confidence interval: 0.66-0.86; P<0.001). Nevertheless, major bleeding events occurred in more patients in the rivaroxaban-plus-aspirin group (288 patients [3.1%] vs. 170 patients [1.9%]; hazard ratio, 1.70; 95% CI, 1.40 to 2.05; P<0.001).

Miller (13) noted that the use of anticoagulation therapy is common after cardiac intervention, but may also increase the risk and amount of bleeding.

Our study showed that post-catheterization complications were observed to be relatively high among participants, affecting up to 13% of diabetic patients, mainly in the form of post-catheterization chest pain (3.2%), but about 1% had thrombosis, or dyspnea while 3 cases died (0.6%).

Tavakol et al. (14) stated that the risk of major complications during cardiac catheterization procedure is not high, being usually less than 1%, while the risk of mortality is quite low (0.05%). The complications can range from minor discomfort at the site of catheterization, to major ones like death.

This very high incidence of post-catheterization complications among our diabetic patients may provide evidence that diabetes constitutes a high risk for these post-catheterization complications among patients with myocardial infarction.

Our study also revealed that the post-catheterization complications among diabetic patients were higher among males than females, among those aged 50 years or more, among obese patients, among smokers, among patients with dyslipidemia, and among those who underwent more than one artery catheterization.

Miller (13) noted that post-catheterization complication rates are dependent on several factors, such as patients' demographics, vascular anatomy, comorbid conditions, clinical presentation, the procedure being performed, and the experience of the operator. She listed several risk factors that are associated with developing a complication after cardiac catheterization, such as older age, female sex, and among those who had previous cardiac intervention.

It is to be emphasized that knowing who is at high risk of developing post-catheterization complications will help guide clinicians' assessment of the cardiac catheterization procedure. Manda and Baradhi (15) stated that when the risk of complications is expected to be more than what is considered acceptable for the procedure, alternative modes of imaging and assessment can be used. Experienced operators should modify the technique of the procedure in a way as to get the best possible outcomes for each individual patient with the least amount of risk.

Study limitations

There are few limitations that should be stated. First, this study was conducted at a single-center (i.e., PFBKCC) in Abha City, Aseer Region, Saudi Arabia. This may limit the generalizability of our results. Second, the present

study followed a retrospective hospital record-based design. Although this research design is relatively cheap, quick, and easy to perform, it has some disadvantages. Hospital records may not include all pertinent risk factors. Moreover, since different healthcare professionals have been involved in patient care, the measurement of risk factors and outcome(s) throughout the hospital records would probably be less accurate and consistent than those obtained from prospective cohort studies (16).

Conclusions

Most patients with diabetes mellitus and myocardial infarction are males. Post-catheterization complications are common among diabetic patients with myocardial infarction, mainly chest pain, thrombosis, dyspnea and death. Anticoagulants are the most frequently administered medications to these patients. Hospital stay for these cases is mainly for less than two weeks, but they usually need follow up for more than four weeks. It is important to achieve strict control for diabetes before conducting coronary catheterization.

References

1. Balghith MA, Almutairi AA, Almohini IA, Albadah AR, Almutairi AA, Alhamdan AA, et al. The Effect of Glycemic Control on Cardiac Outcomes in Saudi Diabetic Patients who Underwent Coronary Angiogram. Heart Views 2020; 21(4):245-250. doi: 10.4103/HEARTVIEWS.HEARTVIEWS_28_20.
2. Aldarwish WA, Alqarni AA, Medawi AA, Alhwaishel AZ, AbuHassan AH, Aldarwish B. Myocardial infarction risk factors and outcome among diabetic and nondiabetic patients at the high altitude of Saudi Arabia. IJMDC. 2020; 4(3): 620-628. doi: 10.24911/IJMDC.51-1574537501.
3. Albugami S, Almehmadi F, Bukhari Z, Alqarni M, Abukhodair A, BinShihon M, et al. Glycated Haemoglobin and Outcomes of Percutaneous Coronary Intervention among Type Two Diabetic Patients in Saudi Arabia. Cureus 2020; 12(10):e11278. doi: 10.7759/cureus.11278.
4. N'Guetta R, Yao H, Ekou A, Séri B, N'Cho-Mottoh M-P, Soya E, et al. Coronary artery disease in black African patients with diabetes: Insights from an Ivorian cardiac catheterization centre. Archives of cardiovascular disease 2019; 112:296-304. Doi: 10.1016/j.acvd.2019.01.003.
5. Mayo Clinic. Cardiac catheterization. Website: Cardiac catheterization - Mayo Clinic. Accessed on August 8th, 2022.
6. Grant PJ, Cosentino F, Marx N. Diabetes and coronary artery disease: not just a risk factor. Heart, heartjnl–2019–316243. doi:10.1136/heartjnl-2019-316243doi:10.1136/heartjnl-2019-316243.
7. Rathore V, Singh N, Mahat RK. Risk Factors for Acute Myocardial Infarction: A Review. EJMI 2018; 2(1):1–7. DOI: 10.14744/ejmi.2018.76486.
8. Huma S, Tariq R, Amin F, Mahmood KT. Modifiable and non-modifiable predisposing risk factors of myocardial infarction -A review. J Pharm Sci Res 2012; 4:1649–1653.
9. Zhu J, Su X, Li G, Chen J, Tang B, Yang Y. The incidence of acute myocardial infarction in relation to overweight and obesity: a meta-analysis. Arch Med Sci 2014; 10:855–62.
10. Saito Y, Kobayashi Y. Update on Antithrombotic Therapy after Percutaneous Coronary Intervention. Intern Med 2020; 59: 311-321. doi: 10.2169/internalmedicine.3685-19.
11. Craig I. Coleman, Akshay A. Kharat, Brahim Bookhart & William L. Baker. Combination anticoagulant or P2Y12 inhibitor with low-dose aspirin versus low-dose aspirin alone in patients at risk or with documented coronary and/or peripheral artery disease, Current Medical Research and Opinion, 2022; 38 (1): 27-34. DOI: 10.1080/03007995.2021.1991294.
12. Eikelboom JW, Connolly SJ, Bosch J, et al. Rivaroxaban with or without aspirin in stable cardiovascular disease. N Engl J Med 2017; 377:1319–30.
13. Miller N. Warning! Cardiac cath complications. Nursing made Incredibly Easy! July/August 2012; 8-10. Website: July/August 2012 - Volume 10 - Issue 4: Nursing made Incredibly Easy (lww.com). Accessed on July 8th, 2022.
14. Tavakol M, Ashraf S, Brener SJ. Risks and complications of coronary angiography: a comprehensive review. Glob J Health Sci. 2012 Jan 01;4(1):65-93.
15. Manda YR, Baradhi KM. Cardiac Catheterization Risks and Complications StatPearls. Website: https://www.ncbi.nlm.nih.gov/books/NBK531461. Accessed on August 8th, 2022.
16. Sedgwick P. Retrospective cohort studies: advantages and disadvantages. BMJ, 2014; 348(jan24 1), g1072–g1072. doi:10.1136/bmj.g1072.

Assessment of Quality of Life among Elderly Patients Attending Primary Healthcare Centers in Aseer Region, Saudi Arabia

Osama Mohammed Alqahtani [1], Awad Saeed Alsamghan [2], Safar Abadi Alsaleem [2], Alaa Ali Saeed Alyahya [3], Faizah Salem Alrazhi [4], Asma Sulaiman Alshahrani [4], Atheer Saeed M Alasmari [3], Asma Abdullah Saeed [3], Ranyah Ahmed Nasser Qawwadi [4], Bushra Mohammed Alotayfi [5], Nadine Thabet Saeed Alshahrani [4]

(1) Family Medicine Resident, Joint Program of Family Medicine, Abha, Saudi Arabia
(2) Department of Family and Community Medicine, College of Medicine, King Khalid University, Abha, Saudi Arabia
(3) Medical student, King Khalid University, Abha, Saudi Arabia
(4) Medical intern, King Khalid University, Abha, Saudi Arabia
(5) Family Medicine Resident, Family medicine training program in Jazan, Jazan, Saudi Arabia

Corresponding Author
Osama Mohammed Alqahtani
Email: Osamah22770@gmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Osama Mohammed Alqahtani et al. Assessment of Quality of Life among Elderly Patients Attending Primary Healthcare Centers in Aseer Region, Saudi Arabia. World Family Medicine. 2022; 20(11): 51-61.
DOI: 10.5742/MEWFM.2022.95251375

Abstract

Aim of study: Aim of study: To explore quality of life (QOL) among elderly population and to identify the factors associated with their QOL.

Methods: Following an observational cross-sectional research design, this study included 405 elderly patients attending the primary healthcare centers (PHCCs) in Aseer Region, Saudi Arabia. A self-administered questionnaire was constructed and utilized for data collection. It included personal and socio-demographic characteristics, lifestyle habits, clinical data and the WHOQOL-BREF Questionnaire to assess participants' QOL.

Results: About half of participants (53.3%) were males, 65.7% was less than 70 years old, 89.4% were Saudi, and 68.1% were currently married. Regular exercise was practiced by 19.3% of participants, while 8.4% were smokers. About two-thirds of participants were hypertensive (64%), or diabetic (63.2%), while 49.6% had musculoskeletal diseases, about one third had visual problems (38.8%), eye diseases (34.8%), or dyslipidemia (33.6%), while 23.2% had heart disease. The mean overall percent score for WHOQOL was 66.4±11.4%, while the lowest mean percent score was for their physical health (64.5±11.4%), while that for psychological domain was 66.2±11.5%, that for social relationships was 68.1±17.7%, and for environment was 67.6±14.6%, while negative feelings were always felt by 4%, very often by 23%, and quite often by 45%. Par- ticipants' WHOQOL mean percent scores differed significantly according to their age group ($p<0.001$), marital status ($p<0.001$), educational status ($p<0.001$), occupational status ($p=0.001$), monthly income ($p<0.001$), residence ($p=0.004$), and regular practice of exercise ($p<0.001$).

Conclusions: Elderly people attending PHC centers in Aseer Region have suboptimal overall QOL, with their physical health being the lowest manifestation. Several chronic diseases are highly prevalent among elderly people, such as hypertension, diabetes, sensory problems, musculoskeletal diseases, heart and urinary diseases. Therefore, it is necessary to provide high attention toward geriatric care in order to enhance their QOL.

Key words: Elderly, primary health care, Quality of life, life style, WHOQOL.

Introduction

Globally, there is an increasing in longevity as a result of improvements in economics, living status and health, and Saudi Arabia is not an exception. By 2021, the estimated worldwide elderly population represented 21.1% of the population, with an expected rise to about two billion by 2050 (1). In the Kingdom of Saudi Arabia, life expectancy of men is 73.5 years and that of women 76.5 years and overall, 74.8 years and Saudi Arabia ranked the 84th position all over the world (2).

According to the World Health Organization (WHO), almost 15% of elderly population aged 60 years and over having neuropsychiatric disorders; commonly dementia and depression (3). Also, the world Health Organization declared that "aging must be accompanied by continuous opportunities for good health, participation, and security" to make it a positive experience (4). In order to achieve this, there should be comprehensive and multidisciplinary care for elderly people, considering the nature of their living environment (5).

The WHO defines the concept of quality of life (QOL) as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns" (6).

With increasing in the proportion of elderly population in the community, heath demands and other social requirements increase (7). Studies have shown that aging is associated with deterioration of physical health, mental and memory weakness as well as psychological disturbance (8). The elderly population often faces various forms of pressure, such as health-care expenditures, work migration, financial disciplines, and reduced family size, which can adversely affect their life (9).

The most important aspects of QOL assessment among elderly people are autonomy, self-decision-making, absence of suffering and pain, competent sensory abilities, social support, sufficient financial level, feeling usefulness to others, self-sufficiency and happiness (10).

Determinants of quality of life among elderly people are numerous including demographic factors such as age and gender, socio-economic factors such as educational level, marital status, financial status and, social support, cultural values, health-related factors such as chronic illness, functional status, availability of health care services, and finally personal factors in the form of coping mechanisms and self-efficacy (7, 10-12).

This study aimed to explore quality of life among elderly population in Aseer Region, Kingdom Saudi Arabia and to identify the factors associated with their quality of life.

Methodology

This study followed an observational cross-sectional research design. Elderly patients attending the governmental primary healthcare centers (PHCCs) in Aseer Region, Saudi Arabia constitute the target study population.

The minimum sample size was calculated according to Bartlett et al (13). to be 384, according to the formula: (n=Z2XpXq/d2), where (n) is the calculated sample size; (Z) is the z-value for the selected level of confidence = 1.96; (p) is the prevalence of poor QOL, which has been assumed to be 50%, (i.e., 0.05); (q) is (1–P), i.e., 0.50; and (d) is the maximum acceptable error (0.05). However, the sample size was increased to 405 to compensate for possible non-respondence and missing values.

Recruitment of participants took place during the period from July to August 2021. A multi-stage random sampling technique was applied. In the first stage, two out of the four geographical regions (East, West, North and South) Aseer Region were selected by simple random sampling. In the second stage, one PHCC was selected from each selected region by simple random technique. Moreover, the PHCC affiliated to King Khalid University was purposively selected. Finally, 135 elderly patients attending each of these three PHCCs were consecutively interviewed and recruited to the present study.

Data collection tools

A self-administered questionnaire was constructed and utilized for data collection. It included the following parts: Personal and socio-demographic characteristics, including age in years, gender, highest educational level, marital status, average monthly income and current residence.

- Lifestyle habits: smoking, regular practice of physical exercise.
- Clinical data: history of associated co-morbidity e.g., diabetes, hypertension, cardiac disease, respiratory diseases, renal diseases, cancer, arthralgia, paralysis, hearing impairment and vision impairment, using moving aid.
- The WHOQOL-BREF Questionnaire to assess participants' QOL. It is a 26-item reliable and validated tool assessing quality of life (QOL) in the domains of physical health, psychological health, social relationships and environment (14, 15). This tool has been tested across cultures including in general Arabic population and showed very good psychometric properties, such as construct validity and internal consistency with Cronbach's alpha superior to other QOL assessment tools (16, 17). For categorization of the quality of life, the following values of the WHOQOL-BREF score were extracted from the reviewed studies and were applied in the current study: score ≤ 45, poor HRQOL; score 46–65, moderate HRQOL; and score > 65, relatively high HRQOL (18).

Data collection technique

After obtaining the necessary ethical approval (ECM# 2021-3601, on 21-2-2021) the researchers visited the selected three study PHCCs. Prior to data collection, the researchers briefly introduced themselves and offered a clear explanation of the study purpose to all PHC physicians and potential participants (or their caregivers). Approximately 10-15 elderly participants could be recruited daily. Interviews were conducted during participants' waiting times. Data were collected during the period from March till May 2021.

Data entry and statistical analysis

Descriptive and analytic statistical methods and tests were adopted using the Statistical Package for Social Sciences (IBM, SPSS version 25). Frequency and percentage were calculated for all categorical variables, while mean and standard deviation were calculated for quantitative variables. Hypotheses testing was conducted using the chi square test (X2) to detect relationships between categorical variables, while independent t-test, or analysis of variance (ANOVA) were applied to compared means between groups. Level of significance was decided at $p<0.05$.

All official approvals were fulfilled before conducting the research. Before start of data collection, an informed consent has been asked from every potential participant who was informed that he/she has the full right not to participate in the study or to withdraw prior to its completion. Confidentiality and privacy were guaranteed for all participants.

Results

Table (1) shows that 53.3% of participants were males, 65.7% was less than 70 years old, 89.4% were Saudi, and 68.1% were currently married. About one-third of participants (36%) were illiterate, while 15.8% were university educated. The monthly income of 47.9% was less than 5000 SR. Residence of most participants (78%) was urban.

Table (2) shows that regular exercise was practiced by 19.3% of participants, while 8.4% were smokers.

Table (3) and Figure (1) show that about two-thirds of participants were hypertensive (64%), or diabetic (63.2%), while 49.6% had musculoskeletal diseases, about one third had visual problems (38.8%), eye diseases (34.8%), or dyslipidemia (33.6%), while almost one-fourth had heart disease (23.2%) or urinary problems (21%). Almost one-fifth of participants had kidney disease (19%) or hearing problems (18.5%). Moreover, 7.2% had stroke and 4% had cancer.

Table (4) and Figure (2) show that the mean overall percent score for WHOQOL was 66.4±11.4%, while the lowest mean percent score was for their physical health (64.5±11.4%), while that for psychological domain was 66.2±11.5%, that for social relationships was 68.1±17.7%, and for environment was 67.6±14.6%

Figure (3) shows that negative feelings were always felt by 4%, very often by 23%, and quite often by 45%.

Table (5) shows that participants' WHOQOL mean percent scores differed significantly according to their age group ($p<0.001$), being lowest among those aged 70+ years, their marital status ($p<0.001$), being lowest among single participants, their educational status ($p<0.001$), being lowest among illiterate participants, their occupational status ($p=0.001$), being lowest among unemployed participants, their monthly income ($p<0.001$), being lowest among participants with lower income, and their residence ($p=0.004$), being lower among rural residents. However, participants' WHOQOL mean percent scores did not differ significantly according to their gender or nationality.

Table (6) shows that participants' WHOQOL mean percent scores differed significantly according to regular practice of exercise ($p<0.001$), being lower among those who do not practice regular exercise. However, participants' WHOQOL mean percent scores did not differ significantly according to their smoking status.

Table (7) shows that regarding the physical domain, participants' QOL differed significantly according to their age group ($p<0.001$), being lowest among those aged 70+ years, their nationality ($p=0.005$), being lower among Saudi participants, their marital status ($p=0.001$), being lowest among single participants, their educational status ($p<0.001$), being lowest among illiterate participants, differed significantly according to their occupational status ($p<0.001$), being lowest among unemployed participants, and according to their monthly income ($p=0.036$), being lowest among participants with lower income.

Regarding the psychological domain, participants' QOL differed significantly according to their age group ($p<0.001$), being lowest among those aged 70+ years, their nationality ($p<0.001$), being lower among Saudi participants, their marital status ($p=0.001$), being lowest among divorced participants, their educational status ($p<0.001$), being lowest among illiterate participants, differed significantly according to their occupational status ($p=0.004$), being lowest among unemployed participants, their monthly income ($p=0.001$), being lowest among participants with lower income, and according to their residence ($p=0.037$), being lower among rural residents.

Regarding the social domain, participants' QOL differed significantly according to their age group ($p<0.001$), being lowest among those aged 70+ years, their marital status ($p=0.005$), being lowest among divorced participants, their educational status ($p<0.001$), being lowest among illiterate participants, differed significantly according to their occupational status ($p=0.011$), being lowest among retired participants, their monthly income ($p=0.059$), being lowest among participants with lower income, and according to their residence ($p=0.022$), being lower among rural residents.

Participants' QOL differed significantly according to their age group (p<0.001), being lowest among those aged 70+ years, their marital status (p<0.001), being lowest among single participants, their educational status (p<0.001), being lowest among illiterate participants, differed significantly according to their occupational status (p=0.009), being lowest among unemployed participants, their monthly income (p<0.001), being lowest among participants with lower income, and according to their residence (p=0.001), being lower among rural residents.

Table (8) shows that regarding the physical, psychological and environment domains, participants' QOL differed significantly according to their regular practice of exercise (p<0.001 for all), being lower among those who do not practice regular exercise. Regarding their social domain, participants' QOL differed significantly according to their regular practice of exercise (p<0.001), being lower among those who do not practice regular exercise, and according to their smoking status (p=0.046), being lowest among current smokers.

Table 1: Personal characteristics of elderly participants (n=405)

Personal characteristics	No.	%
Gender		
• Male	216	53.3
• Female	189	46.7
Age groups		
• <70 years	266	65.7
• 70-80 years	101	24.9
• >80 years	38	9.4
Nationality		
• Saudi	362	89.4
• Non-Saudi	43	10.6
Marital status		
• Married	276	68.1
• Single	5	1.2
• Widow	97	24.0
• Divorced	27	6.7
Educational status		
• Illiterate	146	36.0
• Primary	87	21.5
• Intermediate	48	11.9
• Secondary	60	14.8
• University	64	15.8
Occupational status		
• Unemployed	77	19.0
• Retired	172	42.5
• Housewife	88	21.7
• Private business	15	3.7
• Full time	29	7.2
• Part time	24	5.9
Monthly income (SR)		
• 15,000+	47	11.6
• 10,000-14,999	68	16.8
• 5,000-9,999	96	23.7
• <5,000	194	47.9
Residence		
• Rural	89	22.0
• Urban	316	78.0

Table 2: Life style habits of elderly participants (n=405)

Life style habits	No.	%
Regular practice of exercise	78	19.3
Smoking status		
• Current smoker	34	8.4
• Ex-smoker	65	16.0
• Non-smoker	306	75.6

Table 3: Prevalence of different morbidities among participants

Morbidities	No.	%
Hypertension	259	64.0
Diabetes	256	63.2
Musculoskeletal diseases	201	49.6
Visual problems	157	38.8
Eye disease	141	34.8
Dyslipidemia	136	33.6
Heart disease	94	23.2
Urinary problems	85	21.0
Kidney disease	77	19.0
Hearing problems	75	18.5
Respiratory diseases	70	17.3
Use of walking assistance device	59	14.6
Memory problems	41	10.1
Stroke	29	7.2
Cancer	16	4.0

Figure 1: Associated comorbidities

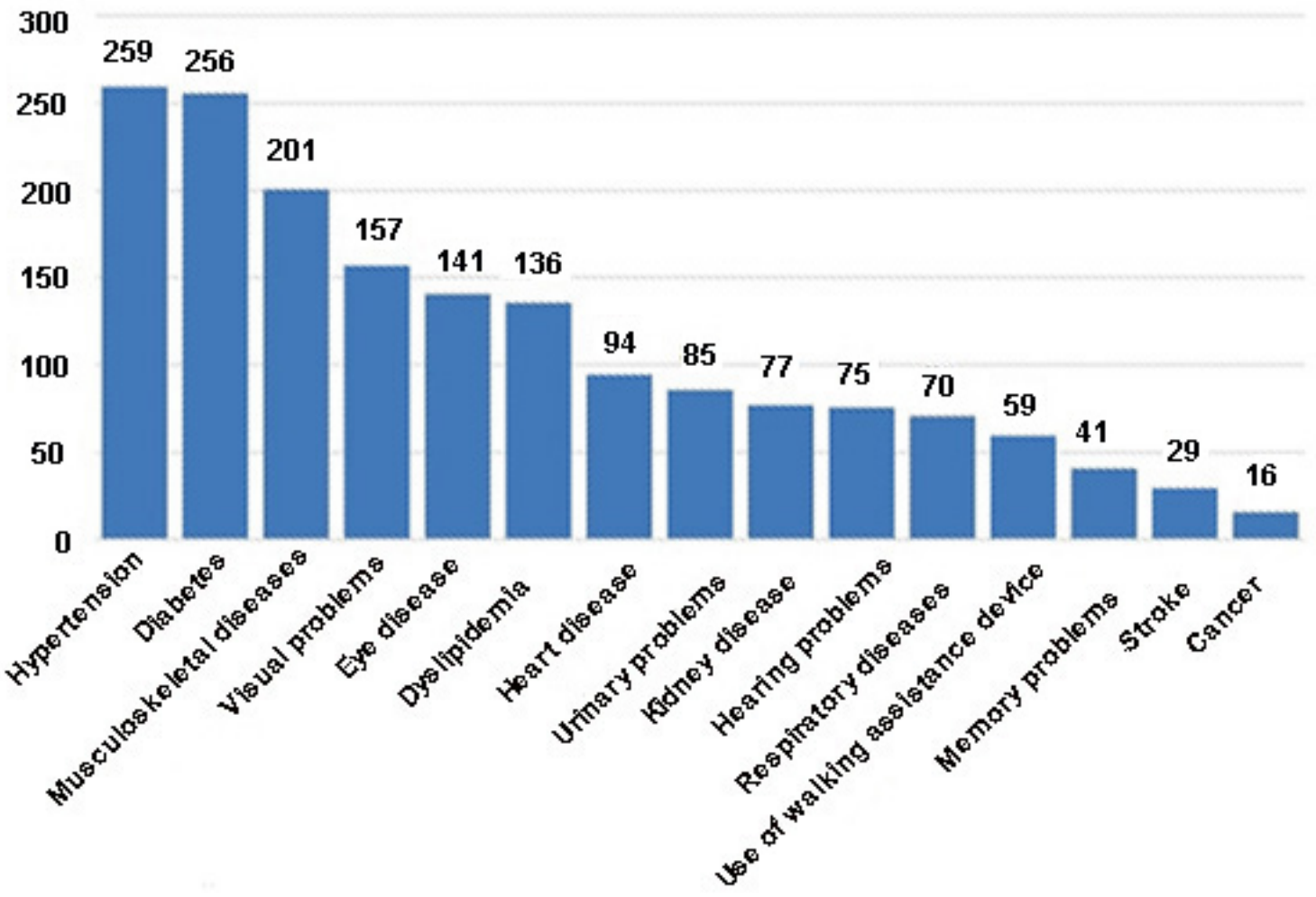


Table 4: Participants' WHOQOL domain mean percent scores

Domains	Mean	SD
Physical Health	64.5	11.4
Psychological	66.2	11.5
Social Relationships	68.1	17.7
Environment	67.6	14.6
Overall	66.4	11.4

Figure 2: WHOQOL domain mean percent scores

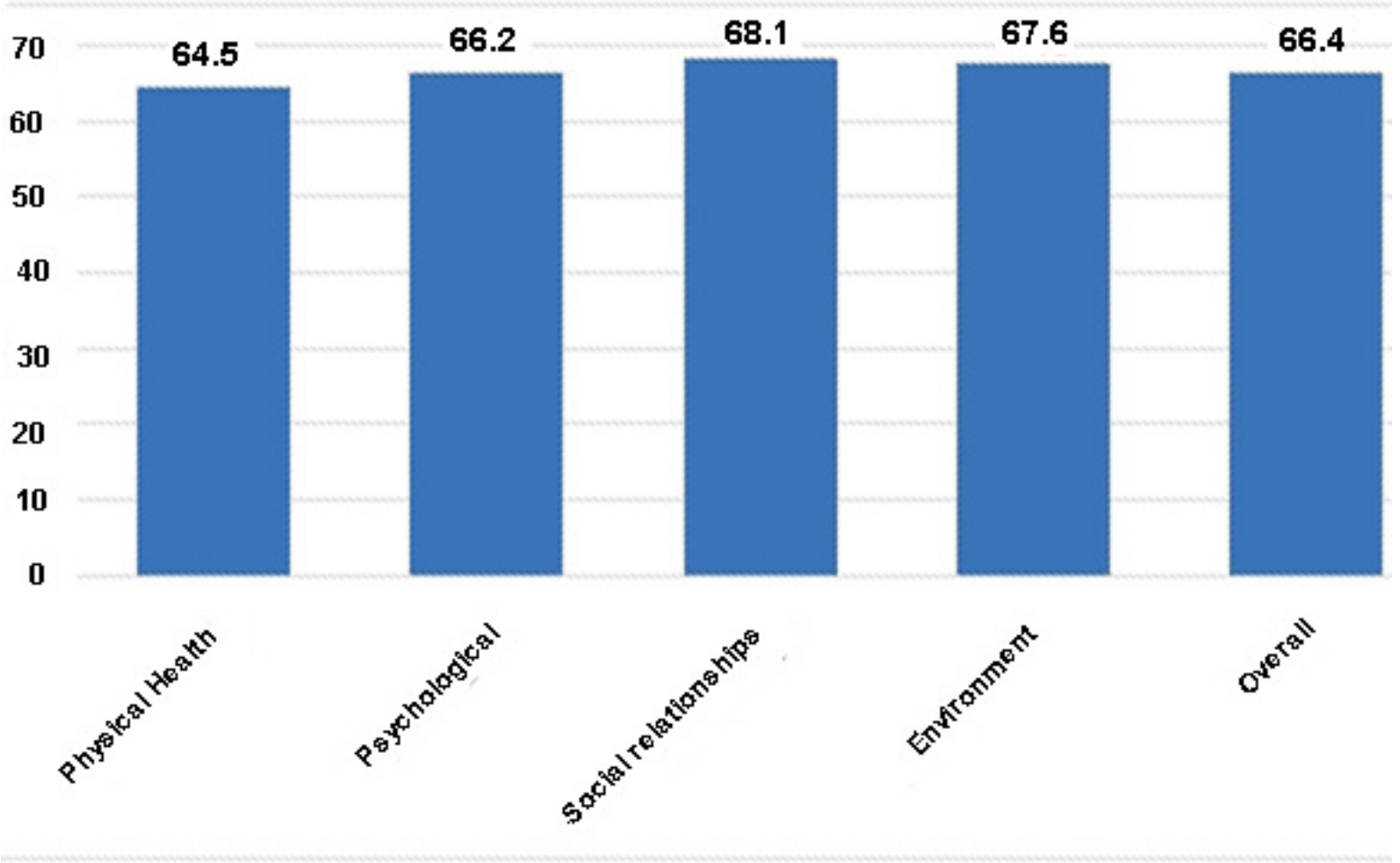


Figure 3: How often does the elderly participant have negative feelings

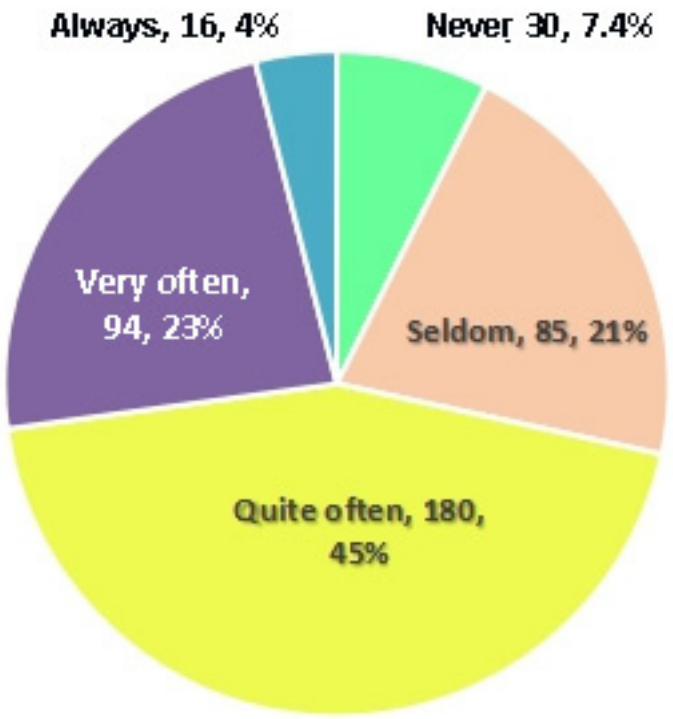


Table 5: Participants' overall WHOQOL mean percent scores according to their personal characteristics

Personal characteristics	No.	Mean	SD	P-value
Gender				
• Male	216	66.5	11.6	
• Female	189	66.3	11.1	0.895
Age groups				
• <70 years	266	69.0	11.1	
• 70-80 years	101	61.2	10.1	
• >80 years	38	62.1	10.4	<0.001†
Nationality				
• Saudi	362	66.1	11.5	
• Non-Saudi	43	69.4	9.8	0.068
Marital status				
• Married	276	68.3	11.2	
• Single	5	59.2	7.7	
• Widow	97	62.4	10.4	
• Divorced	27	62.5	12.2	<0.001†
Educational status				
• Illiterate	146	62.1	9.9	
• Primary	87	67.9	11.8	
• Intermediate	48	70.6	10.9	
• Secondary	60	65.7	12.1	
• University	64	71.7	9.8	<0.001†
Occupational status				
• Unemployed	77	62.9	11.6	
• Retired	172	66.1	11.3	
• Housewife	88	66.7	10.7	
• Private business	15	68.3	12.6	
• Full time	29	73.4	9.3	
• Part time	24	69.3	11.4	0.001†
Family monthly income (SR)				
• 15,000+	47	73.2	10.7	
• 10,000-14,999	68	69.1	12.2	
• 5,000-9,999	96	66.1	11.1	
• <5,000	194	64.0	10.5	<0.001†
Residence				
• Rural	89	63.4	10.9	
• Urban	316	67.3	11.4	0.004†

Table 6: Participants' overall WHOQOL mean percent scores according to their life style habits

Life style habits	No.	Mean	SD	P-value
Regular practice of exercise				
• No	327	64.7	11.0	
• Yes	78	73.4	9.9	<0.001†
Smoking status				
• Smoker	34	65.3	12.2	
• Ex-smoker	65	64.3	11.2	
• Non-smoker	306	67.0	11.3	0.180

Table 7: Participants' WHOQOL domain mean percent scores according to their personal characteristics

Personal Characteristics	No.	Physical		Psychological		Social		Environment	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Gender									
• Male	216	64.8	10.9	66.7	12.0	66.1	17.4	67.9	15.0
• Female	189	64.2	12.0	65.6	11.3	70.3	17.8	67.3	14.1
• P-value		0.581		0.355		0.017†		0.641	
Age groups									
• <70 years	266	66.8	11.3	68.6	11.3	71.9	16.9	70.3	13.8
• 70-80 years	101	60.1	10.3	61.6	10.6	60.3	17.1	62.2	14.1
• >80 years	38	60.7	10.9	61.6	10.1	62.3	16.6	63.6	16.6
• P-value		<0.001†		<0.001†		<0.001†		<0.001†	
Nationality									
• Saudi	362	64.0	11.4	65.4	11.4	67.5	17.8	67.8	14.6
• Non-Saudi	43	69.1	10.5	72.7	9.5	72.7	16.1	65.9	14.2
• P-value		0.005†		P<0.001†		0.069		0.422	
Marital status									
• Married	276	65.9	11.0	68.0	11.1	69.9	17.5	70.1	14.1
• Single	5	66.3	13.6	64.0	15.2	49.3	16.1	53.0	3.3
• Widow	97	60.5	11.3	62.3	10.4	65.2	16.7	63.1	14.5
• Divorced	27	64.6	12.9	62.0	13.8	63.5	19.9	60.8	13.6
• P-value		0.001†		<0.001†		0.005†		<0.001†	
Educational status									
• Illiterate	146	60.2	10.2	62.5	10.3	63.6	16.8	63.0	14.1
• Primary	87	66.3	12.3	67.1	11.7	73.2	18.7	67.9	14.6
• Intermediate	48	68.2	10.1	68.7	10.5	71.4	17.5	74.0	14.8
• Secondary	60	64.3	12.3	65.9	12.8	64.1	17.3	67.3	13.4
• University	64	69.4	9.4	71.7	10.5	72.6	15.8	73.4	13 0
• P-value		<0.001†		<0.001†		<0.001†		<0.001†	
Occupational status									
• Unemployed	77	59.5	11.6	63.0	11.2	67.5	18.4	64.0	16.5
• Retired	172	64.3	10.8	66.1	11.3	65.0	17.0	68.1	14.5
• Housewife	88	65.7	11.6	65.9	11.4	70.3	17.4	66.9	12.7
• Private business	15	70.5	13.9	68.7	14.1	70.2	17.8	65.3	14.6
• Full time	29	70.2	9.8	72.5	9.4	76.3	17.4	75.7	10.8
• Part time	24	67.1	8.9	68.9	11.0	72.5	18.2	70.4	16.1
• P-value		<0.001†		0.004†		0.011†		0.009†	
Monthly income (SR)									
• 15,000+	47	68.3	11.0	71.7	12.2	72.1	19.6	79.0	12.8
• 10,000-14,999	68	65.7	11.2	67.4	12.0	70.6	19.8	72.8	14.8
• 5,000-9,999	96	64.4	10.7	64.3	11.4	69.0	16.3	67.7	14.1
• <5,000	194	63.2	11.8	65.3	10.7	65.7	16.9	63.0	13.1
• P-value		0.036		0.001†		0.059		<0.001†	
Residence									
• Rural	89	63.0	11.3	64.0	11.3	64.3	18.4	63.0	14.5
• Urban	316	65.0	11.4	66.8	11.5	69.1	17.4	68.9	14.4
• P-value		0.142		0.037†		0.022†		0.001†	

† Statistically significant p<0.05

Table (8): Participants' WHOQOL domain mean percent scores according to their life style habits

Life style habits	No.	Physical		Psychological		Social		Environment	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Regular practice of exercise									
• No	327	62.8	11.2	64.5	11.1	66.3	17.6	66.0	14.4
• Yes	78	71.6	9.6	73.1	10.5	75.6	16.2	74.5	13.3
• P-value		<0.001†		<0.001†		<0.001†		<0.001†	
Smoking status									
• Current smoker	34	66.2	13.1	66.3	12.5	64.1	16.1	64.2	14.0
• Ex-smoker	65	62.6	9.5	64.7	11.1	64.5	16.1	65.4	15.4
• Non-smoker	306	64.7	11.6	66.5	11.4	69.3	18.1	68.5	14.4
• P-value		0.269		0.535		0.046†		0.107	

† Statistically significant p<0.05

Discussion

Findings of the present study revealed that elderly overall QOL were significantly lower among those who are aged above 70 years, single, illiterate participants, unemployed, with low monthly income, rural residents, who do not practice regular exercise. All QOL domains were significantly affected by participants' sociodemographic characteristics, such as their age, marital status, education, occupation, income and residence. Moreover, negative feelings were always felt by 4%, very often by 23%, and quite often by 45%.

These findings are in accordance with those reported by several national and international studies. In Riyadh Al-Surimi et al. assessed the QOL among elderly patients at the Home Health Care program of the Ministry of National Guard Health Affairs. They reported that their overall QOL was significantly affected by their socio-demographic characteristics, e.g., marital status. Educational level was a significant determinant for physical health and environment domains, while age, was a significant determinant for psychological domain. Marital status was the only significant determinant for the social domain (19). Karlin et al. reported that the majority of elderly in Saudi Arabia were concerned regarding their physical functioning, financial resources, and their daily obligations (20).

In Turkey, Asılar and Bakar reported that elderly's education, income level, and social support were directly proportional to their quality of life, while cigarette smoking negatively affected their quality of life (21). In Slovakia, Soósová reported that the highest QOL was observed in the domains of social relationships, whereas the lowest QOL was observed in the domains of physical health, and social participation (10).

Our study revealed that the elderly's overall QOL is suboptimal, with a mean overall percent score of 66.4±11.4%, with the lowest mean percent score being for physical health (64.5±11.4%), while that for psychological domain was 66.2±11.5%, 68.1±17.7% for social relationships, and 67.6±14.6% for environment.

Similarly, Cheraghi et al. who conducted a systematic review and meta-analysis to assess the QOL of the elderly population using WHO-QOL-BRIEF questionnaire reported that the pooled overall mean QOL percent score was 60.1±4.6%, that for physical health was 55.13%, for environment was 51.8%, for psychological was 56.68% and for the social relationship was 57.82% (21). In India, Devraj and D'mello reported that the average overall QOL percent score among elderly was 74.3%. elderly's age, gender, marital status, education, job status, and socioeconomic status, were significant determinants of QOL of the participants (7).

These findings reflect the necessity to provide high attention and urgent care toward physical, social, environmental and mental health to elderly in order to enhance their QOL (23).

Our study showed that most elderly participants had various chronic diseases, such as hypertension, diabetes sensory problems, heart or renal diseases, in addition to stroke and cancer.

This is in agreement with that reported by Shah et al., in India, who found that common chronic health problems among elderly participants were joint pain, visual and eye problems, hypertension, and diabetes mellitus. Domains of quality of life were better among educated and married elderly people (12). In Brazil, Miranda et al. reported that the lowest QOL score was observed regarding the environmental domain. Advanced age, physical activity, diabetes, musculoskeletal diseases, and hypertension were significant determinants of QOL (24).

These findings indicate the importance of geriatric care which allows elderly people to receive the highly needed specialized care and takes into consideration their special needs, especially while facing several chronic conditions that require specialized care management. Moreover, elderly people should be encouraged to receive preventive care to enhance prolonged health and their independence.

Conclusions

Based on findings of the present study, it can be concluded that elderly people attending PHC centers in Aseer Region have suboptimal overall QOL, with their physical health being the lowest manifestation. Several chronic diseases are highly prevalent among elderly people, such as hypertension, diabetes, sensory problems, musculoskeletal diseases, heart and urinary diseases. Therefore, it is necessary to provide high attention toward geriatric care in order to enhance their QOL.

References

1. United Nations, Department of Economic and Social Affairs, Population Division. World Population Aging 2013. ST/ESA/SER.A/348. United Nations; 2013.
2. The World Health Organization. World Health ranking, 2018. Available at: https://www.worldlifeexpectancy.com/saudi-arabia-life-expectancy
3. World Health Organization. Mental Health and Older Adults. Fact Sheet no 381. World Health Organization; 2016. Available from: http://www.who.int/mediacentre/factsheets/fs381/en/. [Last accessed on January 31st, 2022].
4. World Health Organization. Active ageing: a policy framework. Geneva: WHO; 2002 [cited 2022 February 19th]. Available from: http://www.who.int/ ageing/publications/active_ageing/en/
5. Dahlberg L, McKee KJ. Correlates of social and emotional loneliness in older people: evidence from an English community study. Aging and Mental Health. 2014;18(4):504– 514.
6. WHOQOL Group. Study protocol for the World Health Organization project to develop a quality of life assessment instrument (WHOQOL). Qual Life Res. 1993; 2(2):153-159
7. Devraj S, D'mello MK. Determinants of quality of life among the elderly population in urban areas of Mangalore, Karnataka. J Geriatr Ment Health 2019; 6:94-8.
8. World Health Organization. WHOQOL-BREF: Introduction, Administration, Scoring and Generic Version of the Assessment. Programme on Mental Health. Geneva: World Health Organization; 1996. Available from: http://www.who.int/mental_health/media/en/76.pdf. [Last accessed on January 17th, 2022].
9. World Health Organization. The World Health Organization Quality of Life (WHOQOL). WHO. Available from: http://www.who. int/mental_ health/publications/whoQOL/en/. [Last accessed on January 17th, 2022].
10. Soósová MS. Determinants of quality of life in the elderly. Cent Eur J Nurs Midw 2016; 7(3):484–493 doi: 10.15452/CEJNM.2016.07.0019
11. Forjaz MJ, Rodriguez-Blazquez C, Ayala A, RodriguezRodriguez V, de Pedro-Cuesta J, Garcia-Gutierrez S, PradosTorres A. Chronic conditions, disability, and quality of life in older adults with multimorbidity in Spain. European Journal of Internal Medicine. 2015;26(3):176–181.
12. Shah VR, Christian DS, Prajapati AC, Patel MM, Sonaliya KN. Quality of life among elderly population residing in urban field practice area of a tertiary care institute of Ahmedabad city, Gujarat. J Family Med Prim Care. 2017; 6(1): 101–105. Doi: 10.4103/2249-4863.214965.
13. Bartlett J. Kotrlik JW, Higgins CC. Organizational Research: Determining Appropriate Sample Size in Survey Research, 2001. Retrieved January 15, 2021 from: http://citeseerx. st.psu. edu/ viewdoc/ download? doi:10.1.1.486.8295 &rep=rep1&type=pdf.
14. Bonomi AE, Patrick DL, Bushnell DM, Martin M. Validation of the United States' version of the World Health Organization Quality of Life (WHOQOL) instrument. J Clin Epidemiol [Internet]. 2000;53(1):1–12.
15. Skevington SM, Lotfy M, O'Connell KA. The World Health Organization's WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial. A Report from the WHOQOL Group. Qual Life Res [Internet]. 2004 Mar;13(2):299–310. Available from: http://link.springer.com/10.1023/ B:QURE.0000018486. 91360.00
16. Al Sayah F, Ishaque S, Lau D, Johnson JA. Health related quality of life measures in Arabic speaking populations: A systematic review on cross-cultural adaptation and measurement properties. Qual Life Res [Internet]. 2013; 22(1):213–29. Available from: http://link.springer.com/10. 1007/ s11136-012-0129-3
17. Ohaeri J, Awadalla A. The reliability and validity of the short version of the WHO quality of life instrument in an Arab general population. Ann Saudi Med [Internet]. 2009;29(2):98. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2813624/
18. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The Multidimensional Scale of Perceived Social Support. J Pers Assess 1988;52(1):30–41.
19. Al-Surimi K, Al-harbi I, El-Metwally A, Badri M. Quality of life among home healthcare patients in Saudi Arabia: household-based survey. Health and Quality of Life Outcomes 2019; 17, Article number: 21. https://doi.org/10.1186/s12955-019-1095-z
20. Karlin KJ, Weil J, Felmban W. Aging in Saudi Arabia: An exploratory study of contemporary older persons' views about daily life, health, and the experience of aging. Gerontology & Geriatric Medicine 2016; 1–9 DOI: 10.1177/2333721415623911
21. Asılar RH, Bakar N. Factors Affecting Depression and Quality of Life in the Elderly. Journal of Gerontology & Geriatric Research, 4(5). https://doi.org/10.4172/2167-7182.1000249.
22. Cheraghi Z, Doosti-Irani A, Nedjat S, Cheraghi P, Nedjat S. Quality of life in elderly Iranian population using the QOL/-brief Questionnaire: A systematic review. Iran J Public Health 2016 Aug;45(8):978-985. http://ijph.tums.ac.ir
23. Doosti-Irani A, Nedjat S, Nedjat S, Cheraghi P, Cheraghi Z. Quality of life in Iranian elderly population using the SF-36 questionnaire: systematic review and meta-analysis. East Mediterr Health J. 2019; 24(11):1088-1097. doi: 10.26719/2018.24.11.1088.
24. Miranda LCV, Soares SM, Silva PAB. Quality of life and associated factors in elderly people at a Reference Center. Ciência & Saúde Coletiva. 2016; 21(11):3533-3544

Factors affecting patients' waiting time at the Radiology Department

Waleed Abdullah Ali Omar [1], Reham Mohammed Al-Shahrani [1], Mohammed Ahmed Almushafi [1], Hussein M. Boraie [2]

(1) Abha Health Sector, Ministry of Health, Saudi Arabia
(2) Professor, Dept. of Health Services and Hospitals Administration, Faculty of Economics and Administration, King Abdulaziz University, Jeddah, Saudi Arabia

Corresponding author
Waleed Abdullah Ali Omar
Abha Health Sector, Ministry of Health,
Saudi Arabia
Email: X-ray18noor@hotmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Waleed Abdullah Ali Omar et al. Factors affecting patients' waiting time at the Radiology Department. World Family Medicine. 2022; 20(11): 62-68. DOI: 10.5742/MEWFM.2022.95251376

Abstract

Aim of Study: To identify the extent and causes for prolonged patient waiting times and overcrowding at the Radiology Department (RD) in Aseer Central Hospital, Abha City, Saudi Arabia.

Methods: A cross-sectional observational study design was followed. It included 107 staff members at the RD in Aseer Central Hospital. A data collection tool was designed by the researchers and used for data collection.

Results: 51.4% of patients were referred to RD from the outpatient clinics, 27.3% were referred from the ED, while 21.3% were inpatients. Monday and Tuesday were the most overcrowded days at the RD (33.3% and 20.8%, respectively). Almost half of the patients (47%) stayed in the waiting area for 1-3 hours. Patient waiting times differed significantly according to their days of received radiologic services, with the longest waiting time being on Wednesday (44.4%, p=0.021), and according to patients provided radiologic services. The most frequently stated causes by the radiology staff for overcrowding at the RD were the "huge number of patients received directly from the community who did not go via a primary health care center"; "the large number of non-emergency patients" and the "socially recommended cases sent to RD via the ED" (45.8%, 32.7% and 29.9%, respectively).

Conclusions: Patient waiting times are unduly prolonged. It is mostly 1-3 hours. The main bulk of overcrowding comes from patients referred from the outpatient clinics. The main causes for overcrowding are the excessive number of non-emergency, unscheduled patients, and the socially recommended cases, in addition to the shortage of specialist radiology physicians.

Recommendations: There is a need to implement an elaborate system to organize unscheduled patients, who may crowd out other emergency patients and to allocate a special radiology section for patients referred from the ED. To increase the number of serving specialist radiologists at the RD of Aseer Central Hospital. To enforce provided radiology services at primary care centers in Aseer Region.

Key Words: Waiting time, Radiology Department, Patient referrals.

Introduction

More than a century ago, by the discovery of X-rays, radiology has grown to be a medical specialty. Since then, all hospitals became equipped with X-ray apparatus, evidencing the importance of radiodiagnosis. Nowadays, a radiology service can comprise several methods, including conventional radiology, fluoroscopy, nuclear medicine, computed tomography (CT), mammography, interventional radiology, bone densitometry, ultrasonography (US) and magnetic resonance imaging (MRI) (1).

At the radiology department, the diversity of input and the wide range of services make it a difficult system to be managed (2). Several common problems that are commonly encountered in the radiology department are mainly prolonged waiting times, and waiting area congestion. One of the principal features of a well-managed radiology department is the short average length of time that patients spend before accessing a radiology service (3-4).

Anderson et al. (5) demonstrated that the overall patient satisfaction with provided health care services is largely determined by the length of time spent to receive health care services. Lengthy patient waiting times have been emphasized as the major cause of dissatisfaction with health care services.

During the last year, there was a considerable increase in the beneficiaries of Aseer Central Hospital's services, both inside and outside Aseer Region, with 17,232 cases at outpatient clinics, 119,088 at the emergency department (ED), 39,405 at the dental center, and 35,702 patients at the rehabilitation department. Also, the hospital performed 274,551 laboratory tests, and 96,721 radiology examinations (6).

This huge number of performed radiology examinations reflects the greatly overbooked services and probably a heavily over-crowded radiology department, hence affecting the quality of the radiology services provided to clients. Therefore, it is a pressing necessity to identify the extent and the main factors associated with overcrowd at the Radiology Department in order to be able to put forward recommendations for overcoming this problem.

This study aimed to identify the extent and causes for prolonged patients' waiting time and overcrowding at the Radiology Department (RD) in Aseer Central Hospital, Abha City, Saudi Arabia.

Methodology

A cross-sectional observational study design was followed. Cross-sectional study design is a type of observational study design. In a cross-sectional study, the investigator measures the outcome and the exposures in the study participants at the same time (7).

The Radiology Department is in Aseer Central Hospital, Abha City, which is a governmental tertiary care central hospital that received during 2018 a total of 366,516,000 patients (6). There are about 120 staff in the Radiology Department, including radiologists, technicians, nurses and other medical service providers. The Radiology Department in Aseer Central Hospital has 9 divisions that serve all diagnoses and interventions needed for the whole southern region of the Kingdom of Saudi Arabia.

All adult patients seen or waiting to be seen in the Radiology Department in Aseer Central Hospital were observed during the whole day starting at 08:00 am (Sunday-Thursday) for a three-month period (i.e., April to June 2019).

Since the total population of staff at the Radiology Department in Aseer Central Hospital is limited (N=120), all Radiology staff were invited to participate in this study, i.e., no specific sampling technique was followed. Only 107 agreed to participate in this study (i.e., 89% response rate).

Based on relevant review of literature, the researcher designed a data collection tool. The study variables were included in the following:
1. Personal and demographic characteristics of staff at the Radiology Department: This part included the following variables: Age, gender, nationality, day, time, type of provided radiology services to patients.
2. Variables related to the possible causes for overcrowded Radiology Department in Aseer Central Hospital, e.g., average patient waiting times for each provided type of radiology service, type of patient referrals, possible causes for overcrowding.

The validity of the designed study questionnaire was assessed by a Professor of Hospital & Health administration, King Abdul-Aziz University, and a Professor of Community Medicine, King Khalid University. Moreover, the test-retest reliability of the study tool was assessed by its twice application on ten Radiology staff in Abha Private Hospital and comparing the responses which revealed an 80% agreement.

Staff responses were coded and entered for statistical analysis using the Statistical Package for Social Sciences (SPSS, version 25.0). Descriptive statistics (i.e., frequency and percentages) were calculated. Chi square test was applied to test the significance of differences between different study variables according to patient waiting times. P-values less than 0.05 were considered as statistically significant.

Results

Table (1) shows that more than half of participant radiology staff (59.8%) were aged 25-45 years, while 18.7% were less than 25 years old and 21.5% were more than 45 years old. Almost half of participants (51.4%) were males, while most participants (72.9%) were Saudi. Most participants were at the MRI department (30.3%), Ultrasonography Department (20.2%), CT Department (18.2%), or plain X-ray Department (17.2%). A few participants were at the Fluoroscopy or Interventional departments (5.1% each), and the Dual-Energy X-ray Absorptiometry (DEXA) or mammography departments (2% each).

Figure (1) shows that more than half of patients (51.4%) were referred to Radiology department from the outpatient clinics, 27.3% were referred from the ED, while 21.3% were inpatients.

Table (2) shows that Monday and Tuesday are the most overcrowded days at the Radiology Department (33.3% and 20.8%, respectively), followed by Sunday (16.4%) then Wednesday and Thursday (14.8% each). About one third of patients (32.2%) had to stay in the waiting area of the Radiology Department for less than one hour, while 47% stayed for 1-3 hours and 20.8% stayed for more than 3 hours.

Table (3) shows that patient waiting times differed significantly according to their days of received radiologic services, with the longest waiting time (>60 minutes) being on Wednesday (44.4%, p=0.021). Waiting times differed significantly according to patient provided radiologic services, with patients receiving fluoroscopy, CT and interventional radiology having the highest percentage of >3 hours' waiting time (100%, 48% and 42.9%, respectively, p<0.001). Moreover, inpatients had a significantly higher percentage of >3 hours' waiting time than outpatients and ED patients (33.3, 14.9% and 22%, respectively, p=0.009). However, patients' waiting time did not differ significantly according to their age groups, gender, nationality, or scheduled time of service.

Table (4) describes the most frequently stated causes by the radiology staff for overcrowding at the Radiology Department. These causes were the "huge number of patients received directly from the community who did not go via a primary health care center"; "the large number of non-emergency patients" and the "socially recommended cases sent to Radiology Department via the ED" (45.8%, 32.7% and 29.9%, respectively). Other frequent causes for overcrowding at the Radiology Department were the "Lack of specialist radiology physicians to provide service at the community level"; and "Expensive radiology services at private clinics" (20.6%, and 18.7%). Less frequent causes included "Increasing complexity of cases referred from EDs"; "variability of service times and appointment schedules"; and "limited access to radiology services at primary care centers" (15.9%; 14%; and 6.5%, respectively).

Table 1: Personal characteristics of participant radiology staff (n=107)

Personal characteristics	No.	%
Age		
<25 years	20	18.7
25-45 years	64	59.8
> 45 years	23	21.5
Gender		
Male	55	51.4
Female	52	48.6
Nationality		
Saudi	78	72.9
Non-Saudi	29	27.1
Department		
Computerized tomography	18	18.2
Magnetic Resonance Imaging	30	30.3
Ultrasonography	20	20.2
Mammography	2	2.0
Plain X-ray	17	17.2
Fluoroscopy	5	5.1
Dual-Energy X-ray Absorptiometry (DEXA)	2	2.0
Interventional	5	5.1

Figure 1: Source of patient referrals to Radiology Department

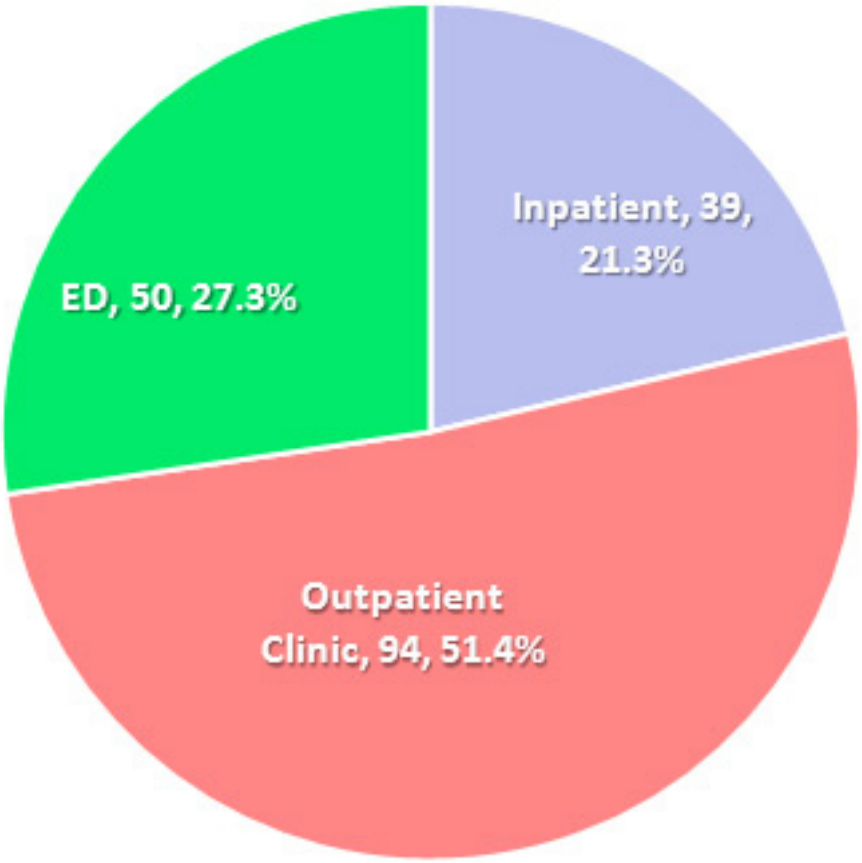


Table 2: Characteristics of radiologic services provided to patients at Aseer Central Hospital

Radiologic service characteristics	No.	%
No. of patients according to days of radiologic services		
Sunday	30	16.4
Monday	61	33.3
Tuesday	38	20.8
Wednesday	27	14.8
Thursday	27	14.8
Time of service		
08:00 -12:00	55	30.1
13:00-18:00 pm	82	44.8
19:00-24:00	46	25.1
Waiting time at the radiology center waiting area		
< 1 hour	59	32.2
1-3 hours	86	47.0
> 3 hours	38	20.8

Table 3: Patient waiting times at the radiology center waiting area according to their personal characteristics and provided radiologic service

	<1 hour		1-3 hours		>3 hours		P
Personal characteristics	No.	%	No.	%	No.	%	Value
Age							
<25 years	15	37.5	12	30.0	13	32.5	
25-45 years	23	26.4	47	54.0	17	19.5	0.062
> 45 years	21	37.5	27	48.2	8	14.3	
Gender							
Male	21	25.3	45	54.2	17	20.5	
Female	38	38.0	41	41.0	21	21.0	0.138
Nationality							
Saudi	43	30.1	71	49.7	29	20.3	
Non-Saudi	16	40.0	15	37.5	9	22.5	0.366
Day							
Sunday	12	40.0	12	40.0	6	20.0	
Monday	16	26.2	38	62.3	7	11.5	
Tuesday	11	28.9	21	55.3	6	15.8	0.021†
Wednesday	5	18.5	10	37.0	12	44.4	
Thursday	6	22.2	17	63.0	4	14.8	
Radiographic service							
CT	3	12.0	10	40.0	12	48.0	
MRI	3	37.5	2	25.0	3	37.5	
Ultrasonography	8	17.8	29	64.4	8	17.8	
Mammography	7	28.0	14	56.0	4	16.0	
Plain X-ray	36	55.4	25	38.5	4	6.2	<0.001†
Fluoroscopy	0	0.0	0	0.0	2	100.0	
DEXA	2	33.3	2	33.3	2	33.3	
Interventional	0	0.0	4	57.1	3	42.9	
Referred as							
Inpatient	7	17.9	19	48.7	13	33.3	
Outpatient clinic	29	30.9	51	54.3	14	14.9	0.009†
ED	23	46.0	16	32.0	11	22.0	
Time of service							
08:00 -12:00	15	27.3	29	52.7	11	20.0	
13:00-18:00 pm	22	26.8	43	52.4	17	20.7	0.960
19:00-24:00	13	28.3	26	56.5	7	15.2	

†Statistically significant

Table 4: Causes of overcrowded Radiology Department as stated by ACH radiology staff

Causes of overcrowding at the Radiology Department	No.	%
Huge number of patients received directly from the community who did not go via a primary care center	49	45.8
Large number of non-emergency patients	35	32.7
Socially recommended cases sent for radiology from EDs	32	29.9
Lack of specialist radiology physicians providing service at the community level	22	20.6
Expensive radiology services at private clinics	20	18.7
Increasing complexity of cases referred from EDs	17	15.9
Variability of service times and appointment schedules	15	14.0
Limited radiology services at primary care centers compared with many types of services provided by the Radiology Department at ACH	7	6.5

Discussion

Imaging has become an important part of patients' physical examinations. Moreover, the utilization of imaging markedly increased for screening and follow-up of patients. During the last decade, radiologists endured a heavy workload (8).

Results of this study indicated that there is excessive crowding at the Radiology Department in Aseer Central Hospital, and the time patients spend at the waiting area is very long, being 1-3 hours for almost half of patients, and more than 3 hours for 21% of patients.

These findings are in accordance with those reported by Onwuzu et al. (2) in Nigeria, who reported that patients spend 1-3 hours at the waiting area of the Radiology Department. Patients usually spend almost an hour after arrival getting their request cards ready for typing. Once their request is taken into the diagnostic room, it takes about an hour and a quarter to be called in, and attended to by the radiographer.

Shakoor (9) stated that Radiology departments are experiencing increasing rates of patient demands and hence, becoming unable to accommodate these increasing demands. These increased demands will inevitably lead to considerably prolonged patient waiting times and will negatively affect their satisfaction toward provided services.

Van Nynatten and Gershon (10) added that the expanding indications for imaging combined with inappropriate ordering, and delays in reporting, have led to unnecessarily long wait times, and consequently, overcrowding of patients at radiology departments.

Sciacchitano et al. (11) stressed that when the number of patients that present to the radiology department becomes large without a corresponding increase in staff population, the waiting time is bound to be longer as the number of radiology staff will be unable to cope with the daily provided service. Consequently, prolonged patient waiting times will cause deterioration in their condition and in some cases; the effectiveness of the proposed treatment may be reduced.

Results of the present study revealed that the main bulk of overcrowding at the Radiology Department comes from patients referred from the outpatient clinics, followed by those referred from the Emergency Department, and finally inpatients. There is an observed fluctuation in patient crowding, with the highest on Mondays and Tuesdays, and a reported peak during the afternoon. Patient waiting times differed significantly according to their days of received radiologic services, with the longest waiting time being on Wednesdays. Moreover, waiting times differed significantly according to provided radiologic services and type of patient referral. This confirms the first and second hypotheses. However, patient waiting times did not differ significantly according to their scheduled time of service.

The observed fluctuation has been reported by several studies. In Nigeria, Onwuzu et al. (2) noted that most patients arrive to the Radiology Department before 11:00 am, while 40.5% arrive between 11:00 am and 2:00 pm. They explained this fluctuation by the fact that patient waiting times depend on their time of arrival, type of requested radiologic service, and their source of referral, as patients from Emergency Department should be immediately attended to.

In Holland, Hofman (12) noted that peaks of busy hours at the Department of Radiology are around 9:00 – 11:00 am, and at 2:00 pm. These peaks can be attributed to the visits of specialists to the patients at the wards, generating peaks of unscheduled arrivals.

Results of this study established that the main causes for overcrowding at the Radiology Department, as reported by the Radiology Department staff, were the huge number of non-emergency, unscheduled patients who did not go via a primary health care center; and the socially recommended cases, in addition to the shortage of specialist radiology physicians and the expensive radiology services at private hospitals. Less frequent causes were the limited access to radiology services at primary care centers.

Hofman (12) also stated that the inflow of patients to the Radiology Department is either elective (e.g., referred from Outpatient Clinics) or non-elective (e.g., referred from the Emergency Department). Scheduled patients include outpatients, while inpatients can be regarded as unscheduled patients since most of them require a scan on the same day. Different degrees of urgency are associated with patients' characteristics.

Several maneuvers were suggested to overcome overcrowding peaks at Radiology departments. Off-peak scheduling was recommended by scheduling more appointments during the times of low walk-in demands and filling off-peak hours with elective requests. Elective patients may be scheduled well in advance since direct examination is not necessary, while for emergency patients time is critical to the patients' potential recovery. Therefore, a dedicated emergency room was advised for emergency scheduling (13). Heng & Wright (14) noted that a dedicated emergency room decreases overcrowding, and increases the probability for referred emergency patients being served as soon as possible.

This study had some limitations. Collected data within the present study were based on service providers (i.e., staff of Radiology Department) only, and did not include service receivers (i.e., patients). Moreover, it was limited to assessment of time spent at the waiting area of the Radiology Department and did not cover the duration between patient examination and time scheduled for receiving the necessary radiologic services.

In conclusion, patient waiting times at the Radiology Department in Aseer Central Hospital till performance of the necessary radiologic service is unduly prolonged, mostly ranging from one to three hours. The main bulk of overcrowding comes from patients referred from the inpatients, ED and outpatient clinics. The highest peak occurs during the afternoon, especially on Mondays and Tuesdays. Wednesdays are the most crowded days at the Radiology Department. Fluoroscopy and CT are associated with the most prolonged hours of waiting times. The main causes for overcrowding at the Radiology Department are the excessive number of non-emergency, unscheduled patients, and the socially recommended cases, in addition to the shortage of specialist radiology physicians.

Therefore, there is a pressing necessity to improve patient waiting times, and to reduce overcrowding and workload at the Radiology Department. Moreover, there is a need to implement an elaborate system to block the referral of socially recommended patients and to organize unscheduled patients, who may crowd out other emergency patients.

It is recommended to allocate a special radiology section for patients referred from the Emergency Department; to increase the number of serving specialist radiologists at the Radiology Department of Aseer Central Hospital; and to enforce provided radiology services at primary care centers in Aseer Region.

More radiology equipment is needed to serve more patients at the Radiology Department. Appointment schedules should be reorganized to avoid overcrowded days, e.g., Mondays and Tuesdays.

References

1. Pereira AG, Vergara LGL, Merino EAD, Wagner A (2015). Solutions in radiology services management: a literature review. Radiol Bras.; 48(5):298–304.
2. Onwuzu SWI, Ugwuja MC, Adejoh T (2014). Assessment of Patient's Waiting Time in the Radiology Department of a Teaching Hospital. ARPN Journal of Science and Technology; 4(3): 183-186.
3. Leddy KM, Kaldengberg DO, Becker BW (2003). Timeliness in ambulatory care treatment. An examination of patient satisfaction and wait times in medical practices and outpatient test and treatment Facilities. J Ambul Care Manage; 26(2):138–149.
4. Cayirli T, Yang KK, Quek SA (2012). A universal appointment rule in the presence of no-shows and walk-ins. Prod Oper Manag; 21:682–97.
5. Anderson RT, Camacho FT, Balkrishnan R. Willing to wait? (2007). The influence of patient wait time on satisfaction with primary care. BMC Health Serv Res. 7(1):31.
6. Saudi Ministry of Health (2018). Website: https://www.moh.gov.sa/en/Pages/ default.aspx. Last accessed: January 1st, 2022.
7. Setia MS (2016). Methodology Series Module 3: Cross-sectional Studies. Indian J Dermatol; 61(3): 261–264.
8. Dicle O. Workload in Radiology (2013). HealthManagement.; 13(3). Website: https://healthmanagement.org/c/healthmanagement/issuearticle/workload-in- radiology. Last access on 17/1/2022.
9. Shakoor M (2015). Using Discrete Event Simulation Approach to Reduce Waiting Times in Computed Tomography Radiology Department. International Scholarly and Scientific Research & Innovation; 9(1): 177-181.
10. Van Nynatten L, Gershon A (2017). Radiology wait times: Impact on Patient Care and Potential Solutions. UWOMJ; 86(2).
11. Sciacchitano M, Goldstein MB, DiPlacido J. Stress, burnout and hardiness in R.T.s. Radiol Technol. 2001; 72(4):321-8.
12. Hofman L (2014). Capacity management at the radiology department of Isala Managing the variability of scheduled and unscheduled patient arrivals. Master Thesis, University of Twente.
13. Cayirli T, Veral EA (2003). Outpatient scheduling in health care: a review of literature. Prod Oper Manag.; 12:519–49.
14. Heng M, Wright J (2013). Dedicated operating room for emergency surgery improves access and efficiency. Canadian Journal of Surgery; 56(3):167-174.

Elastography as predictor for thyroid nodule malignancy

Reyad Alsuqair[1], Nermeen Omar [2], Sultanah Alshreef [3], Yazeed Alharthi [1], Mohannad Algarni [1], Abdulaziz Aljuaid [1], Omar J. AlThaqufi [3]

(1) Medical intern, Taif University School of Medicine, Taif, Saudi Arabia.
(2) Department of Radiology, Ain Shams University, Cairo, Egypt.
(3) Department of Radiology and Medical Imaging, Alhada Armed Forces Hospital, Taif, Saudi Arabia.

Corresponding author:
Dr. Omar J. AlThaqufi
Department of Radiology and Medical Imaging,
Alhada armed Forces hospital,
Taif, Saudi Arabia.
Email : Omar.althaqufi@hotmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Omar J. AlThaqufi et al. Elastography as predictor for thyroid nodule malignancy. World Family Medicine. 2022; 20(11): 69-76. DOI: 10.5742/MEWFM.2022.95251378

Abstract

Background: Ultrasound elastography is a promising noninvasive technique that is still in its infancy. It uses tissue elasticity measurements to distinguish between benign (soft tissues) and malignant (hard tissues) nodules.

Objectives: to see if elastography has diagnostic significance and if it may be used as a predictor of thyroid nodule malignancy

Methods: An analytical cross-sectional study was done and data collected using Philips Epiq 7 linear transducer 8-12MHZ, strain type of elastography. A sample of 27 patients from Al-Hada Armed Forces Hospital, Taif, Saudi Arabia were included. Data about patients' demographics, AP, TR, Echogenicity, Margin, Composition, Echogenic foci, FNA result, Elastography findings and TIRADs classification were collected.

Results: According to FINA findings, the majority of patients (96.3 percent) had a benign tumour, and 81.5 percent had soft elastography. T2 was the most common TIRADs classification (55.6 percent). The percentage of patients with T2 (TIRADs) was significantly greater in patients with a younger mean age, and there was a non-significant association between TIRADs categorization and FINA findings. Females had a much higher percentage of benign diagnoses based on FINA results, with no significant link detected between FINA results and the demographic or clinical characteristics of the patients. Both TIRADs categorization and FINA results were shown to have no significant link with the elastography data.

Conclusion: The elastography findings were found to have a non-significant link with both TIRADs categorization and FINA results. Future studies with larger samples should be conducted to clarify the study outcomes.

Keywords: Elastography, predictor, thyroid, nodule, malignancy

Introduction

Thyroid nodules are a common discovery, and the use of ultrasound (US) has helped to raise awareness of them (1). While the majority of thyroid nodules are asymptomatic and benign, ruling out cancer, which occurs in around 5-10% of all nodules, is a major challenge in their treatment (2).

The gold standard for distinguishing benign from malignant thyroid nodules is fine-needle aspiration biopsy (FNAB), although in 0.7-15 percent of cases, thyroid lobectomy is required to make a definite diagnosis. It's also a more invasive operation with a larger price tag (3,4).

Thyroid Imaging Reporting and Data System is one of the techniques suggested for standardized reporting and assessment (TIRADS). TIRADS have the advantage of improving patient care and cost-effectiveness by avoiding unnecessary fine needle aspiration biopsy (FNAB) in thyroid nodule patients (6). According to the American College of Radiology (ACR), it is divided into five categories: i) Not Suspicious; ii) Benign; iii) Mildly Suspicious; iv) Moderately Suspicious; v) Highly Suspicious (7).

Ultrasound elastography is a valuable noninvasive tool that is still relatively young. It's based on measuring tissue elasticity and can tell the difference between benign (soft tissues) and malignant (hard tissues) nodules (8,9). Shear wave elastography (SWE) and strain real-time elastography (RTE) were both found to be efficient in identifying increased stiffness as a marker for suspected neoplasm, with RTE exhibiting superior findings (8,9).

The use of a high-resolution ultrasound and elastography together allows for the identification of circumstances when a FNA is not necessary (10). The mean sensitivity and specificity for the diagnosis of malignant thyroid nodules were 92 percent and 90 percent, respectively, according to a meta-analysis of real-time ultrasound (11). According to a study published in 2021, adding SRE to TIRADS improves its sensitivity and negative predictive value (12).

Several studies have found that ultrasonic elastography (USE) has lower sensitivity and specificity than standard US (13.14). However, no clear recommendations have been made about its use alone, with TIRADS classification in conjunction with fine needle aspiration (FNA) for thyroid nodule evaluation, and Elastography considered a potential new approach.

This study aimed to evaluate the diagnostic value of elastography and if it can be used as a predictor for thyroid nodule malignancy.

Subjects and Methods

Data of the present study was collected using Philips Epiq 7 linear transducer 8-12MHZ, strain type of elastography. A non-probable sampling technique was utilized and sample size of 27 candidates was targeted. The study was an analytical cross-sectional study done between November 2021 and January 2022 at Al-Hada Armed Forces Hospital, Taif, Saudi Arabia.

Sample size: 27 candidates from the Radiology Department at Al-Hada Armed Forces Hospital, Taif, Saudi Arabia were the sample of the study.

Study participants: the inclusion criteria were patients of all ages, genders, size for nodule, solid nodule, nearly solid nodule, adequate sample histopathology report, TIRAD 3,4 AND 5. And the exclusion criteria were patients with any cystic nodule, nearly cystic nodule, non-adequate samples histopathology report, TIRAD 1 AND 2.

Data collection: a pre-designed checklist was prepared to collect data about patients' age, gender, AP, TR, Echogenicity, Margin, Composition, Echogenic foci, FNA result, Elastography findings and TIRADs classification.

Ethical considerations: Ethical approval for the study was obtained from the research ethics committee of Taif university, Saudi Arabia.

Data analysis: The SPSS program version 26 was used analyze the data. The Chi-squared test ($\chi 2$) was used to assess the association between qualitative data reported as numbers and percentages. Quantitative data was presented as mean and standard deviation (Mean ± SD). To assess the relationships between quantitative variables, the One-Way ANOVA test, Kruskal Wallis test, the Independent sample t-test and the Mann Whitney test were used according to the data normality. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1 shows that the mean age of studied patients was 48.3 ± 11.77 years. Their mean AP and TR were 16.11 ± 10.87 and 21.56 ± 12.19 respectively. Most of patients were females (85.2%). The echogenicity of most of patients (63%) was Iso; 92.6% had a smooth margin and 44.45 had a solid composition. None of patients had an echogenic focus. Most patients (96.3%) had a benign tumor based on FINA results and 81.5% had a soft elastography. The most common TIRADs classification was the T2 (55.6%).

Table 2 shows that patients with a younger mean age had a significant higher percentage of those who had T2 (TIRADs) classification (p=< 0.05). On the other hand, a non-significant relationship was found between TIRADs classification and all other patients' demographic or clinical data (p=> 0.05).

Figure 1 illustrates a non-significant relationship between TIRADs classification and FINA results (p=> 0.05).

Table 3 shows that females had a significantly higher percentage of having a benign diagnosis based on FINA results compared to male patients (p=< 0.05). On the other hand, a non-significant relationship was found between FINA results and patients' demographic or clinical data (p=> 0.05).

Table 4 shows that a non-significant relationship was found between Echogenicity and patients' demographic or clinical data (p=> 0.05).

Table 1. Distribution of the studied patients according to their demographic and clinical data (No. 27)

Variable	No. (%)
Age	48.3 ±11.77
AP	16.11 ±10.87
TR	21.56 ±12.19
Gender	
Female	23 (85.2)
Male	4 (14.8)
Echogenicity	
Hyper	3 (11.1)
Hypo	7 (25.9)
Iso	17 (63)
Margin	
lobulated	2 (7.4)
Smooth	25 (92.6)
Composition	
Cystic and solid	2 (7.4)
Solid	12 (44.4)
Solid and cystic	3 (11.1)
Spongiform	10 (37)
Echogenic foci	None
FNA result	
Benign	26 (96.3)
Malignant	1 (3.7)
Elastography	
Hard	5 (18.5)
Soft	22 (81.5)
TIRADs	
T1	4 (14.8)
T2	15 (55.6)
T3	1 (3.7)
T4	6 (22.2)
TR5	1 (3.7)

Table 2. Relationship between TIRADs classification and patients' demographic and clinical data (No.:27)

Variable	TIRADs					χ^2	p-value
	T1	T2	T3	T4	T5		
Age	63 ±14.72	43.6 ±10.23	59 ±0.001	47.67 ±5.57	53± 0.001	3.23*	**0.031**
AP	17 ±14.98	17.2 ±12.61	9 ±0.001	15.17 ±2.99	9 ±0.001	4**	0.851
TR	26.75± 18.55	20.87 ±13.28	16± 0.001	21.67± 6.12	16± 0.001	4**	0.862
Gender							
Female	3 (13)	13 (56.5)	1 (4.3)	6 (26.1)	0 (0.0)	7.32	0.12
Male	1 925)	2 (50)	0 (0.0)	0 (0.0)	1 (25)		
Echogenicity							
Hyper	0 (0.0)	1 (33.3)	0 (0.0)	2 (66.7)	0 (0.0)	8.33	0.401
Hypo	1 (14.3)	3 (42.9)	0 (0.0)	2 (28.6)	1 (14.3)		
Iso	3 (17.6)	11 (64.7)	1 (5.9)	2 (11.8)	0 (0.0)		
Margin							
lobulated	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)	0 (0.0)	1.72	0.786
Smooth	4 (16)	13 (52)	1 (4)	6 (24)	1 (4)		
Composition							
Cystic and solid	1 (50)	1 (50)	0 (0.0)	0 (0.0)	0 (0.0)	8.55	0.741
Solid	0 (0.0)	8 (66.7)	1 (8.3)	3 (25)	0 (0.0)		
Solid and cystic	1 (33.3)	1 (33.3)	0 (0.0)	1 (33.3)	0 (0.0)		
Spongiform	2 (20)	5 (50)	0 (0.0)	2 (20)	1 (10)		
FNA result							
Benign	4 (15.4)	14 (53.8)	1 (3.8)	6 (23.1)	1 (3.8)	0.83	0.934
Malignant	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	0 (0.0)		
Elastography							
Hard	0 (0.0)	2 (40)	0 (0.0)	2 (40)	1 (20)	6.64	0.154
Soft	4 (18.2)	13 (59.1)	1 (4.5)	4 (18.2)	0 (0.0)		

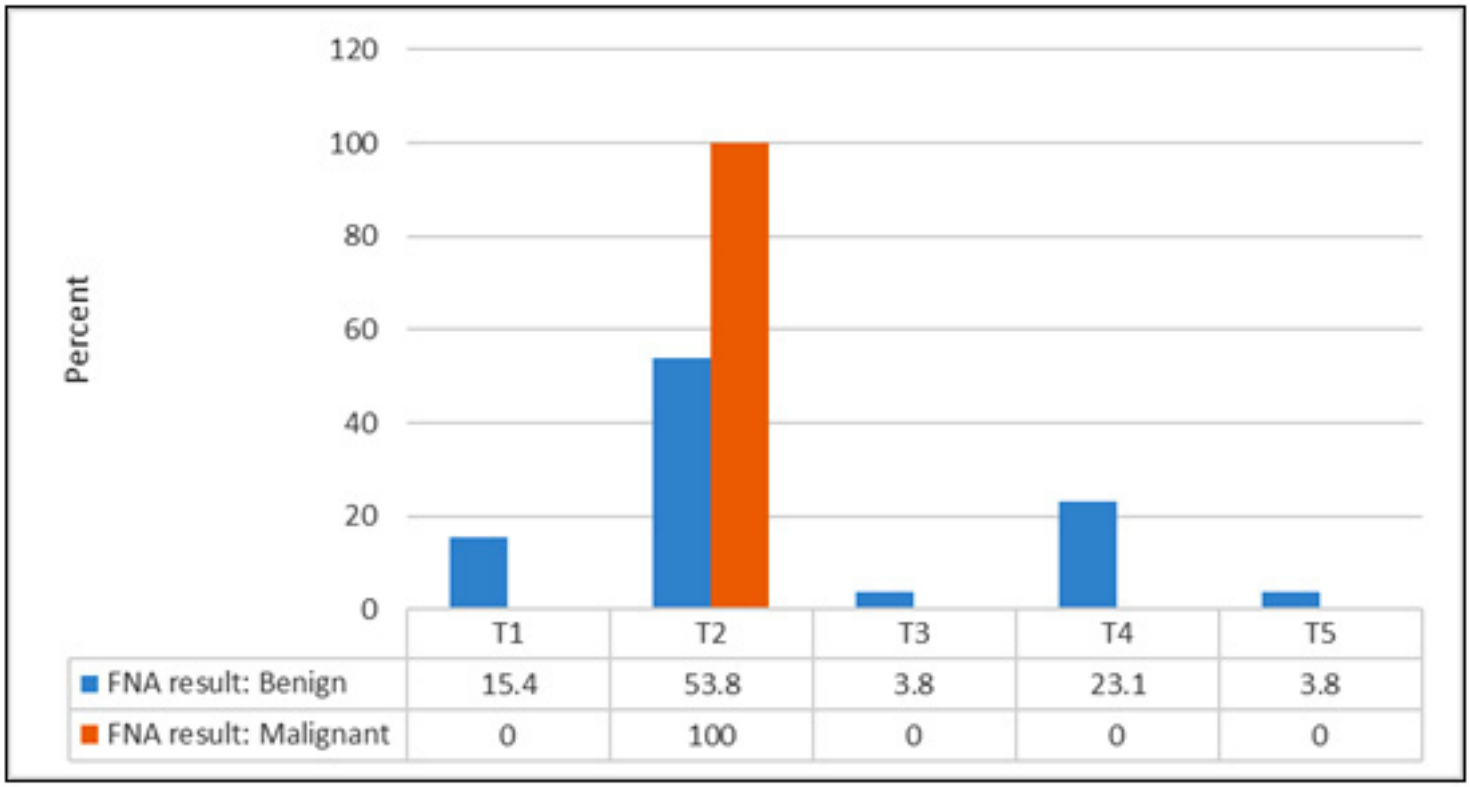
N.B.: *= One -Way ANOVA test ** = Kruskal Wallis test

N.B.: T1=I) Not Suspicious; T2= Benign; T3= Mildly Suspicious; T4= Moderately Suspicious; T5=Highly Suspicious.

TIRADs

	T1	T2	T3	T4	T5
FNA result: Benign	15.4	53.8	3.8	23.1	3.8
FNA result: Malignant	0	100	0	0	0

Figure 1: Relationship between TIRADs classification and FINA results (No.:27)



N.B.: ($\chi 2 = 0.83$, p-value = 0.934)

Table 3: Relationship between FINA results and patients' demographic and clinical data (No.:27)

Variable	FNA result		χ^2	p-value
	Benign No. (%)	Malignant No. (%)		
Age	47.81 ±11.73	61 ±0.001	1.1*	0.28
AP	15.42 ±10.47	34 ±0.001	0.19**	0.296
TR	21.54 ±12.43	22± 0.001	0.74	0.815
Gender				
Female	23 (100)	0 (0.0)	5.97	**0.015**
Male	3 (71)	1 (25)		
Echogenicity				
Hyper	3 (100)	0 (0.0)	2.96	0.227
Hypo	6 (85.7)	1 (14.3)		
Iso	17 (100)	0 (0.0)		
Margin				
lobulated	2 (100)	0 (0.0)	0.08	0.773
Smooth	24 (96)	1 (4)		
Composition				
Cystic and solid	2 (100)	0 (0.0)	1.29	0.73
Solid	11 (91.7)	1 (8.3)		
Solid and cystic	3 (100)	0 (0.0)		
Spongiform	10 (100)	0 (0.0)		
Elastography				
Hard	5 (100)	0 (0.0)	0.23	0.627
Soft	21 (95.5)	1 (4.5)		

N.B.: *= Independent sample t-test ** =Mann Whitney test

Table 4. Relationship between Echogenicity and patients' demographic and clinical data (No.:27)

Variable	Echogenicity			χ2	p-value
	Hyper No. (%)	Hypo No. (%)	Iso No. (%)		
Age	44.33 ±6.8	48 ±8.44	49.12 ±13.75	2	0.82
AP	24.33±12.7	13.86 ±9.56	15.59 ±11 06	0.2	0.216
TR	27.33 ±10.01	15.86 ±8.72	22.88 ±13.35	0.31	0.358
Gender					
Female	2 (8.7)	5 (21.7)	16 (69.6)	2.94	0.23
Male	1 (25)	2 (50)	1 (25)-		
Margin					
lobulated	0 (0.0)	0 (0.0)	2 (100)	1.27	0.53
Smooth	3 (12)	7 (28)	15 (60)		
Composition					
Cystic and solid	0 (0.0)	0 (0.0)	2 (100)	6.78	0.342
Solid	2 (16.7)	2 (16.7)	8 (66.7)		
Solid and cystic	0 (0.0)	0 (0.0)	3 (100)		
Spongiform	1 (10)	5 (50)	4 (40)		
Elastography					
Hard	1 (20)	1 (20)	3 (60)	0.52	0.768
Soft	2 (9.1)	6 (27.3)	14 (63.6)		

Discussion

The aim of this study was to determine if elastography had diagnostic significance and if it may be utilized as a predictor of thyroid nodule malignancy.

There were 27 patients in the current study. One of the study's findings was that patients with a younger mean age had a larger percentage of those classified as T2 (TIRADs). In addition, female patients had a significantly higher percentage of benign diagnoses based on FINA results than male patients.

Previous studies found that the risk factors for thyroid nodules include female gender, advanced age, iodine deficiency, and previous head and neck radiation (15,16).

Patients with a T2 categorization had a 100% malignancy rate, according to our research. A prior study discovered that TR 3 individuals had a 22.7 percent malignancy risk. We used the most recent ACR TIRADS criteria from 2017. (17). Previous versions of the TIRADS categorization have been utilised in other investigations (ACR TIRADS 2009, K TIRADS 2017 and EU TIRADS 2017). Barbosa et al. (18) reported a percentage of malignancy of 23.3 percent in participants with TR 3 using the most recent ACR TIRADS 2017 criteria. According to the 2017 ACR TIRADS criteria, there are four probable TR3 scenarios: Solid and hyperechoic; solid and isoechoic; mixed solid cystic and hyperechoic with macrocalcification; mixed solid cystic and hypoechoic Individual traits like macrocalcifiation or the hyperechoic nature of the nodule was not included as possible features to predict malignancy in prior systems, which could explain the greater probability of malignancy in TR3. This could be one of ACR TIRADS 2017's disadvantages (17,18).

Thyroid nodules are now divided into five TIRADS categories based on five descriptors (composition, echogenicity, shape, margin, and echogenic foci/ calcification). Each description is assigned a point, and the TIRADS score is derived by summing all of the points from all descriptors. Solid nodules, hypoechogenicity, uneven edges, microcalcifications, and a form taller than wide on a transverse view are all sonographic observations that point to malignancy (19).

Fine needle aspiration cytology (FNAC) is a valuable technique for developing a systematic strategy to the clinical care of thyroid nodules and determining the appropriate surgical method when surgery is required. Thyroid FNA is expected to have a high degree of sensitivity and specificity, similar to other clinical tests in medicine. As a result, thyroid FNA reporting should be as near to similar as possible among pathologists to allow for logical management methods and avoid clinician confusion (20,21).

One of these work results was that a non-significant relationship was found between TIRADs classification and FINA results. The sensitivity, specificity, accuracy, positive predictive and negative predictive value of FNAC were 80 percent, 90 percent, 85 percent, 86 percent, and 86.6 percent, respectively, whereas TIRADS were 80 percent, 47.2 percent, 61 percent, 51.3 percent, and 77.3 percent in a prior study (17). TIRADS classification was equally sensitive and specific as FNAC classification.

Microcalcification was the most sensitive (80%) and specific (100%) of the individual USG measurements (86 percent). According to the findings, USG and FNAC are similarly sensitive in detecting malignant thyroid nodules, however FNA is more specific (90 percent). It's a non-invasive technique that may accurately discriminate between malignant and benign tumours (85 percent).

In the present study, a non-significant relationship was found between Elastography and both TIRADs classification or FINA results. Ultrasound was found to help in differentiating benign from malignant thyroid nodules. However, individual US features may be of limited value (22,23).

False negative and false positive outcomes are among FNAC's drawbacks. Bloch (24) conducted a comparison research between FNAC and histology and discovered that FNAC had a 91.6 percent accuracy rate. A comparable study by Mundasad et al. (25) discovered that FNAC had a sensitivity (52.6%), specificity (86.6%), and accuracy (79.1%) for thyroid cancer. In a comparable study, Handa et al. (26) found that FNAC had a sensitivity of 97 percent, a specificity of 100 percent, a positive predictive value of 96 percent, and a negative predictive value of 100 percent.

Elastography is a newly discovered dynamic technology that employs ultrasound to quantify tissue stiffness by detecting the degree of deformation when an external force is applied. Elastography uses tissue deformation, or strain, generated by compression and is measured by precompression and postcompression ultrasonic signals, similar to palpation in the assessment of the thyroid during physical examination (27). Significant differences in stiffness between normal thyroid tissue and pathologic thyroid tissue have been discovered using thyroid elastography. Although US elastography is not yet widely utilised in clinical practice, it has been found to be helpful in distinguishing between benign and malignant breast (28) and prostate lesions (29). When compared to standard US, US elastography is less stressful for patients, is simple to conduct, and takes only a few minutes longer to complete (30).

FNAC is the most accurate and cost-effective approach for evaluating thyroid nodules, according to the Revised American Thyroid Association Management Guidelines for Patients with Thyroid Nodules and Differentiated Thyroid Cancer (9). The fact that 10–15 percent of FNAC cytology specimens are non-diagnostic and 10–20 percent are indeterminate is a serious constraint (31,32).

The non-significant relationship between TIRADs classification and both FINA results and elastography findings in the present study was revealed from other studies. Bojunga et al., (33) conducted a meta-analysis of research on real-time elastography for identifying benign from malignant thyroid nodules and concluded that elastography was advantageous for patients having surgery. In that meta analysis, 8 studies with a total of 639 nodules were examined, and the overall mean sensitivity and specificity for the detection of malignant thyroid nodules were found to be 92 percent confidence interval (CI) 88–96 and 90 percent CI, 85–95, respectively. In another meta-analysis, Ghajarzadeh et al. (34) methodically analysed 12 papers that evaluated 1,180 thyroid nodules, and the diagnostic accuracy of sonoelastography in detecting malignant nodules was explored. They found that a threshold elasticity score of between 1 and 2 had the maximum sensitivity of 98.3 percent (95 percent CI, 96.2 percent –99.5 percent). They also stated that patients with an elasticity score of 1 did not require any more invasive testing.

Limitations

One of the limitations of the present study is the small sample size. Another limitation is being a single Centre study, so its results cannot be generalized.

Conclusion

In this study most patients (96.3%) had a benign tumor based on FINA results and 81.5% had a soft elastography. The most common TIRADs classification was the T2 (55.6%). Patients with a younger mean age had a significantly higher percentage of those who had T2 (TIRADs) and a non-significant relationship between TIRADs classification and FINA results. Females had a significantly higher percentage of having a benign diagnosis based on FINA results with a non-significant relationship found between FINA results and patients' demographic or clinical data. A non-significant relationship was found between both TIRADs classification and FINA results and the elastography findings. For more clarification of the study results, future studies on larger samples should be done.

References

1. Filho RHC, Pereira FL, Iared W. Diagnostic Accuracy Evaluation of Two-Dimensional Shear Wave Elastography in the Differentiation Between Benign and Malignant Thyroid Nodules: Systematic Review and Meta-analysis. J Ultrasound Med. 2020;39(9):1729–41.
2. Zhu L, Chen Y, Ai H, Gong W, Zhou B, Xu Y, et al. Combining real-time elastography with fine-needle aspiration biopsy to identify malignant thyroid nodules. J Int Med Res. 2020;48(12).
3. Lacout A, Chevenet C, Thariat J, Figl A, Marcy PY. Qualitative ultrasound elastography assessment of benign thyroid nodules: Patterns and intra-observer acquisition variability. Indian J Radiol Imaging. 2013;23(4):337–41.
4. Nell S, Kist JW, Debray TPA, De Keizer B, Van Oostenbrugge TJ, Rinkes IHMB, et al. Qualitative elastography can replace thyroid nodule fine-needle aspiration in patients with soft thyroid nodules. A systematic review and meta-analysis. Eur J Radiol [Internet]. 2015;84(4):652–61. Available from: http://dx.doi.org/10.1016/j.ejrad.2015.01.003
5. Cantisani V, David E, Grazhdani H, Rubini A, Radzina M, Dietrich CF, et al. Prospective Evaluation of Semiquantitative Strain Ratio and Quantitative 2D Ultrasound Shear Wave Elastography (SWE) in

Association with TIRADS Classification for Thyroid Nodule Characterization. Ultraschall der Medizin. 2019;40(4):495–503.
6. Friedrich-Rust M, Meyer G, Dauth N, Berner C, Bogdanou D, Herrmann E, et al. Interobserver Agreement of Thyroid Imaging Reporting and Data System (TIRADS) and Strain Elastography for the Assessment of Thyroid Nodules. PLoS One. 2013 Oct 24;8(10).
7. Regmi S, Tiwari A, Sharma R. Comparison of Fine Needle Aspiration Cytology in Thyroid Lesions using The Bethesda System for Reporting Thyroid Cytopathology with Ultrasonography using Thyroid Imaging Reporting and Data System. J Lumbini Med Coll. 2018;6(2).
8. Yang X, Zhai D, Zhang T, Zhang S. Use of strain ultrasound elastography versus fine needle aspiration cytology for the differential diagnosis of thyroid nodules: A retrospective analysis. Clinics. 2020;75(7):1–8.
9. Borlea A, Borcan F, Sporea I, Dehelean CA, Negrea R, Cotoi L, et al. TI-RADS diagnostic performance: Which algorithm is superior and how elastography and 4D vascularity improve the malignancy risk assessment. Diagnostics. 2020;10(4):1–16.
10. Ríos A, Rodríguez JM, Torregrosa NM, Torregrosa B, Cepero A, Abellán MD, et al. Evaluation of the thyroid nodule with high-resolution ultrasonography and elastography without fine needle aspiration biopsy. Med Clínica (English Ed. 2018;151(3):89–96.
11. Bojunga J, Herrmann E, Meyer G, Weber S, Zeuzem S, Friedrich-Rust M. Real-time elastography for the differentiation of benign and malignant thyroid nodules: A meta-analysis. Thyroid. 2010;20(10):1145–50.
12. Celletti I, Fresilli D, De Vito C, Bononi M, Cardaccio S, Cozzolino A, et al. TIRADS, SRE and SWE in INDETERMINATE thyroid nodule characterization: Which has better diagnostic performance? Radiol Medica [Internet]. 2021;126(9):1189–200. Available from: https://doi.org/10.1007/s11547-021-01349-5
13. Moon HJ, Sung JM, Kim EK, Yoon JH, Youk JH, Kwak JY. Diagnostic performance of gray- scale US and elastography in solid thyroid nodules. Radiology. 2012;262(3):1002–13.
14. Ünlütürk U, Erdogan MF, Demir Ö, Güllü S, Başkal N. Ultrasound elastography is not superior to grayscale ultrasound in predicting malignancy in thyroid nodules. Thyroid. 2012;22(10):1031–8.
15-Zimmermann MB, Galetti V. Iodine intake as a risk factor for thyroid cancer: a comprehensive review of animal and human studies. Thyroid Res. 2015 Jun 18;8:8. doi: 10.1186/s13044-015-0020-8. PMID: 26146517; PMCID: PMC4490680.
16-Rahbari R, Zhang L, Kebebew E. Thyroid cancer gender disparity. Future Oncol. 2010 Nov;6(11):1771-9. doi: 10.2217/fon.10.127. PMID: 21142662; PMCID: PMC3077966.
17-De D, Dutta S, Tarafdar S, Kar SS, Das U, Basu K, Mukhopadhyay P, Ghosh S. Comparison between Sonographic Features and Fine Needle Aspiration Cytology with Histopathology in the Diagnosis of Solitary Thyroid Nodule. Indian J Endocrinol Metab. 2020 Jul-Aug;24(4):349-354. doi: 10.4103/ijem.IJEM_349_20
18-Barbosa T, Junior C, Graf H, Cavalvanti T, Trippia M, da Silveira Ugino R, et al. ACR TI RADS and ATA US scores are helpful for the management of thyroid nodules with indeterminate cytology. BMC Endocrine Disorders 2019;19.
19- Kwak J, Han K, Yoon J, Moon H, Son E, Park S, et al. Thyroid imaging reporting and data system for US features of nodules: A step in establishing better stratification of cancer risk. Radiology 2011;260:892 9.
20- Yoon J, Lee H, Kim E, Moon H, Kwak J. Thyroid nodules: Nondiagnostic cytologic results according to thyroid imaging reporting and data system before and after application of the Bethesda system. Radiology 2015;276:579 87.
21- Singh Ospina N, Brito J, Maraka S, Espinosa de Ycaza A, Rodriguez Gutierrez R, Gionfriddo M, et al. Diagnostic accuracy of ultrasound guided fine needle aspiration biopsy for thyroid malignancy: Systematic review and meta analysis. Endocrine 2016;53:651 61
22- Kim EK, Park CS, Chung WY, et al. New sonographic criteria for recommending fine-needle aspiration biopsy of nonpalpable solid nodules of the thyroid. AJR Am Roentgenol 2002;178: 687–91.
23- Wienke JR, Chong WK, Fielding JR, et al. Sonographic features of benign thyroid nodules: interobserver reliability and overlap with malignancy. J Ultrasound Med 2003;22:1027–31.
24-2 Bloch M. Fine needle aspiration biopsy of head & neck masses. Otolaryngol Head Neck Surg. 1997;89:62–68. [Google Scholar]
25- Mundasad B, Mcallidter I, Carson J (2006) Accuracy of fine needle aspiration cytology in diagnosis of thyroid swelling. Internet J Endocrinol 2(2):23–25
26- Handa U, Garg S, Mohan H (2008) Role of fine needle aspiration cytology in diagnosis and management of thyroid lesion. Indian J Pediatr 25(1):13–17
27-Park SH, Kim SJ, Kim EK, et al. Interobserver agreement in assessing the sonographic and elastographic features of malignant thyroid nodules. AJR 2009;193:W416–23.
28- Itoh A, Ueno E, Tohno E, et al. Breast disease: clinical application of US elastography for diagnosis. Radiology 2006; 239:341–50.
29- Dighe M, Bae Unmin L, Michael, et al. Differential diagnosis of thyroid nodules with US elastography using carotid artery pulsation. Radiology 2008;248(2):662–9.
30- Kagoya R, Monobe H, Tojima H. Utility of elastography for differential diagnosis of benign and malignant thyroid nodules. Otolaryngol Head Neck Surg 2010;143:230–4.
31- Elniel HH, Ibrahim AE, Naglaa MA, et al. Real time ultrasound elastography for the differentiation of benign and malignant thyroid nodules. Open J Med Imaging 2014;4:38–47.
32- Kurita T. Clinical usefulness and future prospects of MicroPure. Toshiba Medical Website. www.toshiba-medical.co.jp/tmd/english/library/pdf/TMR-0808-1-MicroPure.pdf [accessed November 7: 2011.
33. Bojunga J, Herrmann E, Meyer G, Weber S, Zeuzem S, Friedrich Rust M. Real time elastography for the differentiation of benign and malignant thyroid nodules: A meta analysis. Thyroid 2010;20:1145 50.
34. Ghajarzadeh M, Sodagari F, Shakiba M. Diagnostic accuracy of sonoelastography in detecting malignant thyroid nodules: A systematic review and meta analysis. AJR Am J Roentgenol 2014;202:W379 89.

Knowledge, Attitude and Perceptions of the population towards Vitamin D in Jeddah, Saudi Arabia

Fathi El-Gamal [1], Ahmed Daghmash [2], Amjad Yapah [2], Ahmed Buraymah [2], Farah AL Tahawi [2], Fatima Khairurllah [2]

(1) Professor and Chairman of the Family Medicine Department, at Ibn Sina National College for Medical Studies, Jeddah, KSA
(2) Ibn Sina National College for Medical Studies, Jeddah, KSA

Corresponding author:
Prof. Fathi M. El-Gamal,
Department of Family Medicine,
Ibn Sina National College. Al Mahjer Street. Jeddah,
Kingdom of Saudi Arabia.
Tel: 6356555-6355882 / Fax: 6375344 – P.O. Box 31906 Jeddah 21418
Email: drfathimhelgamal1996@hotmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Fathi El-Gamal et al. Knowledge, Attitude and Perceptions of the population towards Vitamin D in Jeddah, Saudi Arabia. World Family Medicine. 2022; 20(11): 77-89. DOI: 10.5742/MEWFM.2022.95251364

Abstract

Background: There is a significant presence of Vitamin D deficiency in the Middle East, and among school children, and university students, in Saudi Arabia.

Objectives: to explore the Knowledge, Attitude and Perceptions of the population towards Vitamin D in Jeddah, Saudi Arabia

Method: It was a cross-sectional study of 880 subjects, who gave their responses through an online Google form. A standardized questionnaire on assessment of Awareness, Knowledge, Attitude, and the Practice of Vitamin D consumption among the General population was used. In addition the Fitzpatrick scale of skin types IV – V, was used. The software SPSS (IBM compatible version 23), was used to analyze the data. Chi square test was used. The level of significance for the present study was 0.05.

Results: 373 subjects (42.4%) consumed Vit. D supplements; the majority of them were females (70.8%). There is no relationship between Vit-D consumption and level of education. It was significantly related to light or pale white-type of skin; and associated with hearing about Vit. D from media or friends and family or health professionals. Use was associated with significantly more knowledge about availability of Vit-D in fortified food, nuts and dairy products. They also knew that exposure to sunlight was important for source of Vit. D. They had reasonable knowledge about the importance of Vit. D. They think that dietary sources of Vit. . D are not sufficient to maintain Vit. . D levels, and knew that Vit. D prevents rickets, and is important for hair growth. There was a lack of knowledge about the RDA for Vit. D. There was significant association between taking Vit. D supplements and wearing sunscreen.

Conclusions: The majority of participants possessed good knowledge about Vitamin D and they identified sun exposure as the main source of vitamin D. However, there is a lack of consistency between knowledge and attitude towards improving vitamin D levels in their sera. This indicates the need to improve awareness among the Saudi population by providing specific guidelines about the frequency, duration, optimum season and amount of exposure to sunlight required, as well as the importance of fortification of food.

Key words: KAP of Vit. D, Determinants, Saudi Arabia

Introduction

The ultraviolet (UVB type) sunlight activates 7-dehydrocholesterol in the skin to produce the fat soluble cholecalciferol (or Vitamin D). It is metabolized in the liver to form 25-hydroxy vitamin D and then the kidneys convert it into 1,25 (OH) D, which is considered the most active metabolite of vitamin D (1, 2).

Vitamin D levels are reduced in younger adults and in men when compared to women, and inversely related to BMI (1). Those who are not exposed to sunlight are unlikely to obtain adequate vitamin D from sunlight. Knowledge and concern about vitamin D were the main determinants of vitamin D supplement use. The basic knowledge about vitamin D has been observed in previous studies among Saudi school girls, and female Saudi university students, and Saudi women. There is a significant presence of Vitamin D deficiency in the Middle East. It is significantly related to education level. People are exposed to a lot of information from several sources (3). The media was often used for getting the information about Vit. D by men, and a distinction was observed between television (more cited by younger individuals and those with lower education or income), and newspapers and radio (more cited by older subjects and those with higher income). School/university was more frequently quoted by younger, better-educated subjects and those with higher income (3,4). Black skinned people absorb more UVB in the melanin of their skin than do white people and, therefore, require more sun exposure to produce the same amount of vitamin D (5).

Few foods naturally contain vitamin D. The flesh of fatty fish (such as trout, salmon, tuna, and mackerel) and fish liver oils are among the best sources. An animal's diet affects the amount of vitamin D in its tissues. Beef liver, egg yolks, and cheese have small amounts of vitamin D, primarily in the form of vitamin D3 and its metabolite 25(OH) D3. Mushrooms provide variable amounts of vitamin D2 (6, 7). In addition, most steps in the metabolism and actions of vitamins D2 and D3 are identical. However, most evidence indicates that vitamin D3 increases serum 25(OH) D levels to a greater extent and maintains these higher levels longer than vitamin D2, even though both forms are well absorbed in the gut (8-10). Certain malabsorption syndromes such as celiac disease, short bowel syndrome, gastric bypass, inflammatory bowel disease, chronic pancreatic insufficiency, and cystic fibrosis may lead to vitamin D deficiency. Lower vitamin D intake orally is more prevalent in the elderly population (11). About 50% to 90% of vitamin D is absorbed through the skin via sunlight while the rest comes from the diet. Twenty minutes of sunshine daily with over 40% of skin exposed is required to prevent vitamin deficiency (4). Cutaneous synthesis of vitamin D declines with aging. Dark-skinned people have less cutaneous vitamin D synthesis. Decreased exposure to the sun is seen in individuals who are institutionalized, or have prolonged hospitalization can also lead to vitamin D deficiency. Medications such as phenobarbital, carbamazepine, dexamethasone, nifedipine, spironolactone, clotrimazole, and rifampin induce hepatic p450 enzymes which activate degradation of vitamin D. End organ resistance to vitamin D can be seen in hereditary vitamin D resistant rickets (11).

Vitamin D3 (VitD3) is known to play a role in the skin barrier function, as it modulates structural proteins of the cornified dermis layer, regulating the glycoseramides essential for the hydrating protective lipid barrier which keeps the skin moisturized. It modulates innate immunity via the production of the anti-microbial peptides (AMPs) cathelicidin and defensin which can help reduce skin infection risk. In addition, Amon et al. (2018) discussed how vitamin D has inhibitory effects on monocyte production (via Toll-like receptors) as well as inhibiting dendritic cell activity and increasing mast cell release of IL10. They also discussed how vitamin D reduces the release of pro-inflammatory cytokines from Th1 cells and inhibits the release of IgE by reducing B cell function (12).

There is consensus that daily intake of 400 IU of vitamin D can prevent nutritional rickets in infants and children. Many observational studies suggest a link between low vitamin D status and T2DM (13). Clearly daily intake >400 IU/day is necessary to reduce the reported rates of deficiency in the UK (14). Homebound individuals; people who wear long robes, dresses, or head coverings for religious reasons; and people with occupations that limit sun exposure are among the groups that are unlikely to obtain adequate amounts of vitamin D from sunlight (15). Similarly, critically ill patients have a very high prevalence of vitamin D deficiency and low vitamin D levels are clearly associated with greater illness severity, morbidity, and mortality in both adult and pediatric intensive care unit (ICU) patients, as well as medical and surgical ICUs (16). When do we get sufficient Vitamin D synthesis from sunlight exposure in the KSA? Despite numerous research studies on the status of vitamin D, there is a conspicuous lack of data in infants and children worldwide, together with countries in the middle-eastern region (17, 18). Some expert bodies and vitamin D researchers suggest, for example, that approximately 5–30 minutes of sun exposure, particularly between 10 a.m. and 4 p.m., either daily or at least twice a week to the face, arms, hands and legs without sunscreen, usually leads to sufficient vitamin D synthesis (19, 20). Constructs related to individual dispositions, a general attitude towards food fortification and perceived personal benefit of vitamin D fortification, as well as perception of cultural norms and problem awareness, are important in consumers' decision-making. The findings are relevant for public health as they demonstrate paths to heighten the intake of vitamin D (21). Both oral and IM routes are effective for the treatment of Vitamin D deficiency. 25-hydroxyvitamin D levels in the IM cholecalciferol group show a sustained increase from baseline (22). The production of vitamin D3 from sun exposure vs. oral supplementation has been evaluated in several studies. Data from Australia and New Zealand, has demonstrated that whole body exposure of mid-day sun in summer for 10–15 min is comparable to taking vitamin D3 orally. Based on this, exposure of hands, face and arms (around 15% of body surface) should produce about 1000 IU of vitamin D3. The optimum time to get sun exposure for vitamin D3 production during summer is from 9:00 AM and before 10:30 AM, as well as after 2:00 PM until

3:00 PM, while during winter it is from 10:00 AM until 2:00 PM (23-25). Messages on skin cancer prevention and benefits of sun exposure on 25-OH-D status should be clear and integrated (26-27). The present study aimed at exploring Knowledge, Attitude and perceptions towards Vitamin D of the general public of Jeddah, Saudi Arabia.

Methodology

A cross-sectional study was carried out, and the sampling method was a non-probability convenient one where data were collected through online Google forms, on adults, in Jeddah, Saudi Arabia. Sample size was determined using G*power software, where α = 0.05, Power = 0.95 effect size = 0.3, and degree of freedom= 5. The minimal sample size required was 277 subjects; thus, 880 subjects were enrolled in the present study. Data were collected using structured questionnaire which provided information on socio-demographic characteristics, and clinical aspects. A standardized questionnaire on assessment of Awareness, Knowledge, Attitude, and the Practice of Vitamin D among the General population was used (4). In addition the Fitzpatrick scale of skin types IV – V, was used (5). The software SPSS (IBM compatible version 23), was used and Chi square test and multiple linear regression were used to analyze the data. The level of significance for the present study was 0.05%.

Availability of the data:
The row data is available at the research center of ISNC and all results of the data are included in the paper.

Results

Table 1 reveals distribution of studied subjects by consumption of vitamin D supplements, and personal and sociodemographic characteristics. Out of the 880 respondents, 373 subjects (42.4%) consumed Vit-D supplements; the majority of them were females (70.8%) compared to males. This difference was statistically significant ($p < 0.000$). Nationality and living areas were not significant with consumption of Vit-D supplements ($p >0.05$). There is no relationship between Vit-D and level of education (p-value < 0.777). A greater proportion of those who consume Vit. – D supplements were of skin type light or pale white. This difference was statistically significant where $x2 =11.184$, and $p < 0.048$. A greater proportion of those who consume Vit. D supplements had previously heard of vitamin D supplements (98.9%) compared to those who hadn't. This difference was statistically significant where $x2 =5.413$, and $p < 0.020$. A greater proportion of those who consume Vit-D supplements did not get information from the media($p < 0.022$). A greater proportion of those who consume Vit. D heard about it from friends or families. ($p <0.05$) A greater proportion of those who consume Vit. D heard about it from Health professionals (doctor, nurse, dietitian, nutritionist). This difference was statistically significant where $x2 = 14.602$ and $p < 0.000$.

Table 2 shows the distribution of studied subjects by consumption of vitamin D supplements and knowledge about sources of Vit. D

Subjects who consumed Vit. D supplement had significantly more knowledge about availability of Vit. D in fortified food, nuts and dairy products compared to those who do not consume Vit. D supplements ($p<0.05$).

Table 3 shows the distribution of studied subjects by consumption of Vit. D supplements and knowledge about importance of Vit. D. A majority of participants who use vitamin D supplements think that dietary sources of Vit. D are not sufficient to maintain Vit. D levels compared to those who did not ($p <0.05$). Those who consumed Vit. D supplements knew that Vit. D prevents rickets, and is important for hair growth ($p <0.05$).

A greater proportion of those who consume vitamin D supplements did not know the RDA of Vit. D ($p <0.05$).

A greater proportion of those who consume vitamin D supplements knew that exposure to sunlight was important for any subject to get Vit. D where $p< 0.05$ (Table 4).

Table 5 displays the distribution of Vit. D supplement intake and practice towards acquiring Vit. D. There was a significant association between taking Vit. D supplements and wearing sunscreen ($p< 0.05$). A greater proportion of those who consume vitamin D supplements were people concerned with low vitamin D levels (77.5%) compared to those who said no or who were unsure. A greater proportion people who were concerned =their vitamin D level was too low (58.8%) was encountered among those who did not consume vitamin D. This difference was statistically significant where $x2 = 34.316$ $p< 0.000$. Those who consumed Vit. D supplements were more likely to have their Vit. D tested, and were eager to know about Vit. D ($p <0.05$).

A greater proportion of those who consumed vitamin D supplements were people willing to purchase/consume fortified foods ($p<0.05$).

Table 1: Distribution of the studied subjects by consumption of vitamin D supplements and personal and sociodemographic characteristics.

Variable	Categories	Have Vit. D supplement				Total		X^2 (p-value)
		No		Yes		N	%	
		N	%	N	%			
Gender	Male	237	46.7%	109	29.7%	346	39.3 %	27.657 (.000)
	Female	270	53.3%	264	70.8%	534	60.7 %	
Living area	Jeddah	398	78.5%	285	76.4%	683	77.6 %	.542 (.462)
	Other	109	21.5%	88	23.6%	197	22.4 %	
Nationality	Saudi	278	55.0%	216	85.5%	494	56.5 %	1.055 (.304)
	Non Saudi	227	45.0%	153	41.5%	380	43.5 %	
Level of education	Didn't finish high school	33	6.5%	26	7.0%	59	6.7 %	4.027 (.777)
	High school	178	35.1%	138	37.0%	316	35.9 %	
	Trade School	13	2.6%	5	1.3%	18	2.0 %	
	Undergraduate/ Bachelor's degree	223	44.0%	157	42.1%	380	43.2 %	
	Postgraduate degree (PGDip)	11	2.2%	8	2.1%	19	2.2 %	
	Master's degree	16	3.2%	11	2.9%	27	3.1%	
	Doctorate (PhD)	5	1.0%	8	2.1%	13	1.5 %	
	Other	28	5.5%	20	5.4%	48	5.5 %	
Fitzpatrick Scale, which skin type best describes yours?	Light or pale white- Always burns, never tans	41	8.1%	56	15.0%	97	11.0 %	11.184 (.048)
	White, Fair- Usually burns, tans with difficulty	173	34.1%	119	31.9%	292	33.2 %	
	Medium, between white to moderate brown- Moderately burns, moderately tans	196	38.1%	134	35.9%	330	37.5 %	
	Moderate brown- Rarely burns, tans more than average	61	12.0%	44	11.8%	105	11.9 %	
	Brown, dark brown- Rarely burns, tans very easily	28	5.5%	15	4.0%	43	4.9 %	
	Very dark brown to black, black- Never burns, tans very easily, deeply pigmented	8	1.6%	5	1.3%	13	1.5 %	

(continued next page)

Have you previously heard of vitamin D?	YES	489 96.4%	369 98.9%	858 97.5 %	5.413 (.020)
	NO	18 3.6%	4 1.1%	22 2.5 %	
Media	YES	257 50.7	160 42.9%	417 47.4 %	5.237 (.022)
	NO	250 49.3%	213 57.1%	463 52.6 %	
Book	YES	118 23.3%	93 24.9%	211 24.0 %	.324 (.569)
	NO	389 76.7%	280 75.1%	669 76.0 %	
Leaflets/ Posters	YES	75 14.8%	42 11.3%	117 13.3 %	2.327 (.127)
	NO	432 85.2%	331 88.7%	763 86.7 %	
Family/ Friends	YES	243 47.9%	152 40.8%	395 44.9 %	4.476 (.034)
	NO	264 52.1%	221 59.2%	485 55.1 %	
Health professionals (doctor, nurse, dietitian, nutritionist)	YES	218 43.3 %	210 56.3%	428 48.8 %	14.602 (.000)
	NO	286 56.7 %	163 43.7 %	449 51.2 %	

Table 2: Distribution of the studied subjects by consumption of vitamin D supplements and knowledge about source of Vit. D.

Variable	Categories	Do you take Vit. D supplement?				Total		χ^2 (p-value)
		No		Yes				
		N	%	N	%	N	%	
Food	Yes	259	51.1%	183	49.1%	442	50.2%	.352 (.553)
	I do not know	248	48.9%	190	50.9%	438	49.8%	
Sunlight	Yes	457	90.1%	333	89.3%	790	89.8%	.174 (.677)
	I do not know	50	9.9%	40	10.7%	90	10.2%	
Water	Yes	9	1.8%	7	1.9%	16	1.8%	.012 (.911)
	I do not know	498	98.2%	366	98.1%	864	98.2%	
Air	Yes	4	0.8%	4	1.1%	8	0.9%	.192 (.662)
	I do not know	503	99.2%	369	98.9%	872	99.1%	
Exercise	Yes	15	3.0%	15	4.0%	30	3.4%	.737 (.391)
	I do not know	492	97.0%	358	96.0%	850	96.6%	
	No	391	77.1%	306	82.0%	697	79.2%	
Oily fish	Yes	232	46.4%	192	52.3%	424	48.9%	2.965 (.085)
	I do not know	268	53.6%	175	47.7%	443	51.1%	
Egg yolks	Yes	138	27.2%	115	30.8%	253	28.7%	1.369 (.242)
	I do not know	369	72.8%	258	69.2%	627	71.3%	
Fortified foods	Yes	53	10.5%	56	15.0%	109	12.4%	4.117 (.042)
	I do not know	454	89.5%	317	85.0%	771	87.6%	
Red meat	Yes	74	14.6%	54	14.5%	128	14.5%	.002 (.961)
	I do not know	433	85.4%	319	85.5%	752	85.5%	
Dairy products	Yes	83	16.4%	59	15.8%	142	16.1%	.049 (.826)
	I do not know	424	83.6%	314	84.2%	738	83.9%	
Fruit	Yes	118	23.3%	74	19.8%	192	21.8%	1.487 (.223)
	I do not know	389	76.7%	299	80.2%	688	78.2%	
Vegetables	Yes	82	16.2%	80	21.4%	162	18.4%	3.980* (.046)
	I do not know	425	83.8%	293	78.6%	718	81.6%	
Chicken	Yes	20	3.9%	15	4.0%	35	4.0%	.003* (.954)
	I do not know	487	96.1%	358	96.0%	845	96.0%	
Nuts	Yes	52	10.3%	59	15.8%	111	12.6%	6.030* (.014)
	I do not know	455	89.7%	314	84.2%	769	87.4%	

Table 3: Distribution of the studied subjects by consumption of vitamin D supplements and knowledge about Vit. D sources and benefits to the body.

Variable	categories	Have Vit D supplement				Total		X^2 (p-value)
		No		Yes				
		N	%	N	%	N	%	
Do you think dietary sources are sufficient to maintain vitamin D levels?	Yes	96	18.9%	48	12.9%	144	16.4%	21.925 (.000)
	No	236	46.5%	233	62.5%	469	53.3%	
	Unsure	175	34.5%	92	24.7%	267	30.3%	
Factors affect vitamin D production / I don't know	Yes	262	51.7%	189	50.7%	451	51.2%	.087 (.768)
	No	245	48.3%	184	49.3%	429	48.8%	
Skin pigmentation	Yes	119	23.5%	85	22.8%	204	23.2%	.056 (.812)
	I do not know	388	76.5%	288	77.2%	676	76.8%	
Cloud cover	Yes	31	6.1%	24	6.4%	55	6.3%	.038 (.846)
	I do not know	476	93.9	349	93.6%	825	93.8%	
Pollution	Yes	25	4.9%	14	3.8%	39	4.4%	.704 (.402)
	I do not know	482	95.1%	359	96.2%	841	95.6%	
Time of day	Yes	34	6.7%	32	8.6%	66	7.5%	1.087 (.297)
	I do not know	473	93.3%	341	91.4%	814	92.5%	
Latitude	Yes	15	3.0%	6	1.6%	21	2.4%	1.681 (.195)
	I do not know	492	97.0%	367	98.4%	859	97.6%	
Season	Yes	26	5.1%	21	5.6%	47	5.3%	.107 (.744)
	I do not know	481	94.9%	352	94.4%	833	94.7%	
Smoking	Yes	23	4.5%	16	4.3%	39	4.4%	.031 (.860)
	I do not know	484	95.5%	357	95.7%	841	95.6%	
Sunscreen use	Yes	42	8.3%	25	6.7%	67	7.6%	.764 (.382)
	I do not know	465	91.7%	348	93.3%	813	92.4%	
High-fat diet	Yes	28	5.5%	17	4.6%	45	5.1%	.412 (.521)
	I do not know	479	94.5%	356	95.4%	835	94.9%	
Health benefits/ don't know	Yes	81	16.0%	28	7.5%	109	12.4%	14.205 (.000)
	No	426	84.0%	345	92.5%	771	87.6%	
Bone health	Yes	351	69.2%	274	73.5%	625	71.0%	1.866 (.172)
	I do not know	156	30.8	99	26.5%	255	29.0%	
Prevention of rickets	Yes	186	36.7%	178	47.7%	364	41.4%	10.789 (.001)
	I do not know	321	63.3%	195	52.3%	516	58.6%	
Vision	Yes	99	19.5%	88	23.6%	187	21.3%	2.123 (.145)
	I do not know	408	80.5%	285	76.4%	693	78.8%	
Hair growth	Yes	185	36.5%	170	45.6%	355	40.3%	7.374 (.007)
	I do not know	322	63.5%	203	54.4%	525	59.7%	
Skin health	Yes	235	46.4%	168	45.0%	403	45.8%	.149 (.700)
	I do not know	272	53.6%	205	55.0%	477	54.2%	
Prevention of osteoporosis	Yes	282	55.6%	230	61.7%	512	58.2%	3.223 (.073)
	I do not know	225	44.4%	143	38.3%	368	41.8%	

Table 4: Distribution of the studied subjects by consumption of vitamin D supplements and awareness about Vit. D sources and importance.

Variable	Categories	Have Vit. D supplement				Total		X^2 (p-value)
		Yes		No		N	%	
		N	%	N	%			
Recommended daily amount of vitamin D	5µg/200IU	136	26.8%	117	31.4%	253	28.7%	19.800 (.001)
	10µg/400IU	180	35.5%	103	27.6%	283	32.2%	
	20µg/800IU	112	22.1%	62	16.6%	174	19.8%	
	50µg/2000IU	61	12.0%	61	16.4%	122	13.9%	
	100µg/4000IU	18	3.6%	30	8.0%	48	5.5%	
Individuals not often outdoors	Yes	244	48.1%	184	49.3%	428	48.6%	.125 (.724)
	I do not know	263	51.9%	189	50.7%	452	51.4%	
Institutionalized individuals	Yes	62	12.2%	45	12.1%	107	12.2%	.724 (.941)
	I do not know	445	87.8%	328	87.9%	773	87.8%	
Individuals who cover up the majority of their skin when outdoors	Yes	122	24.1%	97	26.0%	219	24.9%	.434 (.510)
	I do not know	385	75.9%	276	74.0%	661	75.1%	
Individuals with dark skin	Yes	50	9.9%	32	8.6%	82	9.3%	.419 (.518)
	I do not know	457	90.1%	341	91.4%	798	90.7%	
Individuals who don't eat fish	Yes	82	16.2%	75	20.1%	157	17.8%	2.269 (.132)
	I do not know	425	83.8%	298	79.9%	723	82.2%	
When do we get sufficient Vitamin D synthesis from sunlight exposure in the KSA?	All Year	239	47.4%	205	55.3%	444	50.7%	7.241 (.065)
	March or early April to September	54	10.7%	41	11.1%	95	10.9%	
	October to March	41	8.1%	19	5.1%	60	6.9%	
	Unsure	170	33.7%	106	28.6%	276	31.5%	
Those with darker skin pigmentation are more at-risk of Vitamin D insufficiency?	Agree	107	21.1%	88	23.6%	195	22.2%	.772 (.680)
	Unsure	305	60.2%	217	58.2%	522	59.3%	
	Not agree	95	18.7%	68	18.2%	163	18.5%	
Skin pigmentation affects vitamin D status	Agree	153	30.2%	104	27.9%	257	29.2%	.555 (.758)
	Unsure	297	58.6%	225	60.3%	522	59.3%	
	Not agree	57	11.2%	44	11.8%	101	11.5%	
If I regularly protect my skin from the sun, I may be in danger of not getting enough vitamin D	Agree	202	39.8%	171	45.8%	373	42.4%	4.634 (.099)
	Unsure	199	39.3%	121	32.4%	320	36.4%	
	Not agree	106	20.9%	81	21.7%	187	21.3%	
Seek direct sun	Yes	139	27.4%	127	34.0%	266	30.2%	4.482 (.034)
	No	368	72.6%	246	66.0%	614	69.8%	
Shade	Yes	231	45.6%	145	38.0%	376	42.7%	3.928 (.047)
	No	276	54.4%	228	61.1%	504	57.3%	
Cover-up or wear clothing	Yes	168	33.1%	121	32.4%	289	32.8%	.047 (.828)
	No	339	66.9%	252	67.6%	591	67.2%	

Table 4: Distribution of the studied subjects by consumption of vitamin D supplements and awareness about Vit. D sources and importance (continued)

Don't go outside	Yes	69 13.6%	51 13.7%	120 13.6%	.001 (.978)
	No	438 86.4%	322 86.3%	760 86.4%	
Minimal coverage (exposure of shoulders and above the knee)	Yes	114 22.5%	96 25.7%	210 23.9%	1.251 (.263)
	No	393 77.5%	277 74.3%	670 76.1%	
Moderate coverage (exposure of forearms, below knee and face)	Yes	278 54.8%	189 50.7%	467 53.1%	1.495 (.221)
	No	229 45.2%	184 49.3%	413 46.9%	
Maximal coverage (exposure of only hands and face)	Yes	144 28.4%	109 29.2%	253 28.7%	.071 (.791)

Table 5 Distribution of the studied subjects by consumption of vitamin D supplements and their practice to gain Vit. D.

Variable	categories	Have Vit. D supplement				Total		χ^2 (p-value)
		No		Yes				
		N	%	N	%	N	%	
When sunny from March to end of September, how often do you wear sunscreen/sun protection?	Never	162	32.0%	79	21.2%	241	27.4%	15.985 (.003)
	Rarely	107	21.1%	72	19.3%	179	20.3%	
	Usually	45	8.9%	43	11.5%	88	10.0%	
	Always	100	19.7%	94	25.2%	194	22.0%	
	Sometimes	93	18.3%	85	22.8%	178	20.2%	
Regarding typical daylight exposure from the March until end of September, how many days per week on average would you spend outdoors	2 day	89	17.6%	61	16.4%	150	17.1%	2.469 (.650)
	3 day	114	22.5%	100	26.8%	214	24.3%	
	5 day	94	18.6%	67	18.0%	161	18.3%	
	6 day	81	16.0%	52	13.9%	133	15.1%	
On these days of daylight exposure, how long on average would you spend outside each day?	1 hour	241	47.5%	203	54.4%	444	50.5%	4.370 (.224)
	2 hour	136	26.8%	83	22.3%	219	24.9%	
	3 hour	89	17.6%	58	15.5%	147	16.7%	
	5 hour	41	8.1%	29	7.8%	70	8.0%	
On these days of daylight exposure, what time of the day would you most often be out?	All day	71	14.0%	40	10.7%	111	12.6%	7.236 (.065)
	Evening hours	144	28.4%	85	22.8%	229	26.0%	
	Afternoon hours	91	17.9%	79	21.2%	170	19.3%	
	Morning hours	201	39.6%	169	45.3%	370	42.0%	
Are you concerned that your vitamin D levels may be too low?	Yes	298	58.8%	289	77.5%	587	66.7%	34.316 (.000)
	No	151	29.8%	57	15.3%	208	23.6%	
	Unsure	58	11.4%	27	7.2%	85	9.7%	
Have you ever had your vitamin D levels tested?	Yes	120	23.7%	227	60.9%	347	39.4%	126.586 (.000)
	No	375	74.0%	137	36.7%	512	58.2%	
	Unsure	12	2.4%	9	2.4%	21	2.4%	
Are you interested to know more about Vit D?	Yes	426	84.0%	341	91.4%	767	87.2%	10.507 (.001)
	No	81	16.0%	32	8.6%	113	12.8%	
Do you think there is any harm in taking fortified foods?	Yes	72	14.2%	64	17.2%	136	15.5%	5.599 (.061)
	No	255	50.3%	204	54.7%	459	52.2%	
	Unsure	180	35.5%	105	28.2%	285	32.4%	
Would you be willing to purchase/consume fortified foods?	Yes	205	40.4%	225	60.3%	430	48.9%	36.518 (.000)
	No	168	33.1%	70	18.8%	238	27.0%	
	Unsure	134	26.4%	78	20.9%	212	24.1%	

(continued next page)

If no, why not?	Unaware of the benefits of taking them	88	17.8%	10	15.2%	98	17.5%	36.854 (.000)
	Too expensive	50	10.1%	9	13.6%	59	10.5%	
	I don't know which one to take	137	27.7%	12	18.2%	149	26.6%	
	I don't know how I can get them	20	4.0%	0	0.0%	20	3.6%	
	I think I get enough	151	30.5%	12	18.2%	163	29.1%	
	Other	49	9.9%	23	34.8%	72	12.8%	

Discussion

In the present study, women tend more to consume vit D supplement. This is in line with findings from previous study (3). A majority of mothers with basic and vocational education were unable to indicate the proper functions of vitamin D, whereas in the group of mothers with secondary and higher education, this problem was much rarer. Knowledge about vitamin D functions and its nutritional sources rose with the level of mothers' education.(2) This is not in line with the findings from the present study. Greater proportion of those who consume vit – D supplement were those whose skin was Light or pale white- Always burns, never tans. This is consistent with findings from other studies (2, 5). Main sources of information were physicians , television and magazines . Physicians were cited more often by women, older participants and those with a lower educational level. The media were cited more often by men, and a distinction was observed between television (more cited by younger individuals and those with lower education or income) and newspapers and radio (more cited by older subjects and those with higher income). School/university was more frequently quoted by younger, better-educated subjects and those with higher income.(3) This is in line with findings from the present study.

Participants who learned about VitD from their physician were more likely to have a better knowledge of VitD sources and clearly established health effects. Participants who learned about VitD with another healthcare professional (e.g., pharmacist, dietitian, dentist, nurse, etc.) or at school/university also answered correctly for VitD sources and health effects but also tended to associate VitD with other health conditions with unclear consensus, as did participants who learned about VitD in the media. (3) This is consistent with findings from the present study.

Consumption of Vit D was significantly associated with increased knowledge about the function of Vit – D. This is in line with other study. (26)

Few foods naturally contain vitamin D. The flesh of fatty fish (such as trout, salmon, tuna, and mackerel) and fish liver oils are among the best sources . An animal's diet affects the amount of vitamin D in its tissues. Beef liver, egg yolks, and cheese have small amounts of vitamin D, primarily in the form of vitamin D3 and its metabolite 25(OH)D3. (6) . This is in line with findings from the resent study, where consumption of Vit D was associated with consumption of vegetables, Nuts, and diary products. There is consensus that daily intake of 400 IU of vitamin D can prevent nutritional rickets in infants and children Many observational studies suggest a link between low vitamin D status and T2DM. This is in line with findings from the present study. Clearly, daily intakes >400 IU/day are necessary to reduce the reported rates of deficiency in the UK. However, increased intake recommendations will be no more effective than current advice without programs that ensure adequate vitamin D intakes at the population level, best achieved by food fortification programs suited to local lifestyles. For example, from 2003 Finland has fortified milk and fatty spreads [voluntarily] while encouraging deficiency risk group supplementation; in 2010 Finland's food fortification was doubled which has successfully minimized deficiency apart from that in recent immigrant groups (14). This is in line with the present study

Conclusion

The majority of participants possessed good knowledge about vitamin D and they identified sun exposure as the main source of vitamin D. However, there is a lack of consistency between knowledge and attitude towards improving vitamin D levels in their sera. This indicates the

need to improve awareness among the Saudi population by providing specific guidelines about the frequency, duration, optimum season and amount of exposure to sunlight required, as well as the importance of fortification of food like milk.

Ethical consideration

This study was approved by IRRB of Ibn Sina national college for medical studies. Consent of the dean of the college of Ibn Sina as well as of the participants were obtained before the start of study.

The limitation of the study:

This study was convenient non-probability one, and used an online questionnaire so the representation of the data to the population can't be assured. However as this is an exploratory study and showed marked variation (no extreme outliers) in the characteristics of the studies' subjects and a validity study was conducted on the questionnaire and proved to be highly reliable and the results are similar to those obtained globally.

Acknowledgement:

All the authors are grateful to ISNC for medical Sciences for approving the study and giving it consent and, we would like to thank all subjects who spent time to fill in this questionnaire and participate in this survey.

References

1- Naganuma, J., Koyama, S., Arisaka, O., & Yoshihara, S. (2022). Low serum 25-hydroxyvitamin D level is associated with obesity and atherogenesis in adolescent boys. Annals of Pediatric Endocrinology and Metabolism, 27(1), 30–36. https://doi.org/10.6065/apem.2142112.056

2- . Christakos, S., D.V. Ajibade, P. Dhawan, A.J. Fechner and L.J. Mady. Vitamin D: Metabolism. Rheumatic Dis. Clin. 2012; 38: 1-11.

3- O'connor, C., Glatt, D., White, L., & Iniesta, R. R. (2018). Knowledge, attitudes and perceptions towards vitamin d in a UK adult population: A cross-sectional study. International Journal of Environmental Research and Public Health, 15(11). https://doi.org/10.3390/ijerph15112387

4- Blebil, A. Q., Dujaili, J. A., Teoh, E., Wong, P. S., & KC, B. Assessment of Awareness, Knowledge, Attitude, and the Practice of Vitamin D among the General Public in Malaysia. Journal of Karnali Academy of Health Sciences,2019; 2(3), 171–180. https://doi.org/10.3126/jkahs.v2i3.26646[REF]

5- Goon, P., Banfield, C., Bello, O., & Levell, N. J. (2021). Skin cancers in skin types IV–VI: Does the Fitzpatrick scale give a false sense of security? Skin Health and Disease, 1(3). https://doi.org/10.1002/ski2.40 [REF]

6- Roseland JM, Phillips KM, Patterson KY, Pehrsson PR, Taylor CL. Vitamin D in foods: An evolution of knowledge. Pages 41-78 in Feldman D, Pike JW, Bouillon R, Giovannucci E, Goltzman D, Hewison M, eds. Vitamin D, Volume 2: Health, Disease and Therapeutics, Fourth Edition. Elsevier, 2018.

7- U.S. Food and Drug Administration. Food additives permitted for direct addition to food for human consumption; vitamin D2 mushroom powder. Federal Register 2020;85:41916-20

8- Tripkovic L, Wilson LR, Hart K, Johnsen S, de Lusignan S, Smith CP, et al. Daily supplementation with 15 μg vitamin D2 compared with vitamin D3 to increase wintertime 25-hydroxyvitamin D status in healthy South Asian and white European women: A 12-wk randomized, placebo-controlled food-fortification trial. Am J Clin Nutr 2017;106:481-90. [PubMed abstract]

9- Graeff-Armas LA, Bendik I, Kunz I, Schoop R, Hull S, Beck M. Supplemental 25-hydroxycholecalciferol is more effective than cholecalciferol in raising serum 25-hydroxyvitamin D concentrations in older adults. J Nutr 2020;150:73-81. [PubMed abstract]

10- National Institutes of Health. Dietary Supplement Label Database. 2020.

11- Sizar O, Khare S, Goyal A, et al. Vitamin D Deficiency. [Updated 2022 May 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-.

12- Hattangdi-Haridas SR, Lanham-New SA, Wong WHS, Ho MHK, Darling AL. Vitamin D Deficiency and Effects of Vitamin D Supplementation on Disease Severity in Patients with Atopic Dermatitis: A Systematic Review and Meta-Analysis in Adults and Children. Nutrients. 2019;11(8):1854. Published 2019 Aug 9. doi:10.3390/nu1108185

13- Bouillon R, Manousaki D, Rosen C, Trajanoska K, Rivadeneira F, Richards JB. The health effects of vitamin D supplementation: evidence from human studies. Nat Rev Endocrinol. 2022;18(2):96-110. doi:10.1038/s41574-021-00593-

14- Jääskeläinen T, Itkonen ST, Lundqvist A, et al. The positive impact of general vitamin D food fortification policy on vitamin D status in a representative adult Finnish population: evidence from an 11-y follow-up based on standardized 25-hydroxyvitamin D data. Am J Clin Nutr. 2017Jun;105(6):1512. [PubMed], [Web of Science ®], [Google Scholar]

15- Sowah D, Fan X, Dennett L, Hagtvedt R, Straube S. Vitamin D levels and deficiency with different occupations: A systematic review. BMC Public Health 2017;17:519. [PubMed abstract]

16- Cariolou M, Cupp MA. Importance of vitamin D in acute and critically ill children with subgroup analyses of sepsis and respiratory tract infections: a systematic review and meta-analysis. Crit care (Lond, Engl). 2019;9:e027666. 10.1136/bmjopen-2018-027666.

17- Sowah D, Fan X, Dennett L, Hagtvedt R, Straube S. Vitamin D levels and deficiency with different occupations: A systematic review. BMC Public Health 2017;17:519. [PubMed abstract]

18- Bouillon R. Comparative analysis of nutritional guidelines for vitamin D. Nat Rev Endocrinol 2017;13:466-79. [PubMed abstract].U.S. Department of Health and Human Services. The Surgeon General's Call to Action to Prevent Skin Cancerexternal link disclaimer. Washington, DC: U.S. Dept of Health and Human Services, Office of the Surgeon General; 2014.

19- Fouda, M.A.; Turkestani, I.Z.; Almusharraf, S.; Al-Ajlan, A.; Angkaya-Bagayawa, F.F.; Sabico, S.; Mohammed, A.G.; Hassanato, R.; Al-Serehi, A.; Alshingetti, N.M.; et al. Extremely High Prevalence of Maternal and Neonatal Vitamin D Deficiency in the Arab Population. Neonatology 2017, 112, 225–230. [Google Scholar] [CrossRef]
20- Kung AW, Lee KK. Knowledge of vitamin D and perceptions and attitudes toward sunlight among Chinese middle-aged and Cashman KD & Kiely M (2016) Tackling inadequate vitamin D intakes within the population: fortification of dairy products with vitamin D may not be enough. Endocrine 51, 38–46. [PubMed] [Google Scholar]
21- Bimbo, F., Bonanno, A., Nocella, G., Viscecchia, R., Nardone, G., De Devitiis, B., & Carlucci, D. (2017). Consumers' acceptance and preferences for nutrition-modified and functional dairy products: A systematic review. Appetite, 113, 141–154
22- Giustina A, Adler RA, Binkley N, Bouillon R, Ebeling PR, Lazaretti-Castro M, Marcocci C, Rizzoli R, Sempos CT, Bilezikian JP. Controversies in Vitamin D: summary statement from an international conference. J Clin Endocrinol Metab. 2019;104(2):234–40 [PubMed] [Google Scholar]
23- Abukhelaif, A. E., Alzahrani, S. A., Al-Thobaiti, L. Y., Alharbi, A. A., Al Shumrani, K. M., & Alghamdi, Y. S. (2021). Assessment level of awareness of Vitamin D deficiency among the public residents of Al-Baha region; Saudi Arabia. www.surveysystem.com/sscalc.htm
24- Geddawy, A., Al-Burayk, A. K., Almhaine, A. A., Al-Ayed, Y. S., Bin-Hotan, A. S., Bahakim, N. O., & Al-Ghamdi, S. (2020). Response regarding the importance of vitamin D and calcium among undergraduate health sciences students in Al Kharj, Saudi Arabia. Archives of Osteoporosis, 15(1). https://doi.org/10.1007/s11657-020-00790-9
25- Salari, N., Ghasemi, H., Mohammadi, L., Behzadi, M. hasan, Rabieenia, E., Shohaimi, S., & Mohammadi, M. (2021). The global prevalence of osteoporosis in the world: a comprehensive systematic review and meta-analysis. In Journal of Orthopaedic Surgery and Research (Vol. 16, Issue 1). BioMed Central Ltd. https://doi.org/10.1186/s13018-021-02772-0
26- Cancer Research UK. Sun, UV and Cancer. Available online: https://www.cancerresearchuk.org/about- cancer/causes-of-cancer/sun-uv-and-cancer (accessed on 6 April 2018)
27- Vitamin D and Health Report (SACN). Available online. https://www.gov.uk/government/publications/sacn-vitamin-d-and-health-report (accessed on 5 April 2018).

The Prevalence of Constipation and Its Associated Complications in Aseer Region by Using Wexner Scale

Muneer Jan Bhat [1], Sultan Mohammed Abdullah Alkorbi [2], Nejad Mubasher Mohammed Alnaem [2], Abdullah Omar Musleh Alqarni [2], Shadi Ahmad Abdullah Alamri [2], Lama Gasem Asiri [2], Khalid Ali Abdullah Alsaiari [2]

(1) Assistant Professor of Anesthesiology Department of surgery, College of Medicine, King Khalid University, Abha
(2) Medical student at King Khalid university, Abha, Saudi Arabia.

Correspondence:
Shehata Farag Shehata
Lecturer of Biostatistics
High Institute of Public health
Alexandria University
Email: shehatafarag@yahoo.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Muneer Jan Bhat et al. The Prevalence of Constipation and Its Associated Complications in Aseer Region by Using Wexner Scale. World Family Medicine. 2022; 20(11): 90-99. DOI: 10.5742/MEWFM.2022.95251365

Abstract

Background: Constipation is a common condition in the community which represents a significant burden for both individuals and health care systems. For the individual, constipation is associated with pain and symptoms which negatively impact quality of life. Constipation is a common gastrointestinal problem, which causes many expenses for the community with an estimated prevalence of 1% to 80%, worldwide.

Aim: to assess the prevalence of constipation and its associated complications in Asser region, Saudi Arabia, by using Wexner Constipation Scoring System.

Methodology: A descriptive cross-sectional survey was used targeting all groups of population in Aseer region for at least 6 months, aged 18 years or more, and who agreed to participate in the study. Data was collected using structured questionnaire included person's sociodemographic data, in addition to constipation severity as assessed using Wexner constipation scoring system. The final questionnaire was uploaded using social media platforms and answers were included consecutively till no more answers were obtained.

Results: 939 participants completed the survey; 23.2% of participants had a score of (11-10) = mild constipation, and only 1.3% had a score (21-30) = moderate to severe constipation. The most common complications related to constipation and high Wexner score were: Hemorrhoid then hernia then rectal prolapse and anal fissure. In regard to most behaviors related to constipation and high Wexner score: change in daily routine was the highest correlated behavior with Wexner constipation score, followed by "smoking". The clinical status related with constipation and high Wexner score: Chronic diseases and frequent use of medications. For marital status, being widowed or divorced was associated with a significantly higher score in Wexner constipation than being single or married. Doing exercises each day was associated with a lower score in Wexner constipation.

Conclusions: In conclusion, the current study showed that chronic constipation was not a common health problem among the study population with higher severity score among old aged participants who were married and in the working group.

Key words: Constipation, prevalence, population, Wexner score, risk factors, complications, Saudi Arabia.

Background

Constipation is defined as difficult and/or rare passage of stool or both [1]. Constipation is a common gastrointestinal problem, which causes much expense for the community with an estimated prevalence of 1% to 80%, worldwide [2] where the condition is characterized by a wide geographical variation. It is noteworthy that the varieties of definitions have led to a wide range of prevalence. The varieties in the description of constipation was the main cause of a wide range of reported prevalence [1]. Several definitions of constipation are due to scientific considerations such as secondary causes (medications), neurological, or systemic diseases. Though, it is well thought to be primary or idiopathic [3]. Consequently, constipation is usually focused in clinical practice and the global population is observing a rapid increase in its incidence [4].

There are different reported symptoms among patients including straining, incomplete evacuation, and a sense of anorectal blockage which are just as significant as reduced stool frequency [5-8]. Numerous factors are involved in the pathogenesis of the disease, such as nature of diet, genetic factors, colonic motility, absorption, social economic status, daily life activities, biological and pharmacological factors [9].

Constipation, especially chronic constipation is associated with many complications which may develop mainly among neglected cases. Hemorrhoids, anal fissure, fecal impaction, rectal prolapse, and developing of inguinal hernia are the most reported associated complications [10-12].

This study aimed to assess the prevalence of constipation and its associated complications in Aseer region, Saudi Arabia, by using Wexner Constipation Scoring System and to shed light on the most predominant risk factors contributing to the development of constipation in Aseer region and to contribute to medical efforts that aim to increase life quality of life of society.

Methodology

A descriptive cross-sectional survey was used targeting all groups of population aged 18 years or more in Aseer region for at least 6 months, and who agreed to participate in the study. Patients with congenital GIT disorders were excluded. Data was collected using structured questionnaire including a person's sociodemographic data, in addition to constipation severity assessed using Wexner constipation scoring system (WCSS) combined with questions relevant to the target of our research. The Wexner constipation scoring system is a scoring system composed of 8 items, with score ranges from 0 – 30; the highest score the more constipation severity [13]. The study questionnaire was reviewed by a panel of 3 experts for validity and applicability and all suggested modifications were considered. The final questionnaire was uploaded using social media platforms and answers were included consecutively till no more answers were obtained.

Statistical analysis

Analyses were conducted using the Statistical Package for Social Studies (SPSS) version 19 for Windows (IBM SPSS, Chicago, IL, USA). Participants' characteristics were summarized using frequency and percentage. Wexner constipation score was summarized using frequency, percentage, mean and standard deviation. Wexner constipation data were scored using the algorithm provided by the instrument manual. To investigate correlations between Wexner constipation score and other variables under study, Spearman correlation was calculated ($p < 0.05$). To determine potential risk factors (predictors) that influence Wexner constipation score, multivariate regression model was used. Only significant correlated variables with this score from the correlation analysis were included in the multivariate regression model. In addition, the assumptions of multiple regression (multicollinearity outliers, normality, linearity, homoscedasticity, and independence of residuals) were tested. Lower variance inflation factor (VIF) values (≤2.5) was used to indicate that no multicollinearity problem was found.

Results

Table 1 summarizes the demographic characteristics of participants (n=939). The majority of participants (68.6%) were female and 60.8% were between 18-30 years old. About 59.5% of the participants had a bachelor university degree. More than half of participants (52.7%) were single, and 41.7% of the participants were students, 26.2% were non-employed, and 25.8% were employed.

Table 2, shows the majority of participants (85.5%) were non-smokers, 57.9% were doing some kind of exercises, and 35.1% of them were doing these exercises daily. In addition, the majority of participants (96.5%) eat foods that contain dietary fiber with different rates; 32.7% of them eat a small amount daily, whereas 29.9% of them eat these foods daily. Regarding to the number of water glasses or unsweetened fruit juice consumed per day, the results showed that 47% of participants consumed (1-3) cups and 31.7% consumed (4-6) cups. Moreover, 71.6% of participants go directly to the bathroom when they feel the urge to evacuate. Almost 64% of them did not face any reason that led to a clear change in their daily routine.
Table 3 demonstrates that 675 (71.9%) of participants did not use any medications identified in this table. However, 42% of participants who are using medications take iron supplements and 20.8% take antacids. In addition, 617 (65.7%) of participants did not suffer from any medical condition identified in Table 3. For those who are suffering from medical condition(s), 49.7% of them suffered from irritable bowel syndrome, and 25.8% of them suffered from Hemorrhoids.

According to the complications identified in this study, 55.6% of participants did not have any of these complications as shown in Table 4. On the other hand, 52.8% of participants who are suffering from complications identified "feeling incomplete after evacuation" as a major complication

they suffer. In addition, 32.9% and 31.9% of them suffered from hemorrhoids and anal fissure respectively as major complications. Table 4 also demonstrates that 75.5% of participants score (0-10), 23.2% score (11-10) and only 1.3% score (21-30). However, the mean score of participants in Wexner constipation was 7.15 with a standard deviation of 5.006. These results indicate that a low level of constipation was prevalent among participants.

To investigate the correlation between potential risk factors (demographic characteristics, behaviors related to constipation, clinical status and constipation complications) and scoring in Wexner constipation, Spearman correlation was calculated ($p < 0.05$). Regarding demographic characteristics, Table 5 showed that there were significant correlations between Wexner constipation score and age ($r=0.10$; $p<.01$), marital ($r=0.08$; $p<0.05$) and employment status ($r=0.20$; $p<0.01$). In addition, all behaviors identified in this study were significantly correlated with Wexner constipation score except the "number of water glasses or unsweetened fruit juice consumed per day". Having a reason that led to a clear change in daily routine was the higher correlated behavior with Wexner constipation score ($r=0.21$; $p<0.01$), followed by "smoking" ($r=0.19$; $p<0.01$) and "going to bathroom directly in case of urgent evacuation" ($r=-0.19$; $p<0.01$). Regarding clinical status variables; suffering from medical conditions ($r=0.41$; $p<0.01$) and use of medications ($r=0.28$; $p<0.01$) showed significant correlations with Wexner constipation score. For constipation complications; this variable showed a higher significant correlation with Wexner constipation score ($r=0.49$; $p<0.01$) compared to other variables under investigation. In addition, all constipation complications identified for this study showed significant correlations with Wexner constipation score. Hemorrhoids showed the higher value of correlation ($r=0.21$; $p<0.01$) with Wexner constipation score.

Table 6 shows the potential risk factors that influence the scoring in Wexner constipation. Only significant correlated variables with Wexner constipation from the correlation analysis (Table 5) were included in the multivariate regression model. Age, employment status, doing any kind of exercise and eating foods that contain dietary fiber did not account for a significant portion of the variance in Wexner constipation score ($p > 0.05$). However, marital status ($p <0.001$), smoking ($p = 0.042$), times of doing exercises ($p =0.039$), going to bathroom directly in case of urgent evacuation ($p <0.001$), having reason that led to a clear change in daily routine ($p <0.001$), use of medications ($p = 0.005$), suffering from medical conditions ($p <0.001$), and constipation complications ($p <0.001$) were significant risk factors (predictors) that influence the scoring in Wexner constipation. These eight risk factors explained 35.7% of variation in Wexner constipation score ($R2 = 0.357$). According to positive ß coefficient (= 0.124) for marital status, being widowed or divorced was associated with a significantly higher score in Wexner constipation than being single or married. In addition, smoker participants reported significantly higher scores in Wexner constipation than non-smokers. According to positive ß coefficient (= 0.086) for smoking, being smoker was associated with a significantly higher score in Wexner constipation than being non-smokers. Despite doing exercises was not a risk factor for a higher score in Wexner constipation, however times of doing these exercises was a significant risk factor. According to negative ß coefficient (= -0.116), doing exercises each day was associated with a lower score in Wexner constipation. Participants doing exercises less than once a week or a month reported a significantly higher score in Wexner constipation than participants who are doing exercises daily. The results also indicated that going to the bathroom directly in case of urgent evacuation was associated with Wexner constipation score. According to negative ß coefficient (= -0.135), participants who adhere to this behavior reported a significantly lower score in Wexner constipation than participants who did not take care of this behavior. On the other hand, having a reason that led to a clear change in daily routine was associated with Wexner constipation score. Positive ß coefficient (=0.116) for this variable indicating that participants who have reason that led to a clear change in their daily routine reported a higher score in Wexner constipation than participants who do not have a reason for such change. According to clinical status related variables, use of medications and suffering from medical conditions were associated with Wexner constipation score. Positive ß coefficients for both variables (=0.077 and 0.209 respectively) indicating that these two variables were associated with a higher score in Wexner constipation. For constipation complications, having these complications was associated with a higher score in Wexner constipation than the absence of them. Positive ß coefficient (= 0.305) indicating that participants having constipation complications reported a significantly higher score in Wexner constipation than participants who did not have these complications.

Finally, this study assessed the effect of difficulty in evacuation on participants' lifestyle. As shown from Table 7, 53.8% of participants reported no effect, 28.9% reported low effect, and 13.4% reported moderate effect while only 3.9% reported high effect.

Table 1. Demographic characteristics of study participants

Characteristics	*Frequency*	*Percent*
Sex		
Male	295	31.4
Female	644	68.6
Age		
18-30 years	571	60.8
31-40 years	167	17.8
41-50 years	145	15.4
51-60 years	39	4.2
> 60 years	17	1.8
Educational level		
Primary school	19	2
Middle school	28	3
Secondary school	202	21.5
Diploma	90	9.6
University (bachelor)	559	59.5
University (higher studies)	41	4.4
Marital status		
Single	495	52.7
Married	377	40.1
Divorced	48	5.1
Widowed	19	2
Employment status		
Non-employed	246	26.2
Students	392	41.7
Retired	59	6.3
Employed	242	25.8

Table 2. Participants' behaviors related to constipation

Behavior	*Frequency*	*Percent*
Do you smoke?		
yes	136	14.5
no	803	85.5
Are you doing any kind of exercises?		
yes	544	57.9
no	395	42.1
If yes, how often?		
once a month	57	10.5
once a week	119	21.9
3 times a week	177	32.5
daily	191	35.1
Do you eat foods that contain dietary fiber?		
no	33	3.5
Less than once a week	130	13.8
3-5 times a week	188	20
little amount daily	307	32.7
daily	281	29.9
How many total glasses of water or unsweetened fruit juice do you consume per day?		
1-3 cups	441	47
4-6 cups	298	31.7
7-8 cups	125	13.3
>8 cups	75	8
When you feel the urge to evacuate, do you go to the bathroom directly?		
yes	672	71.6
no	267	28.4
Do you have any reason that led to a clear change in your daily routine, such as (travel, marriage, pregnancy, a new job)?		
yes	337	35.9
no	602	64.1

Table 3. Participants' clinical status

Variables	*Frequency*	*Percent*
Do you use any of these medications?		
no	675	71.9
high blood pressure	68	25.8
iron supplement	111	42
antacids	55	20.8
opioids	31	11.7
non-steroidal anti-inflammatory drugs	30	11.4
calcium supplement	45	17
anti-Parkinson's disease medications	15	5.7
antipsychotics	30	11.4
anticonvulsants (anti-epileptics)	19	7.2
Do you suffer from any of these medical conditions?		
no	617	65.7
irritable bowel syndrome	160	49.7
diabetes	71	22
hypothyroidism	40	12.4
hemorrhoids	83	25.8
intestinal obstruction	18	5.6
colorectal cancer	25	7.8
lupus	11	3.4
multiple sclerosis	5	1.6
stroke	14	4.3
Parkinson's disease	5	1.6
spinal cord injury	12	3.7

Table 4. Participants' constipation complications and scoring in Wexner constipation

Variables	*Frequency*	*Percent*
Have you noticed that you have any of these complications?		
no	522	55.6
anal fissure	133	31.9
feeling incomplete after evacuation	220	52.8
rectal prolapse	36	8.6
hemorrhoids	137	32.9
hernia	38	9.1
scoring in Wexner constipation		
0-10	709	75.5
11-20	218	23.2
21-30	12	1.3
	mean	**S.D**
scoring in Wexner constipation	7.15	5.006

Table 5. Bivariate associations between study variables and scoring in Wexner constipation

Variables	*scoring in Wexner constipation*
Demographic	*r*
Sex	0.04
Age	0.10**
Educational level	-0.07
Marital status	0.08*
Employment status	0.20**
Behaviors related to constipation	
Smoking	0.19**
Doing any kind of exercises	-0.07*
Times of doing exercises	-0.10**
Eating foods that contain dietary fiber	-0.15**
Number of water glasses or unsweetened fruit juice consumed per day	-0.02
Going to bathroom directly in case of urgent evacuation	-0.19**
Having a reason that led to a clear change in daily routine	0.21**
Clinical status	
Use of medications	0.28**
Suffering from medical conditions	0.41**
Constipation complications (yes-no)	0.49**
anal fissure	0.14**
feeling incomplete after evacuation	0.13**
rectal prolapse	0.14**
hemorrhoids	0.21**
hernia	0.15**

**Significant at p≤0.01 *Significant at p≤0.05

Table 6. Multivariate model investigating risk factors of Wexner constipation score

Variables	Wexner constipation score		
Demographic			
	ß	t	*P*
Age	-0.052	-1.544	0.123
Marital status	0.124	3.659	*<0.001***
Employment status	0.026	0.951	0.342
Behaviors related to constipation			
Smoking	0.086	1.949	0.042*
Doing any kind of exercises	0.035	0.614	0.539
Times of doing exercises	-0.116	1.981	0.039*
Eating foods that contain dietary fiber	-0.038	-1.353	0.177
Going to bathroom directly in case of urgent evacuation	-0.135	-4.896	*<0.001***
Having a reason that led to a clear change in daily routine	0.116	3.872	*<0.001***
Clinical status			
Use of medications	0.077	2.784	.005**
Suffering from medical conditions	0.209	6.845	*<0.001***
Constipation complications	0.305	10.434	*<0.001***
R^2	0.357		
F(sig)	42.91 (*<0.001***)		

**Significant at p≤0.001 *Significant at p≤0.05

Table 7. Effect of difficulty in evacuation on participants' lifestyle.

	Frequency	*Percent*
Has the difficulty of evacuation affected your lifestyle?		
No	505	53.8
yes, with low effect	271	28.9
yes, with moderate effect	126	13.4
yes, with high effect	37	3.9

Discussion

Constipation is a frequent functional gastrointestinal disorder. Globally, the prevalence of constipation in the general population is nearly 20% while it varies from 2% to 27%, depending on the definition used and population studied [14, 15]. A cross sectional study showed that the cumulative incidence of chronic constipation is higher among the elderly (20%) compared to a younger population (3). Severe constipation is more reported among elderly women, with two to three times higher rates than that of their male counterparts [16-18].

The current study aimed to assess the prevalence of constipation and its associated complications in Aseer region, Saudi Arabia, by using the Wexner Constipation Scoring System and to assess the most significant risk factors contributing to constipation in Aseer region. The study showed that a low level of constipation was prevalent among participants where Wexner constipation was 7.15 with a standard deviation of 5.0. This low score which indicates low incidence and constipation severity was associated with reported daily life activities as more than half of the study participants do exercises, with one-third of them doing these exercises daily. In addition, the majority of participants (96.5%) eat foods that contain dietary fiber with different rates, while only one-third (32.7%) of them eat a little amount daily. As for water drinking, or unsweetened fruit juice consumed per day, the results showed that less than half of participants consumed 1-3 cups and one-third (31.7%) consumed 4-6 cups. Furthermore, about three-quarters (71.6%) of participants go directly to the bathroom when they feel the urge to evacuate. Almost 64% of them did not face any reason that led to a clear change in their daily routine. In India, a similar low prevalence of constipation was estimated where the prevalence of self-reported constipation within the last 1 year was 24.8% whereas 16.8% of participants had constipation according to the Rome II criteria [19]. A systematic review conducted by Schmidt FM et al [20], included 11 studies that revealed a prevalence of constipation that varied from 2.6% to 26.9%. The most frequently cited associated factors were female gender and advanced age, which were cited in 11 and 7 of the studies, respectively. Locally, a study conducted

in the central region population, Riyadh and Qassim provinces, Saudi Arabia [21], revealed that only 4.4% showed constipation clinical signs, whereas those whose result indicates no suffering from constipation represented 95.6%. Constipation is more prevalent among females (79.2%) than males (20.8%). Moreover, constipation is more severe among those who are between 20- and 35-years old.

Considering complications, the current study showed that feeling incomplete after evacuation" was a major complication. In addition, 32.9% and 31.9% of them suffered from hemorrhoids and anal fissure respectively as major complications. These findings were consistent with previously reported constipation related complications [22-24].

The study also showed that there were significant correlations between Wexner constipation score and age ($r=0.10$; $p<0.01$), marital ($r=0.08$; $p<0.05$) and employment status ($r=0.20$; $p<0.01$). In addition, all behaviors identified in this study were significantly correlated with Wexner constipation score except the "number of water glasses or unsweetened fruit juice consumed per day".

Conclusions and Recommendations

In conclusion, the current study showed that chronic constipation was not a common health problem among the study population with a higher severity score among old aged participants who were married and the working group. Since constipation is preventable and widely associated with risk factors, the decreasing of exposure to these risk factors contributes in prevention of developing constipation and of course its complications. Quitting smoking, daily exercise, controlling chronic diseases, eating plenty of foods with high fiber, fixation of routine as much as possible, are behaviors all strongly recommended, and significantly related to lower Wexner score i.e lower incidence of constipation. On the other hand, good dealing and management for constipation, and early intervention either in lifestyle modeling or in a pharmacological method will contribute to decreasing of developing constipation complications.

References

1. Forootan M, Bagheri N, Darvishi M. Chronic constipation: A review of literature. Medicine. 2018 May;97(20).
2. Pinto Sanchez MI, Bercik P. Epidemiology and burden of chronic constipation. Canadian Journal of Gastroenterology. 2011 Oct;25(B):11B-5B.
3. Talley NJ. Definitions, epidemiology, and impact of chronic constipation. Reviews in Gastroenterological Disorders. 2004 Jan 1;4: S3-10.
4. Alhusainy YA, Alhowaish NY, Alorabi HZ, Alsebti AA, AlJutaili HS, Tarakji AR, Tharkar S. Symptoms and prevalence of constipation among adult population of Riyadh city: an internet-based survey. The Egyptian Journal of Hospital Medicine. 2018 Jan 1;70(8):1317-22.
5. Bharucha AE, Lacy BE. Mechanisms, evaluation, and management of chronic constipation. Gastroenterology. 2020 Apr 1;158(5):1232-49.
6. Koch A, Voderholzer WA, Klauser AG, Müller-Lissner S. Symptoms in chronic constipation. Diseases of the colon & rectum. 1997 Aug;40(8):902-6.
7. Mertz H, Naliboff B, Mayer EA. Symptoms and physiology in severe chronic constipation. The American journal of gastroenterology. 1999 Jan 1;94(1):131-8.
8. Loening-Baucke V. Prevalence, symptoms and outcome of constipation in infants and toddlers. The Journal of pediatrics. 2005 Mar 1;146(3):359-63.
9. Ghoshal UC. Review of pathogenesis and management of constipation. Tropical Gastroenterology. 2008 Jun 27;28(3):91-5.
10. Gallo-Torres H, Brinker A, Avigan M. Alosetron: ischemic colitis and serious complications of constipation. Official journal of the American College of Gastroenterology| ACG. 2006 May 1;101(5):1080-3.
11. Norton C. Constipation in older patients: effects on quality of life. British Journal of Nursing. 2006 Feb 23;15(4):188-92.
12. Alessi CA, Henderson CT. Constipation and fecal impaction in the long-term care patient. Clinics in geriatric medicine. 1988 Aug 1;4(3):571-88.
13. Agachan F, Chen T, Pfeifer J, Reissman P, Wexner SD. A constipation scoring system to simplify evaluation and management of constipated patients. Diseases of the colon & rectum. 1996 Jun;39(6):681-5.
14. Higgins PD, Johanson JF. Epidemiology of constipation in North America: a systematic review. Am J Gastroenterol. 2004;99(4):750–759.
15. Bharucha AE, Pemberton JH, Locke GR. American Gastroenterological Association technical review on constipation. Gastroenterology. 2013;144(1):218–238.
16. Choung RS, Locke GR, Schleck CD, Zinsmeister AR, Talley NJ. Cumulative incidence of chronic constipation: a population-based study 1988–2003. Aliment Pharmacol Ther. 2007;26(11–12):1521–1528.
17. Talley NJ, Fleming KC, Evans JM, et al. Constipation in an elderly community: a study of prevalence and potential risk factors. Am J Gastroenterol. 1996;91(1):19–25.
18. Wald A, Scarpignato C, Mueller-Lissner S, et al. A multinational survey of prevalence and patterns of laxative use among adults with self-defined constipation. Aliment Pharmacol Ther. 2008;28(7):917–930.
19. Rajput M, Saini SK. Prevalence of constipation among the general population: a community-based survey from India. Gastroenterology Nursing. 2014 Nov 1;37(6):425-9.
20. Schmidt FM, de Gouveia Santos VL. Prevalence of constipation in the general adult population: an integrative review. Journal of Wound Ostomy & Continence Nursing. 2014 Jan 1;41(1):70-6.
21. Alhassan M, Alhassan A, Alfarhood A, Alotaibi K, Alrashidy N, Alshalhoub K, Almeshal M. Prevalence of constipation among central region population, Riyadh and Qassim provinces, Saudi Arabia, 2018-2019. Journal of Family Medicine and Primary Care. 2019 Feb;8(2):673.

22. Motta ME, Silva GA. Signs and symptoms associated with chronic constipation. J Pediatr (Rio J). 2000 May 1;76(3):222-6.
23. Pekmezaris R, Aversa L, Wolf-Klein G, Cedarbaum J, Reid-Durant M. The cost of chronic constipation. Journal of the American Medical Directors Association. 2002 Jul 1;3(4):224-8.
24. Gray JR. What is chronic constipation? Definition and diagnosis. Canadian journal of gastroenterology. 2011 Oct 1;25(Suppl B):7B-10B.

Association Between Blood Donation and Improved Sleep Quality Among Blood Donors in Aseer Region

Mohammed Abdulrahman Alshibli [1], Zayed Mofareh Ahmed Asiri [2], Ghanem Ahmed Mohammed Al Ghanem [2], Musaad Abdulrahman M Al Shibli [3], Naif Mohammed Alotaibi [3], Saeed Abdullah Saeed Alasmari [4], Abdullah Safar Saeed Al safar [4], Bader Saad S Alshahrani [3], Nada Hamzah Albarqi [5], Naif Sultan S Alqahtani [5], Abdulrhman Abdullah Ali Mansour [5]

(1) Family Medicine Consultant, MOH, Saudi Arabia
(2) General Practice – Prince Faisal Bin Khalid Cardiac Center Aseer PFKCC
(3) Medical intern
(4) General practice
(5) Medical student

Correspondence:
Shehata Farag Shehata
Lecturer of Biostatistics
High Institute of Public health
Alexandria University
Email: shehatafarag@yahoo.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Mohammed Abdulrahman Alshibli et al. Association Between Blood Donation and Improved Sleep Quality Among Blood Donors in Aseer Region. World Family Medicine. 2022; 20(11): 100-108. DOI: 10.5742/MEWFM.2022.95251366

Abstract

Background: High altitude like Aseer region has many challenges, where exposure to hypoxia is the most reported challenge. The ambient hypoxia activates a number of physiologic consequences including hyperventilation, increased resting heart rate and stimulation of erythrocyte production with the goal of preserving the oxygen content of arterial blood at or above sea level values.

Aim: The current study aims to assess the association between blood donation and improved sleep quality among blood donors in Aseer Region, southern of Saudi Arabia.

Methods: A cross-sectional study was carried out using self-administered questionnaire during the period from May to August 2022 targeting all Saudi population aged 18 years or more living in Aseer region. The study questionnaire was uploaded online using social media platforms by the researchers and their colleagues till no more answers were obtained. The study questionnaire included participants' personal data, medical history, blood donation data including frequency, causes and associated symptoms. Sleep quality was assessed using Pittsburgh Sleep Quality Index (PSQI).

Results: A total of 447 participants fulfilling the inclusion criteria completed the study questionnaire. Participants ages ranged from 18 to 60 years with mean age of 26.9 ± 12.7 years old. A total of 215 (48.1%) participants reported donating blood which was only once among 68 (31.6%), and 2-3 times among 82 (38.1%). Regarding overall sleep quality among blood donors in Aseer region, Saudi Arabia, exactly 116 (54%) of the study participants with blood donation history were poor sleepers while 99 (46%) were good sleepers. Better sleep quality was significantly associated with more frequent blood donation times.

Conclusion: In conclusion, the current study showed that sleep quality among Aseer residents after blood donation was much lower than reported incidence especially among participants who donated blood more than once. Also, the attitude toward blood donation was good where nearly 1 out of each 2 participants donated blood for moral issues.

Key words
Blood donation, sleep hygiene, relation, Aseer region, high altitude

Introduction

Sleep disturbance is a frequent and mostly underestimated complaint in the general population [1], which can persist over many years [2] and which is associated with many health problems, higher functional impairment, lost productivity, and excess health care utilization [3-5]. It a challenge to treat sleep-related problems with limited abilities [6], though, insomnia can be a symptom of other conditions, such as depression [7], substance abuse [8], and sleep disordered breathing [9]. Currently, the term "primary insomnia" is used to define insomnia in the absence of such conditions [10].

High altitude areas like Aseer region have many challenges, where exposure to hypoxia is the most reported challenge [11]. The ambient hypoxia activates a number of physiologic consequences including hyperventilation, increased resting heart rate and stimulation of erythrocyte production with the goal of preserving the oxygen content of arterial blood at or above sea level values [12]. In permanent high-altitude residents due to exposure to chronic hypoxia, an increase in erythrocyte numbers and hemoglobin concentration is reported [13].

In the current study, researchers tried to link the effect of blood donation on the sleep quality of high-altitude residents. Blood donation is life saving and has a lot of benefit for the donor and recipient especially in life saving condition and trauma settings. For example Health services could not operate without a continual supply of blood. For management of diseases such as sickle cell and thalassemia however some research reports negative and positive effects of blood donation on the donor. Some of the negative effects include long-term iron deficiency anemia while on the other hand some blood donation positive effects include reduced mortality and reduced risk of myocardial infarction [14-16].

Methodology

A cross-sectional study was carried out using self-administered questionnaire during the period from May to August 2022targeting all Saudi population aged 18 years or more living in Aseer region for at least 6 months. The study questionnaire was developed by the researchers after intensive literature review and experts' consultation. A panel of 3 experts at King Khalid University reviewed the study questionnaire and all suggested modifications were applied. The ultimate questionnaire was uploaded online using social media platforms by the researchers and their colleagues till no more answers were obtained. Participants with a history of mental illness, neurologic diseases and less than 18 years were excluded. The study questionnaire included participants' personal data, medical history, blood donation data including frequency, causes and associated symptoms. Sleep quality was assessed using Pittsburgh Sleep Quality Index (PSQI) and other questions related to sleep quality [17]. A pilot study of 30 persons was used to assess the questionnaire reliability with estimated α-Cronbach's of 0.81.

Data analysis

After data was extracted, it was revised, coded, and fed to statistical software IBM SPSS version 22(SPSS, Inc. Chicago, IL). All statistical analysis was done using two tailed tests. P value less than 0.05 was statistically significant. Descriptive analysis based on frequency and percent distribution was done for all variables including participants personal data, medical data, blood donation and associated symptoms. The global score for PSQI was obtained by summing up all items' discrete scores of its seven "component" scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of scores for these seven components yields one global score. In scoring the PSQI, seven component scores are derived, each scored 0 (no difficulty) to 3 (severe difficulty). The component scores are summed to produce a global score (range 0 to 21). Higher scores indicate worse sleep quality. Tool reliability was assessed using alpha Cronbach's coefficient which reflects the tool internal consistency. Internal consistency reliability of 0.7 or more is judged good [14]. Total score was categorized at cut off point 7 as those who had a global score of 7 points or less were considered to have good sleep quality (good sleepers) while others with a global score of more than 7 points were considered to have moderate to poor sleep quality (poor sleepers). Crosstabulation was used to assess distribution of blood donors' sleep quality by their personal and other related data. Significance of relations in cross tabulation was tested using Pearson chi-square test and exact probability test for small frequency distributions.

Results

A total of 447 participants fulfilling the inclusion criteria completed the study questionnaire. Participants' ages ranged from 18 to 60 years with mean age of 26.9 ± 12.7 years old. A total of 337 (75.4%) participants were males and 327 (73.2%) were in the city. Exactly 291 (65.1%) were single / divorced. As for educational level, 375 (83.9%) had university level of education or above. A total of 210 (47%) were health care professionals and 341 (76.3%) were non-smokers while 85 (19%) were current smokers. Exactly 55 (12.3%) complained of a chronic health problem (Table 1).

Table 1. Bio-demographic data of study participants, Aseer region, Saudi Arabia

Bio-demographic data	No	%
Age in years		
< 30	302	67.6%
30-39	71	15.9%
40+	74	16.6%
Gender		
Male	337	75.4%
Female	110	24.6%
Living in		
City	327	73.2%
Village	120	26.8%
Marital status		
Unmarried	291	65.1%
Married	156	34.9%
Educational level		
Secondary / below	72	16.1%
University/ above	375	83.9%
Career		
Health care worker	210	47.0%
Non-health care worker	237	53.0%
Smoking		
Current smoker	85	19.0%
Non-smoker	341	76.3%
Ex-smoker	21	4.7%
Do you suffer from any chronic disease?		
Yes	55	12.3%
No	392	87.7%

Table 2. Blood donation data among study participants, Aseer region, Saudi Arabia.

Blood donation data	No	%
Have you ever donated blood?		
Yes	215	48.1%
No	232	51.9%
If Yes how many times? (n=215)		
Once	68	31.6%
2-3	82	38.1%
4-5	23	10.7%
> 5	42	19.5%
If you donated more than once. How many times have you donated blood in last year?		
Once	59	40.1%
2 times	21	14.3%
3 times	7	4.8%
4+	60	40.8%
Why have you donated blood (n=215)		
Voluntary	148	68.8%
Humanity duty	98	45.6%
For my health	78	36.3%
For family and friends	50	23.3%
National duty	49	22.8%
I have rare blood type	15	7.0%
Symptoms after blood donation (n=215)		
None	161	74.9%
Dizziness	42	19.5%
Nausea	11	5.1%
Sweating	10	4.7%
Weakness	8	3.7%
Discomfort	7	3.3%
Fainting	6	2.8%
Pallor	6	2.8%
Bruising	6	2.8%
Vomiting	4	1.9%

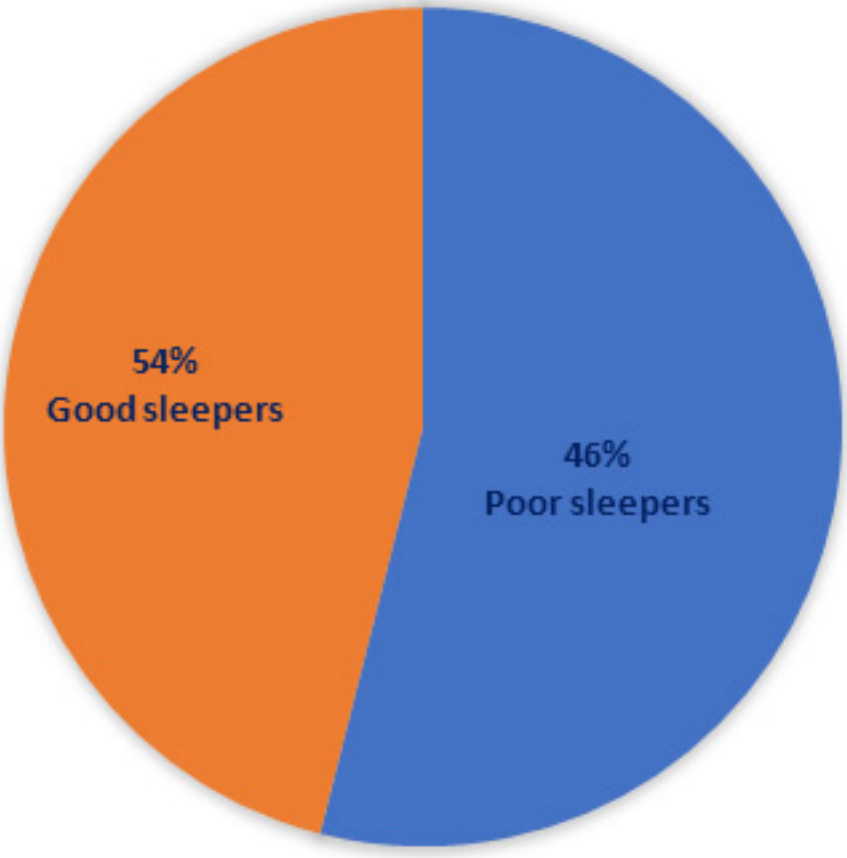
A total of 215 (48.1%) participants reported donating blood which was for only once among 68 (31.6%), 2-3 times among 82 (38.1%) and more than 5 times among 42 (19.5%). As for reported reasons for blood donation, the most reported were voluntary donation (68.8%), for humanity duty (45.6%), for health issue (36.3%), for family / friends (23.3%) while 7% donate as they had a rare blood group. A total of 19.5% of the blood donors felt dizziness after donation while nausea was reported among 5.1% and sweating among 4.7% while 161 (74.9%) had no associated symptoms.

Table 3. Blood intake among study participants, Aseer region, Saudi Arabia.

Blood intake	No	%
Did you receive blood before?		
Yes	35	7.8%
No	412	92.2%
If yes, why?		
Surgery	24	68.6%
Severe iron deficiency anemia	8	22.9%
Other blood disease	1	2.9%
Hemorrhage	2	5.7%

A total of 35 (7.8%) participants reported previously having a blood transfusion. The main reported causes were surgery (68.6%), severe iron deficiency anemia (22.9%), other blood diseases (2.9%), and hemorrhage (5.7%).

Figure 1. Overall sleep quality among blood donors in Aseer region, Saudi Arabia



Overall sleep quality among blood donors in Aseer region, Saudi Arabia. Exactly 116 (54%) of the study participants with blood donation history were poor sleepers while 99 (46%) were good sleepers.

Table 4. Sleep quality components among study participants who donated blood, Aseer region, Saudi Arabia.

Sleep quality components (n=215)	No	%
Subjective sleep quality		
Very good	67	31.2%
Fairly good	105	48.8%
Fairly bad	31	14.4%
Very bad	12	5.6%
Sleep latency		
Very good	50	23.3%
Fairly good	86	40.0%
Fairly bad	53	24.7%
Very bad	26	12.1%
Sleep duration		
> 7 hours	28	13.0%
6-7 hours	148	68.8%
5-6 hours	31	14.4%
< 5 hours	8	3.7%
Habitual sleep efficiency		
> 85%	37	17.2%
75-84%	139	64.7%
65-74%	27	12.6%
< 65%	12	5.6%
Sleep disturbances		
Very low	54	25.1%
Fairly low	116	54.0%
Fairly high	39	18.1%
Very high	6	2.8%
Use of sleeping medication		
Not during donation	173	80.5%
Less than once	24	11.2%
Once or twice	11	5.1%
Three or more times	7	3.3%
Daytime dysfunction		
Very low	99	46.0%
Fairly low	80	37.2%
Fairly high	30	14.0%
Very high	6	2.8%

Regarding subjective sleep quality, it was bad among 20% of the study patients . Sleep latency was also bad among 36.8% of the donors, and only 13% sleep more than 7 hours. Habitual sleep efficiency was less than 85% among 82.8% of the study participants and 20.9% had high sleep disturbance score with 16.8% having high level of daytime dysfunction. Global PSQI score ranged from 0-17 with mean score of 6.4 ± 3.5 points.

Table 5. Factors associated with sleep quality among blood donors in Aseer region, Saudi Arabia

Factors	Sleep hygiene				p-value
	Poor sleepers		Good sleepers		
	No	%	No	%	
Age in years					
< 30	67	54.0%	57	46.0%	.134
30-39	29	64.4%	16	35.6%	
40+	20	43.5%	26	56.5%	
Gender					
Male	106	53.3%	93	46.7%	.476
Female	10	62.5%	6	37.5%	
Living in					
City	81	50.3%	80	49.7%	.049*
Village	35	64.8%	19	35.2%	
Marital status					
Unmarried	68	54.8%	56	45.2%	.761
Married	48	52.7%	43	47.3%	
Educational level					
Secondary / below	19	50.0%	19	50.0%	.590
University/ above	97	54.8%	80	45.2%	
Career					
Health care worker	52	57.1%	39	42.9%	.422
Non-health care worker	64	51.6%	60	48.4%	
Smoking					
Current smoker	40	61.5%	25	38.5%	.321
Non-smoker	70	51.1%	67	48.9%	
Ex-smoker	6	46.2%	7	53.8%	
Do you suffer from any chronic disease?					.373
Yes	15	62.5%	9	37.5%	
No	101	52.9%	90	47.1%	
If Yes how many times?					
Once	61	89.7%	7	10.3%	
2-3	55	67.1%	27	32.9%	.001*
4-5	0	0.0%	23	100.0%	
> 5	0	0.0%	42	100.0%	
If you donated more than once. How many times have you donated blood in last year?					
Once	21	35.6%	38	64.4%	.047*$
2 times	4	19.0%	17	81.0%	
3 times	1	14.3%	6	85.7%	
4+	29	48.3%	31	51.7%	
Did you receive blood before?					.994
Yes	7	53.8%	6	46.2%	
No	109	54.0%	93	46.0%	

Exactly 49.7% of blood donors who live in the city had good sleep quality after donation compared to 35.2% of others who live in a village with reported statistical significance (P=.049). Also, all donors who donated blood for 4 times or more were good sleepers versus 10.3% of others who donated once (P=.001). Additionally, 85.7% of those who donated blood 3 times during the last year were good sleepers in comparison to 64.4% of others who donated only once (P=.047).

Discussion

Residents at high altitude regularly experience sleep disturbances, frequently reporting restless and sleepless nights. Others experience a feeling of suffocation on awakening from sleep. Subjective reports have shown poor sleep as altitude increases, signifying an inverse relationship between sleeping at altitude and sleep quality [18, 19]. A characteristic waxing and waning breathing pattern known as periodic breathing accompanies sleep at high altitude. Periodic breathing during sleep was first described by Mosso in 1886 [20, 21] with further observations a few years later by Douglas and colleagues [22, 23]. This article will review high altitude sleep, focusing on sleep architecture, sleep continuity, arterial oxygen saturation, and on periodic breathing during sleep.

Recently, blood donor health care has been a major concern. It is vital to maintain a healthy, satisfied, and reliable donor population and is consequently highly ranked in blood bank settings globally. Adverse effects such as dizziness, fatigue, and vasovagal reactions are proven causes of donor deferral and therefore, are still of high focus and attention to health care authorities [24, 25]. The focus on adverse effects and how to avoid them have led to the implementation of standard procedures to limit negative side effects of donation worldwide [26, 27].

The current study aimed to assess the association between blood donation and improved sleep quality among blood donors in Aseer Region, southern Saudi Arabia. The study results showed that nearly half of the study participants donated blood mainly 1 to 3 times while some cases donated blood more than 5 times. The main reasons were moral issues including voluntary donation, humanity, families and friends' need but also about one third of the donors did it for their own health. Gader AG et al [28] assessed that 91% of Saudi participants agree that blood donation is a religious obligation, 34% do not object to donating six times/year and 67% did not mind coming to the donor center to give blood.

Non-donors: Forty-six percent were not asked to give blood and those who were asked mentioned fear (5%) and lack of time (16%) as their main deterrents. On the other hand, a study in Nigeria [29] estimated that 20.3% of the study population would not donate blood, and curiously enough, will not accept blood transfusion due mainly to religious beliefs; a situation reminiscent of the behavior of Jehovah's witnesses [30, 31].

Regarding sleep quality after blood donation, the current study showed that more than half of the donors were poor sleepers, which was improved among those who were living in city, mostly due to better quality of life and among those who donated for more than once which means more frequent blood donation was significantly associated with better sleep quality. Ahmed AE et al [32] reported that 33.8% of Saudi adults reported short sleep duration of less than 7 hours/night. Short sleep duration was more prevalent in females (37.3% versus 31.4%, p=0.004). A higher incidence regarding poor sleep quality among Aseer residents was reported by Alhayyani RM et al [33] where 85.1% of Saudi commission residents had poor sleep quality.

Conclusion and Recommendations

In conclusion, the current study showed that sleep quality among Aseer residents after blood donation was much lower than the reported incidence especially among participants who donated blood more than once. Also, the attitude toward blood donation was good where nearly 1 out of each 2 participants donated blood for moral issues rather than emergency or due to others' need. Public encouragement and motivation towards blood donation is mandatory especially in high altitude residents, to improve their daily life and to promote health related consequences. This can be achieved through health education sessions and through health care providers who can declare the benefits and risks of blood donation.

References

1. Freeman D, Sheaves B, Waite F, Harvey AG, Harrison PJ. Sleep disturbance and psychiatric disorders. The Lancet Psychiatry. 2020 Jul 1;7(7):628-37.
2. Fuligni AJ, Chiang JJ, Tottenham N. Sleep disturbance and the long-term impact of early adversity. Neuroscience & Biobehavioral Reviews. 2021 Jul 1; 126:304-13.
3. Krystal AD, Thakur M, Roth T. Sleep disturbance in psychiatric disorders: effects on function and quality of life in mood disorders, alcoholism, and schizophrenia. Annals of Clinical Psychiatry. 2008 Jan 1;20(1):39-46.
4. Ishibashi Y, Shimura A. Association between work productivity and sleep health: a cross-sectional study in Japan. Sleep health. 2020 Jun 1;6(3):270-6.
5. Simon GE, VonKorff M. Prevalence, burden, and treatment of insomnia in primary care. American journal of psychiatry. 1997 Oct 27;154(10):1417-23.
6. Bailey GA, Hubbard EK, Fasano A, Tijssen MA, Lynch T, Anderson KN, Peall KJ. Sleep disturbance in movement disorders: insights, treatments and challenges. Journal of Neurology, Neurosurgery & Psychiatry. 2021 Jul 1;92(7):723-36.
7. Nyer M, Farabaugh A, Fehling K, Soskin D, Holt D, Papakostas GI, Pedrelli P, Fava M, Pisoni A, Vitolo O, Mischoulon D. Relationship between sleep disturbance and depression, anxiety, and functioning in college students. Depression and anxiety. 2013 Sep;30(9):873-80.
8. Roehrs TA, Roth T. Sleep disturbance in substance use disorders. Psychiatric Clinics. 2015 Dec 1;38(4):793-803.
9. Chu G, Choi P, McDonald VM. Sleep disturbance and sleep-disordered breathing in hemodialysis patients. In Seminars in Dialysis. 2018 Jan; 31 (1): . 48-58.
10. Straus LD, Drummond SP, Nappi CM, Jenkins MM, Norman SB. Sleep variability in military-related PTSD: A comparison to primary insomnia and healthy controls. Journal of traumatic stress. 2015 Feb;28(1):8-16.

11. Burtscher M, Gatterer H, Burtscher J, Mairbäurl H. Extreme terrestrial environments: life in thermal stress and hypoxia. a narrative review. Frontiers in Physiology. 2018:572.
12. West JB. The physiologic basis of high-altitude diseases. Annals of internal medicine. 2004 Nov 16;141(10):789-800.
13. León-Velarde F, Gamboa A, Chuquiza JA, Esteba WA, Rivera-Chira M, Monge C C. Hematological parameters in high altitude residents living at 4355, 4660, and 5500 meters above sea level. High altitude medicine & biology. 2000 Jun 1;1(2):97-104.
14. Meyers DG, Strickland D, Maloley PA, Seburg JK, Wilson JE, McManus BF. Possible association of a reduction in cardiovascular events with blood donation. Heart. 1997 Aug 1;78(2):188-93.
15. Meyers DG, Strickland D, Maloley PA, Seburg JK, Wilson JE, McManus BF. Possible association of a reduction in cardiovascular events with blood donation. Heart. 1997 Aug 1;78(2):188-93.
16. Atsma F, de Vegt F. The healthy donor effect: a matter of selection bias and confounding. Transfusion. 2011 Sep;51(9):1883-5.
17. Buysse DJ, Reynolds III CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry research. 1989 May 1;28(2):193-213.
18. Weil JV. Sleep at high altitude. High altitude medicine & biology. 2004 May 1;5(2):180-9.
19. Ainslie PN, Lucas SJ, Burgess KR. Breathing and sleep at high altitude. Respiratory physiology & neurobiology. 2013 Sep 15;188(3):233-56.
20. Mosso A. La respiration periodique et la respiration superflue ou de luxe. Arch Ital Biol. 1886; 7:48–127.
21. Mosso A. Life of Man on the High Alps. London: T. Fisher Un-win,1898.
22. Douglas CG, Haldane JS. The causes of periodic or Cheyne-Stokes breathing. J Physiol. 1909; 38:401–419.
23. Douglas CG, Haldane JS, Henderson Y, Schneider EC. Physio-logical observations made on Pike's Peak, Colorado, with special reference to adaptation to low barometric pressures. Philos Trans Roy Soc Lond Ser. B. 1913; 203:185–318.
24. Newman BH, Newman DT, Ahmad R, et al. The effect of whole-blood donor adverse events on blood donor return rates. Transfusion. 2006; 46:1374-9.
25. van Dongen A. Easy come, easy go. Retention of blood donors. Transfus Med. 2015;25:227-33.
26. Hanson SA, France CR. Predonation water ingestion attenuates negative reactions to blood donation. Transfusion. 2004; 44:924-8.
27. Wieling W, France CR, van Dijk N, et al. Physiologic strategies to prevent fainting responses during or after whole blood donation. Transfusion. 2011; 51:2727-38.
28. Gader AG, Osman AM, Al Gahtani FH, Farghali MN, Ramadan AH, Al-Momen AK. Attitude to blood donation in Saudi Arabia. Asian journal of transfusion science. 2011 Jul;5(2):121.
29. Okpara RA. Attitudes of Nigerians towards blood donation and blood transfusion. Trop Geogr Med. 1989; 41:89–93.
30. Rosengart TK, Helm RE, DeBois WJ, Garcia N, Krieger KH, Isom OW. Open heart operations without transfusion using multimodality blood conservation strategy in 50 Jehovah's Witness patients: Implications for a "bloodless" surgical technique. J Am Coll Surg. 1997; 184:618–29.
31. Mann MC, Votto J, Kambe J, McNamee MJ. Management of the severely anemic patient who refuses transfusion: Lessons learned during the care of a Jehovah's Witness. Ann Intern Med. 1992; 117:1042–8.
32. Ahmed AE, Al-Jahdali F, AlALwan A, Abuabat F, Salih SB, Al-Harbi A, Baharoon S, Khan M, Ali YZ, Al-Jahdali H. Prevalence of sleep duration among Saudi adults. Saudi medical journal. 2017 Mar;38(3):276.
33. Alhayyani RM, Qassem MY, Alhayyani AM, Al-Garni AM, Raffaa HS, Al Qarni HZ, Alhumayed RS, Assiri YM, Alshahrany AM, Alfayi BA, Asiri FY. Sleep patterns and predictors of poor sleep quality among Saudi commission residents in the Aseer region, Saudi Arabia before and during covid-19 pandemic. Journal of Family Medicine and Primary Care. 2022 Jun 1;11(6):2768-73.

Parental awareness of pediatric foreign body aspiration in Taif city, Saudi Arabia

Badr S. Alam [1], Mohammed Althomali [1], Amjad Jawhari [1], Khalid Faraj [1], Abdulaziz Alghuraibi [1], Abdulrahman Alsubaie [1], Sattam Aljuaid [2]

(1) College of Medicine, Taif University, Al-Taif 21944, Saudi Arabia.
(2) Department of Surgery, Prince Mansour Military Hospital, Taif 26523, Saudi Arabia.

Corresponding Author
Mohammed Abdullah Althomali
College of Medicine, Taif University, Al-Taif 21944, Saudi Arabi
Contact: +966 5566 80 356
Email: Moha.Thomali@gmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Badr S. Alam et al. Parental awareness of pediatric foreign body aspiration in Taif city, Saudi Arabia. World Family Medicine. 2022; 20(11): 109-120. DOI: 10.5742/MEWFM.2022.95251367

Abstract

Background: With an overall mortality rate of about 5-7%, foreign body aspiration is a prevalent cause of illness and mortality in children. Studies on aspirated foreign bodies in kids in the Makkah region of Saudi Arabia are nonexistent.

Objectives: The aim of this study was to evaluate parental awareness of pediatric FBA in Taif, Saudi Arabia.

Methods: This descriptive, cross-sectional study included interviewing participants and prompting them to fill in a questionnaire. The data obtained was analyzed using SPSS.

Results: A total of 424 individuals (parents) who participated in this study were divided into the following three study groups: illiterate, undergraduate, and postgraduates. All groups exhibited inadequate overall knowledge of pediatric FBA, with a knowledge score of 67%. Furthermore, a significant association was observed between educational background and knowledge about pediatric FBA (p-value= 0.039); postgraduate participants scored higher than those in the undergraduate group.

Conclusion: A significant number of parents exhibit low knowledge about pediatric FBA. However, most parents were aware of FBA management and prevention. We recommend that parents must be informed about the risks associated with pediatric FBA using several media platforms.

Keywords: Parental, awareness, pediatric, FBA, Taif, Saudi

Introduction

Pediatric foreign body aspiration (FBA) is defined as the suffocation, asphyxiation, or inhalation of a solid matter by a child, that is retained in the upper or lower respiratory tract, particularly in the bronchi, trachea, larynx, or glottis (1).

FBA, a serious condition resulting in total or partial obstruction of the airway, affects children more than adults and adolescents, with a higher prevalence between the ages of one and three years (2). Reports suggest that children are highly prone to aspirating foreign bodies, because of the lack of molar teeth, inadequate swallowing-muscle control, and propensity to simultaneously speak and play while eating (3). However, the primary determinant of FBA was the lack of parental awareness of the risks associated with feeding small organic food items to preschoolers (4).

FBA is a common cause of morbidity and mortality in children, with an overall mortality rate of approximately 5–7%. Although anoxic brain injury and pulmonary hemorrhage are the principal and secondary cause of mortality in children, (5) FBA is the leading cause of unexpected death among infants under the age of one year (2). Moreover, FBA is the fifth most prevalent cause of accidental deaths in children aged 1–3 years, with complications presenting in 14.6–27.8% of patients (2)
.
The most common complications that occur with FBA include respiratory distress, recurrent pneumonia, pulmonary abscess, and neurologic impairment (2,5), with anoxic brain damage occurring in 2.2% of patients (1). The presentation of non-specific symptoms and lack of testimony of the aspiration incident are the factors that contribute to delayed diagnosis (6). Delay in symptom presentation, diagnosis, and treatment has been linked to increased likelihood of significant consequences (2). Additionally, diagnosis becomes complicated when there is no report of an aspiration event. The majority of signs and symptoms are nonspecific and might diminish rapidly. Only few cases report the classic triad of cough, choking, and unilateral wheezing or diminished breath sounds, whereas other patients may be asymptomatic (2). Therefore, effective measures should be determined to prevent aspiration or to allow early diagnosis and treatment (7,.8). Although flexible bronchoscopy is highly helpful under certain circumstances, rigid bronchoscopy with forceps is the gold standard for FBA treatment (7).

There have been no studies on aspirated foreign bodies in children in the Makkah region of Saudi Arabia. Therefore, this study was conducted to address the high mortality rate and severity of complications associated with FBA resulting from a lack of awareness of pediatric FBA in parents. The objective of this study was to evaluate parental awareness of pediatric FBA in Taif, Saudi Arabia.

Subjects and Methods

Study design, setting and time: This was a descriptive cross-sectional study done at Taif city in the Makkah Province of western Saudi Arabia in the time from May to August 2022. Taif city has a surface area of 13,840 km2 and altitude of 1,700–2,500 m asl; the estimated population of Taif was 993,800, according to the census of 1435 (Hijri date) (9).

Study participants: the study included parents with children ≤3 years of age. We excluded unmarried participants, married participants who did not have children, and parents with children >3 years of age. The participants were interviewed in person and prompted to fill-out a questionnaire.

Sample size: To estimate the size of the sample size, the following formula was used:
$SS = Z2 \times P \times (1 - P)/ e2$
where SS = sample size; Z = 1.96 (at 95% confidence level); P = "best estimation" of prevalence (size of affected population); e = margin of error, which was 5% (at 95% confidence level). Assuming the size of affected population was 50% (P) at 95% confidence interval (Z = 1.96) with a margin of error of 5% (e), the minimum representative sample comprised 385 individuals. The sample size was increased by 10% to 424 to compensate for non-responses.

Data collection: The participants were interviewed personally and prompted to fill-out a pretested Arabic questionnaire. Patients and auditors from two medical centers in Taif, including Prince Mansour Military Hospital and Alhada Armed Forces Hospital were surveyed from May to June 2022. The participants belonged to several departments, including maternity, pediatric, and vaccination departments; clinics, including ENT, pediatric, and family clinics; and waiting rooms. Finally, we ensured that all participants met the inclusion criteria and eliminated participants who met the exclusion criteria. To further ensure that all the participants were inhabitants of Taif, we determined their place of living.

A pretested Arabic questionnaire was used that was originally developed in English and used in a previous study conducted in Saudi Arabia [10]. The questionnaire was composed of two sections. The first section was designed to collate demographic data, including age, gender, educational background, number of children, age of each child, and any previous history of FBA within the family. The second section comprised 15 close-ended questions regarding parental awareness, clinical symptoms, management, and prevention of FBA.

Prior consent was obtained from the participants before the survey. After obtaining consent and ethical approval from Alhada Armed Forces Hospital, we interviewed the participants and prompted them to fill-out the 4 minute long questionnaire. The participants were instructed to avoid questioning the interviewee to prevent bias in their

responses. The participants were also ensured that the information provided as part of the survey would be used solely for research purposes. Furthermore, participants were not paid and were informed of their discretion to refuse to answer uncomfortable questions.

Pilot study: A pilot study was conducted on 10% of the total sample size to verify that the target group understood the questionnaire and provided suitable responses. However, the results of the pilot study were not included in the data analysis of the present study.

Data analysis: data was verified for completeness and ensured that all participants conformed to the inclusion criteria. Responses were first categorized based on the gender, educational background, awareness, and level of knowledge of the participants, and then analyzed using the software Statistical Package for the Social Sciences (SPSS version 23). Subsequently, results were tabulated and presented graphically.

Results

The 424 participants included in the study were categorized into the following three groups: 271 (63.9%) constituted the postgraduate group, 137 (32.3%) comprised the undergraduate group, and 16 (3.8%) represented the illiterate group. The mean age ± standard deviation (SD) of the participants was 34.6 ± 7.5 years, with 33.3 ± 6.7 years, 36.6 ± 7.9 years, and 39.7 ± 11.9 years being the mean age ± SD of the postgraduate, undergraduate, and illiterate groups, respectively. A total of 262 (61.8%) participants were females and 162 (38.2%) were males. The number of participants with one, two, three, four, five, and six children were 105 (24.8%), 105 (24.8%), 85 (20%), 61 (14.4%), 43 (10.1%), and 25 (5.9%), respectively.

The youngest child of 171 (40.3%) participants was younger than one-year-old, and 5 (1.2%) participants had a one-year-old second child. The number of parents with youngest, second, and third child aged 1–2 years was 142 (33.5%) and 29 (6.8%), and 2 (0.5%), respectively. Approximately 111 (26.2%), 59 (13.9%), 9 (2.1%), and 1 (0.2%) participants had 2–3-year-old their youngest, second, third, and fourth child, respectively. The number of participants with second, third, fourth, fifth, and sixth child aged >3 years was 226 (53.3%), 203 (47.9%), 128 (30.2%), 68 (16%), and 26 (6.1%), respectively.

Table 1: Age of children of the participants: Approximately 20.5% of the participants reported a history of pediatric FBA, whereas 79.5% of the participants did not encounter pediatric FBA. Furthermore, 24.1%, 21.8%, 21.8%, 12.6%, and 9.2% participants reported that they had a son, father, mother, sister, or daughter with a history of FBA, respectively.

Figure 1: Relationship of the participants with FBA patients: Participants exhibited inadequate knowledge of pediatric FBA, with a knowledge score of 67%. The results of data analysis suggested that 75% illiterate, 66% undergraduate, and 76% postgraduate participants considered that peanuts could result in pediatric FBA. Moreover, the overall knowledge of the participants regarding the cause of pediatric FBA was inadequate, with a knowledge of 72%. Additionally, 75% illiterate, 69% undergraduate, and 75% postgraduate participants agreed with the statement, FBA is most frequently observed in children of ages 0–2 years, indicating inadequate overall knowledge of the epidemiology of pediatric FBA, with a score of 73%.

With an overall knowledge score of 69%, 63% illiterate, 72% undergraduate, and 71% postgraduate participants were in agreement with the statement, Peanuts should not be given to children < 3 years of age. Furthermore, 69% illiterate, 82% undergraduate, and 89% postgraduate participants believed that small toys can cause FBA in children < 3 years of age, indicating good overall knowledge (knowledge score: 80%) about the role of small objects in pediatric FBA. However, 31% illiterate, 29% undergraduate, and 28% postgraduate participants assumed that no supervision was required when toddlers were playing with small toys. This suggested that the participants did not understand the importance of parental supervision while children were playing, with an inadequate knowledge score of 29%. A majority of participants, i.e., 63% illiterate, 66% undergraduate, and 76% postgraduate participants, agreed with the statement, A child crying while holding a small toy is a cause of concern, indicating inadequate knowledge of the signs of pediatric FBA, with a knowledge score of 68%. Hard nuts are beneficial for toddlers, was agreed upon by 56% illiterate, 64% undergraduate, and 71% postgraduate participants, with an overall knowledge score of 64%. Nonetheless, 81% illiterate, 83% undergraduate, and 81% postgraduate participants understood that a child should not be prevented from walking or laughing while eating, suggesting good knowledge (knowledge score: 82%) of the activities that can result in pediatric FBA.

The sample secured a score of 54% on the knowledge of pediatric FBA symptomology. Approximately 75% illiterate, 74% undergraduate, and 79% postgraduate participants, exhibiting an overall score of 76%, considered sudden choking as a symptom of FBA, whereas 75% illiterate, 55% undergraduate, and 59% postgraduate participants, with an overall score of 63%, considered sudden coughing as a symptom of FBA. Moreover, 19% illiterate, 23% undergraduate, and 22% postgraduate participants believed that the absence of symptoms was a reassuring sign. This suggested that most of the participants were unaware of the symptoms of pediatric FBA and secured an overall score of 21%.

In contrast, the participants were aware of the management (knowledge score: 87%) and prevention (knowledge score: 86%) of pediatric FBA. Approximately 88% illiterate, 85% undergraduate, and 88% postgraduate participants were informed that FBA required immediate medical advice (knowledge score: 87%), whereas 75% illiterate, 91% undergraduate, and 92% postgraduate participants

participants agreed to informing the doctor about the change in health after FBA (knowledge score: 86%). Additionally, 75% illiterate, 87% undergraduate, and 88% postgraduate participants agreed that they required more education on FBA (knowledge score: 84%).

Table 2: Knowledge of participants with different educational background about FBA: Statistically significant association was observed between educational background and awareness of FBA (P-value = 0.039), with postgraduate participants scoring higher than undergraduate participants.

Table 3: Differences between undergraduate and postgraduate participants based on their knowledge of FBA: Regarding lack of knowledge about FBA, 19% illiterate, 17% undergraduate, and 19% postgraduate participants were unaware that a child should not be allowed to walk or laugh while eating, whereas 44% illiterate, 36% undergraduate, and 29% postgraduate participants did not know that hard nuts are beneficial for children. Although a child crying while holding a small toy is a cause of concern, 27% illiterate, 34% undergraduate, and 24% postgraduate participants assumed otherwise. Approximately 69% illiterate, 71% undergraduate, and 72% postgraduate participants believed that toddlers could play with small toys without parental supervision. In contrast, 31% illiterate, 18% undergraduate, and 11% postgraduate participants were unaware of the fact that small toys could cause accidents involving FBA. Moreover, 37% illiterate, 31% undergraduate, and 29% postgraduate participants assumed that peanuts could be provided to children of <3 years of age; 25% illiterate, 31% undergraduate, and 25% postgraduate participants were unaware that FBA was most frequently reported in children aged 0–2 years; and 25 % illiterate, 38% undergraduate, and 24% postgraduate participants did not know that peanuts and other nuts could cause accidents involving FBA.

Figure 2: Lack of knowledge about FBA in the three groups of participants: The absence of clinical symptoms following choking was a reassuring sign— was not known to 81% illiterate, 77% undergraduate, and 78% postgraduate participants, while 25% illiterate, 45% undergraduate, and 41% postgraduate participants did not know that sudden coughing was one of the symptoms of FBA. Few participants, i.e., 25% illiterate, 26% undergraduate, and 21% postgraduate participants, were unaware of the fact that sudden choking was one of the symptoms of FBA.

Figure 3: Lack of knowledge about the clinical symptoms of FBA in the three groups of participants: Approximately 25% illiterate, 13% undergraduate, and 9% postgraduate participants were not aware that increased awareness of FBA was required to improve its understanding. Similarly, 25% illiterate, 9% undergraduate, and 8% postgraduate participants exhibited no necessity of informing the doctor if a child with a history of FBA was unwell. Furthermore, 12% illiterate, 15% undergraduate, and 25% postgraduate participants exhibited no knowledge of immediate medical intervention if a child developed FBA.

Figure 4: Lack of knowledge about FBA management and the need for generating awareness for FBA prevention in the three groups of participants: The most preferred mode of generating parental awareness (36.6%) was media platforms, followed by maternity appointments, educational campaigns, and pamphlet distribution, which were preferred by 25.9%, 24.3%, and 13.2% of the participants, respectively.

Figure 5: Modes of generating awareness in the participants

Table 1: Age of the participant's children

Age	Youngest child	2nd child	3rd child	4th child	5th child	6th child
< 1 year	171 (40.3%)	5 (1.2%)				
1 – 2 years	142 (33.5%)	29 (6.8%)	2 (0.5%)			
2 – 3 years	111 (26.2%)	59 (13.9%)	9 (2.1%)	1 (0.2%)		
> 3 years		226 (53.3%)	203 (47.9%)	128 (30.2%)	68 (16%)	26 (6.1%)
Not found		105 (24.8%)	210 (49.5%)	295 (69.6%)	356 (84%)	398 (93.9%)
Total	**424 (100%)**	**424 (100%)**	**424 (100%)**	**424 (100%)**	**424 (100%)**	**424 (100%)**

Figure 1: Relationship of the participants to the patient having history of FBA

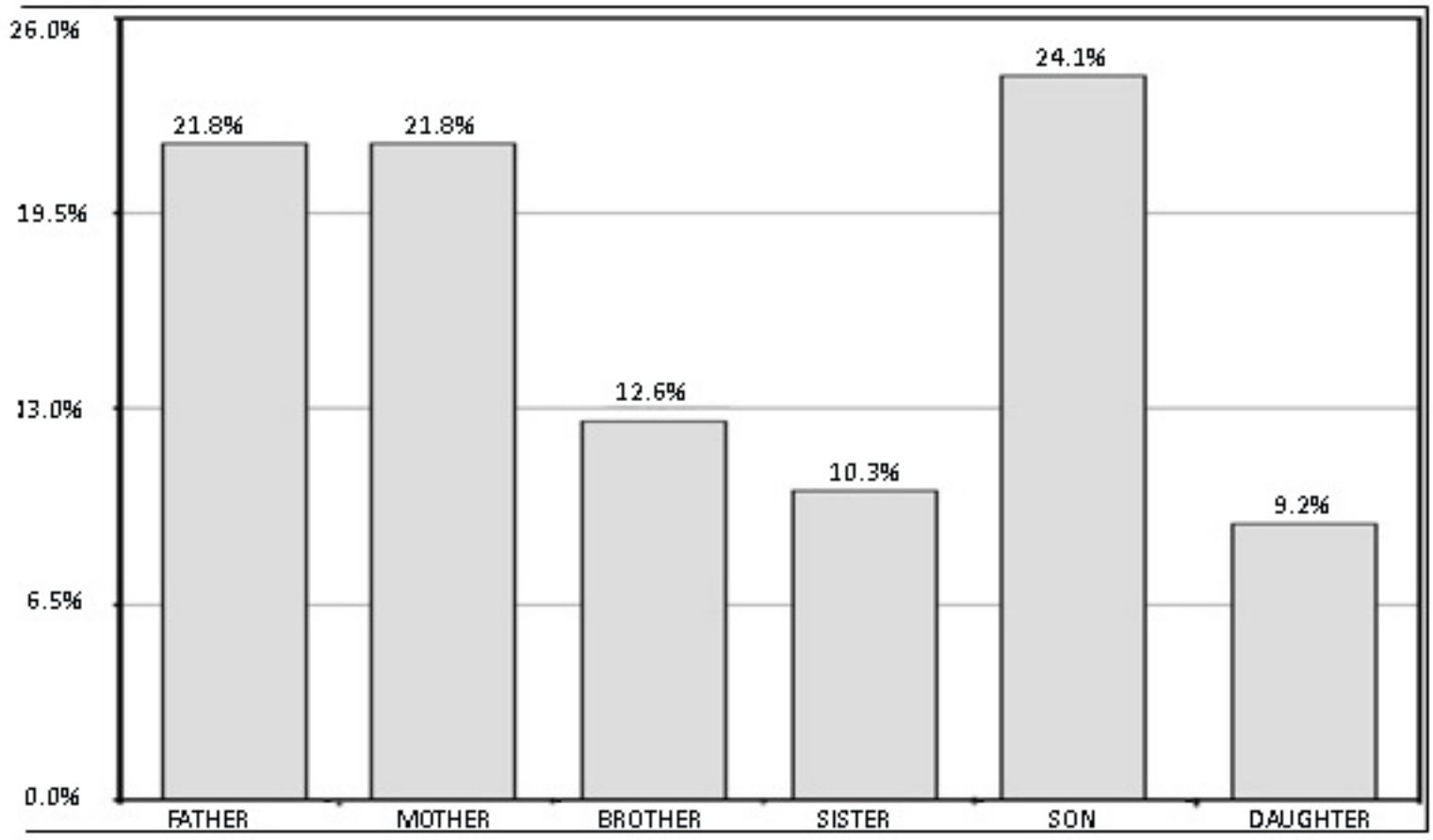


Table 2: General Knowledge of foreign body aspirate stratified by educational level

Questions	Illiterate group	Under-graduate group	Post-graduate group	Overall knowledge	Knowledge	
					Inadequate	Good
General knowledge (8)						
Peanuts could cause FBA	75%	66%	76%	72%	×	
FBA is most frequently seen in 0–2 yrs.	75%	69%	75%	73%	×	
Peanuts should not be given to children < 3 yrs.	63%	72%	71%	69%	×	
Small toys can cause FBA in children < 3 yrs.	69%	82%	89%	80%		×
No supervision is needed when toddlers are playing	31%	29%	28%	29%	×	
Child crying while holding a small toy is not recommended	63%	66%	76%	68%	×	
Hard nuts beneficial to toddlers	56%	64%	71%	64%	×	
Child should not be allowed to walk or laugh while he/she is eating	81%	83%	81%	82%		×
Total	**64%**	**66%**	**71%**	**67%**	×	
Clinical presentation (3)						
Sudden choking symptom of FBA	75%	74%	79%	76%		×
Sudden coughing symptom of FBA	75%	55%	59%	63%	×	
Absence of symptoms is a reassuring signs	19%	23%	22%	21%	×	
Total	**59%**	**51%**	**53%**	**54%**	×	
Management (2)						
FBA requires Immediate medical advice	88%	85%	88%	87%		×
Inform treating doctor about change in health after FBA	75%	91%	92%	86%		×
Prevention (1)						
More education is needed for FBA	75%	87%	91%	84%		×
Total	**79%**	**88%**	**90%**	**86%**		×

Table 3: Difference between under-graduate and post-graduate participants regarding their knowledge of FBA

	Education level	N	Mean	Std. Deviation	P-value
Percent of true answer	Under-graduate	137	0.6747	0.1699	0.039*
	Post graduate	271	0.7116	0.1701	

*P-value was calculated using independent sample t-test.

Figure 2: Lack of FBA general knowledge among the three studied groups (illiterates, under-graduate and post-graduate)

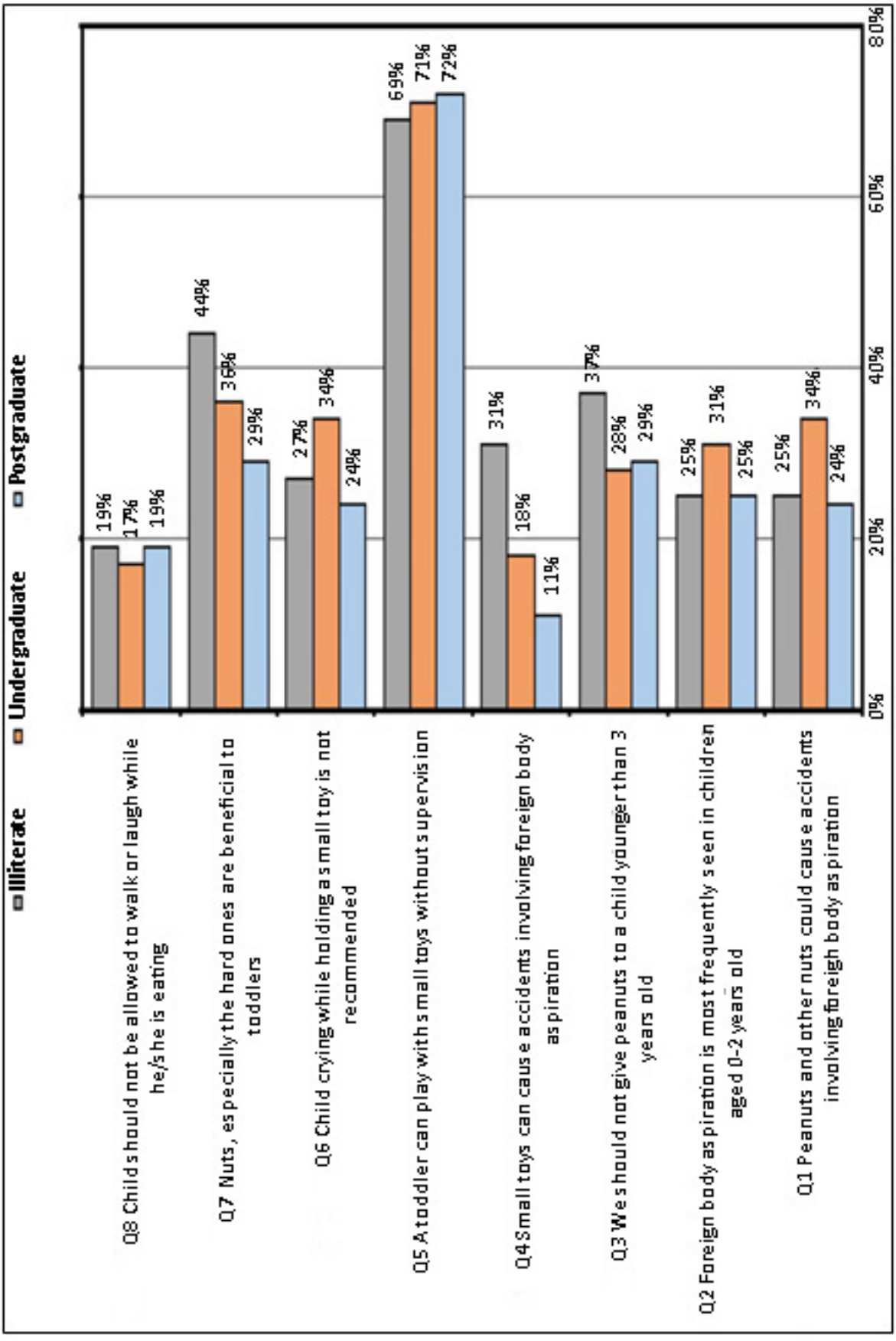


Figure 3: Lack of knowledge about the clinical presentation of FBA among the three studied groups (illiterates, under-graduate and post-graduate).

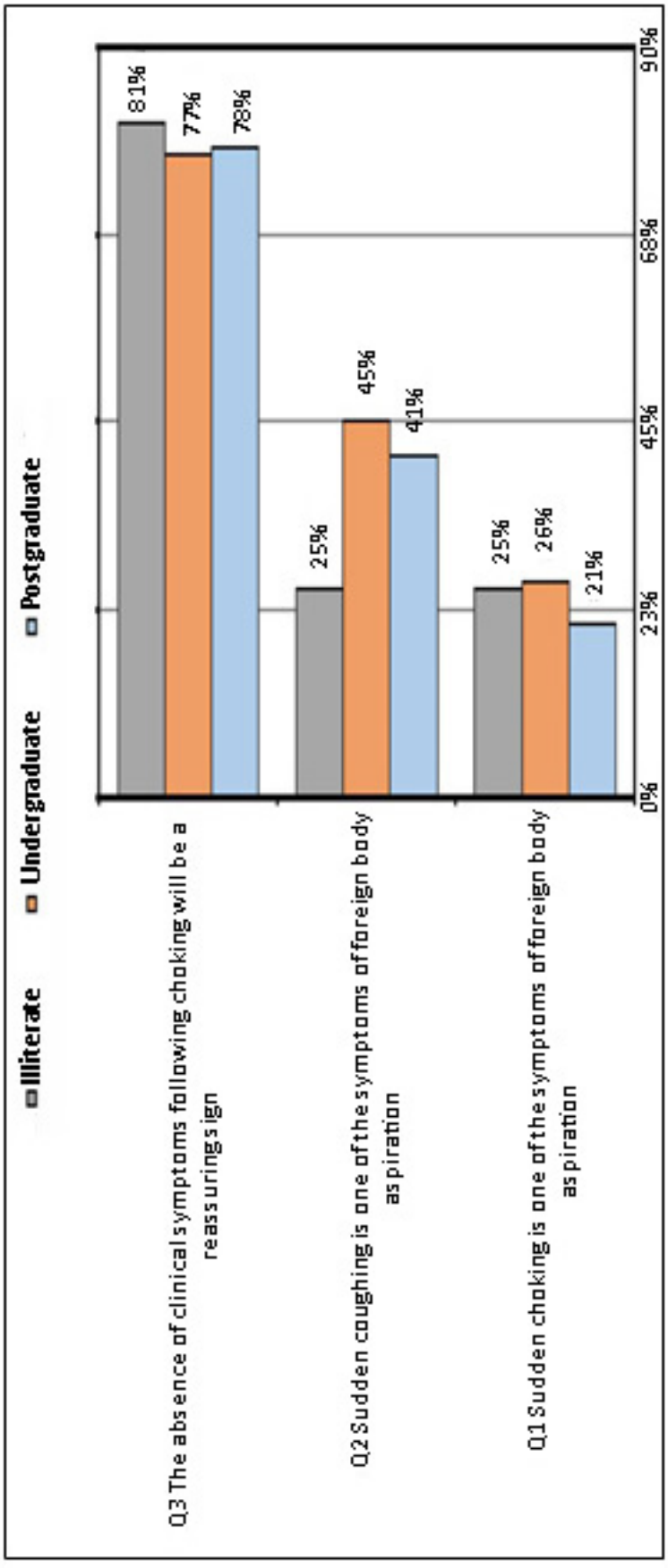


Figure 4: Lack of knowledge about FBA management and need for further education for better prevention among the three studied groups (illiterates, under-graduate and post-graduate).

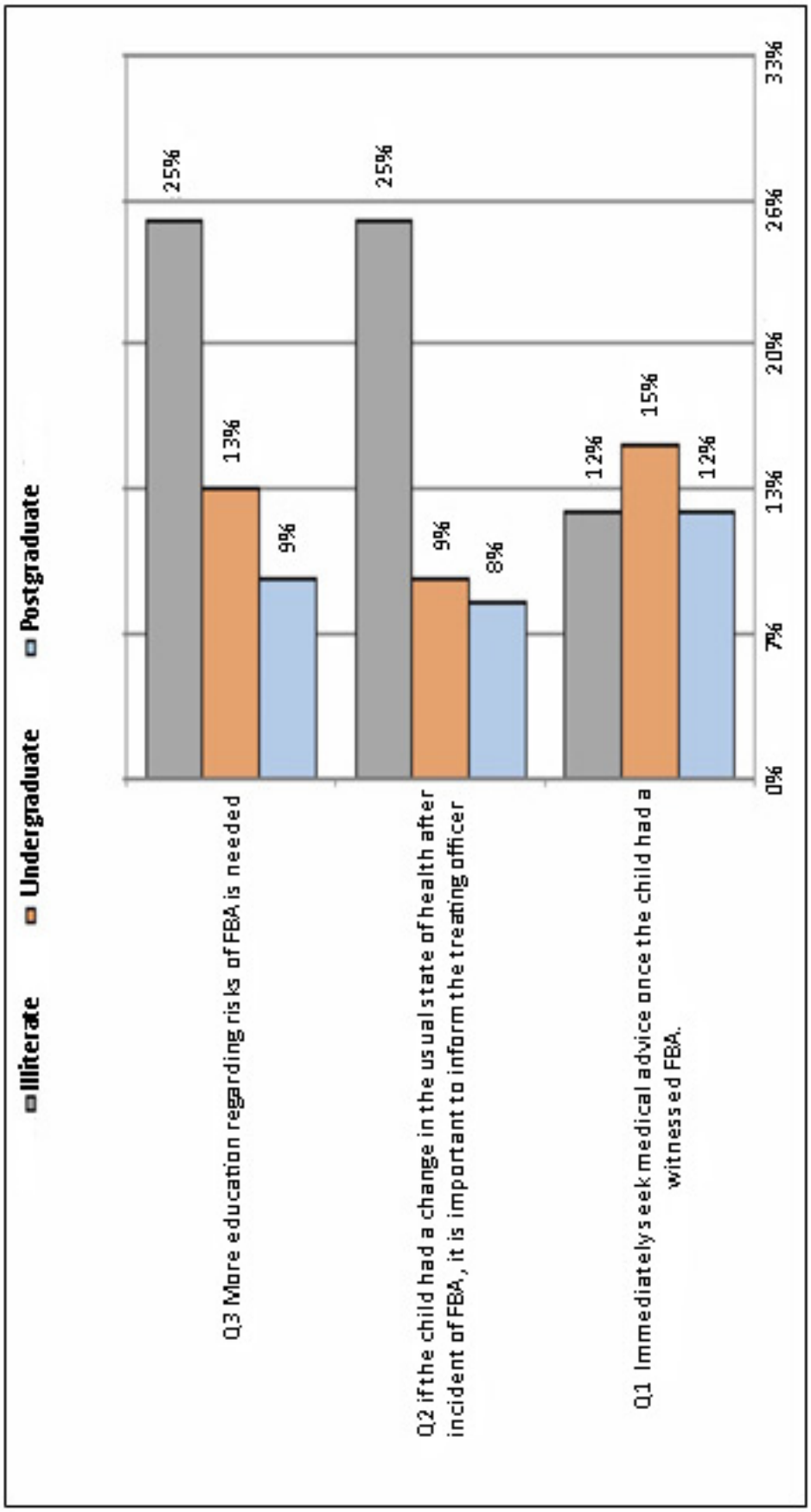
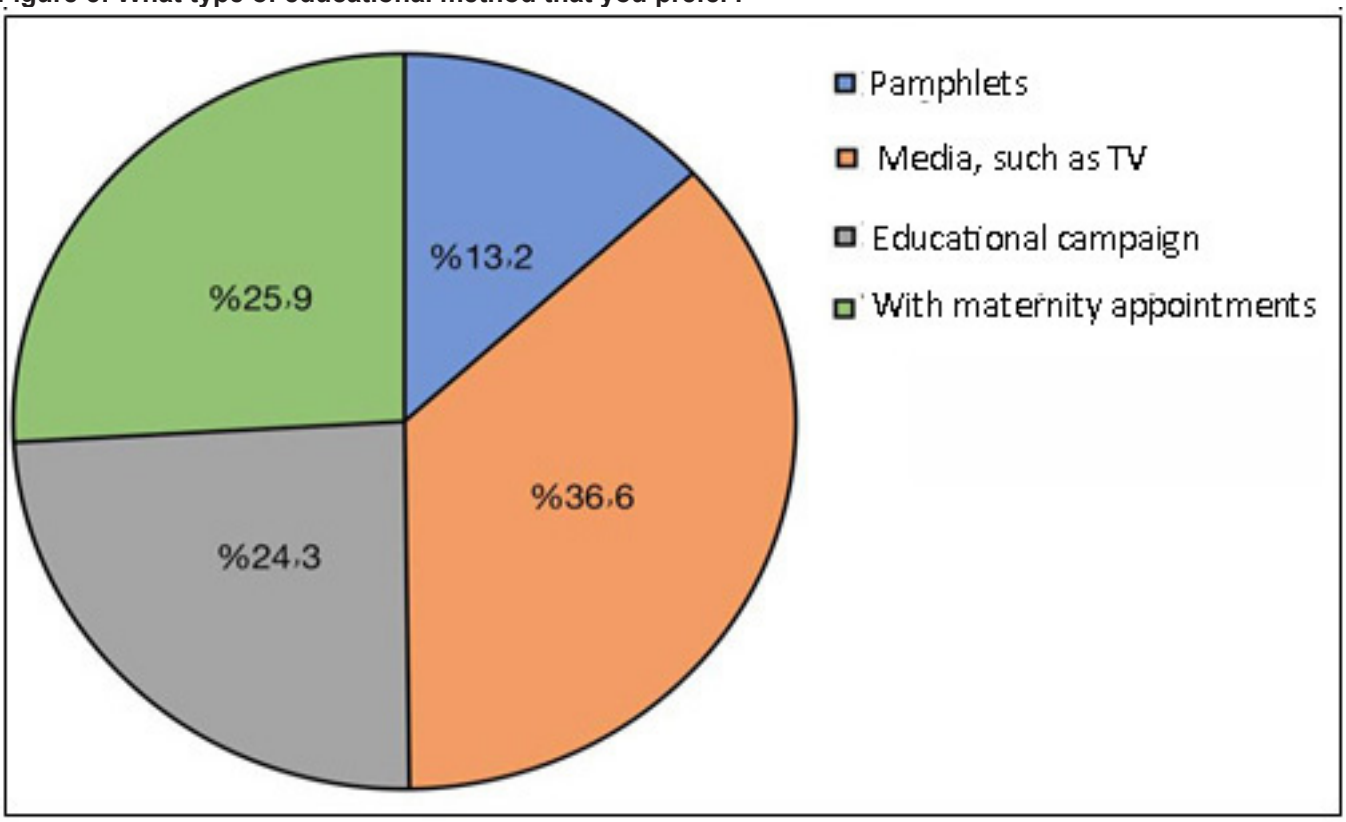


Figure 5: What type of educational method that you prefer?



Discussion

Based on socio-demographic characteristics, approximately two-thirds (63.9%), one-third (32.3%), and extremely few (3.8%) participants constituted the postgraduate, undergraduate, and illiterate groups, respectively. The mean age of the participants was found to be 34.6 ± 7.5 years, with more than half of the participants (61.8%) being females and more than one-third (38.2%) of participants being males. Moreover, one quarter of the participants (24.8%) each had one and two children, whereas half of the participants had more than two children. These findings are similar to those of AlQudehi et al., wherein most participants were females and undergraduates (10).

Less than half (40.3%) of the participants had the youngest child of age less than 1 year, one-third (33.5%) had the youngest child of 1–2 years of age, and approximately more than one quarter (26.2%) had the youngest child aged 2–3 years old, whereas the remaining participants had the youngest child of more than 3 years of age. Similar findings have been reported by KiliÇaslan et al., wherein children aged between 1–3 years were more likely to be affected by FBA (11).

In this study, 20.5% of the participants reported a history of FBA, with peanuts and toys being the most common causes. These findings are in disagreement with those of Yalçin et al., wherein >90% participants exhibited a history of FBA (12).

The overall knowledge of FBA was inadequate, and the participants secured a knowledge score of 67%. The scores of illiterate, undergraduate, and postgraduate participants were 64%, 66%, and 71%, respectively, which were consistent with those indicated by Almutairi et al., who reported an overall knowledge score of 61.3% (6).

The overall score for knowledge about clinical symptoms was 54%, which was considered inadequate. Regarding knowledge of clinical symptoms, illiterate, undergraduate, and postgraduate participants scored 59%, 51%, and 53%, respectively. Similar results were obtained by Alsheiri et al., who also reported inadequate knowledge about clinical symptoms of FBA in the sample (5).

In contrast, an overall knowledge score of 86–87% suggested that the participants were aware of the management and prevention of FBA. These findings did not agree with those of Sarabi et al., who suggested that only 16% of the participants exhibited good knowledge of the management and prevention of FBA (13).

Most participants (36.6%) preferred media platforms, followed by maternity appointments, educational campaigns, and pamphlets, to generate parental awareness. We also observed a statistically significant association between educational background and knowledge about FBA. These results were consistent with those of Aluko et al (14).

The findings of this study could be limited by the possibility of multiple interpretations based on inaccurate information supplied by the participants.

Conclusion

A considerable number of parents lacked adequate knowledge about FBA. However, most parents exhibited good knowledge regarding FBA management and prevention.

Recommendtions

Parents, particularly mothers, must be educated about the risk factors associated with FBA, including age, playing with small toys, and hard food items, which must not be presented to children without supervision. The role of media must be emphasized to raise awareness of various aspects of FBA, including its signs and symptoms and primary management and prevention.

Disclosure of Funding: This study did not receive any grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical Approval: consent and ethical approval from Alhada Armed Forces Hospital number (2022-608) dated 11 April 2022.

Acknowledgments
The authors gratefully acknowledge the following medical students of the College of Medicine, Taif University, who assisted in data collection: Atheer Albar, Abdulmajeed Alshehri, Faisal Althobaiti, Ashwaq Althobaiti, Hanouf Althobaiti, and Khaled Almalki.

References

[1] F. Mohsen et al., “Foreign body aspiration in a tertiary Syrian centre: A 7-year retrospective study,” Heliyon, vol. 7, no. 3, p. e06537, 2021.
[2] H. M. Reyad, M. E. El-Deeb, A. M. Abbas, D. Sherief, and O. A. Elagamy, “Foreign Body Aspiration in Egyptian Children Clinical, Radiological and Bronchoscopic Findings.,” J. Multidiscip. Healthc., vol. 14, pp. 2299–2305, 2021.
[3] Z. M. Nasir and S. T. Subha, “A five-year review on pediatric foreign body aspiration,” Int. Arch. Otorhinolaryngol., vol. 25, no. 2, pp. E193–E199, 2021.
[4] A. Adramerina, S. Xatzigeorgiou, C. Spanou, F. Tzanetis, and C. Neocleous, “How Parents’ Lack of Awareness Could Be Associated With Foreign Body Aspiration in Children,” Pediatr. Emerg. Care, vol. 32, no. 2, 2016.
[5] K. Alshehri et al., “Awareness of the first aid management of foreign body aspiration among students: A cross-sectional study,” J. Educ. Health Promot., vol. 8, no. 1, p. 220.
[6] A. T. Almutairi and F. S. Alharbi, “Parental knowledge and practices toward foreign body aspiration in children in the Al Qassim region of Saudi Arabia.,” J. Fam. Med. Prim. care, vol. 10, no. 1, pp. 199–204, Jan. 2021.
[7] T. Adjeso, M. C. Damah, J. P. Murphy, and T. T. K. Anyomih, “Foreign Body Aspiration in Northern Ghana: A Review of Pediatric Patients,” Int. J. Otolaryngol., vol. 2017, pp. 1–4, 2017.
[8] K. Dongol, Y. Neupane, H. Das Dutta, B. Raj Gyawali, and B. Kharel, “Prevalence of Foreign Body Aspiration in Children in a Tertiary Care Hospital.,” JNMA. J. Nepal Med. Assoc., vol. 59, no. 234, pp. 111–115, Feb. 2021.
[9] Municipality of Taif city [Internet]. Available from: https://www.taifcity.gov.sa/pages/p-57.aspx.
[10] Z. AlQudehy, “Parental Knowledge of Foreign Body Aspiration: A Comparative Study between Saudis and Other Nations,” J. Otolaryngol. Res., vol. 2, no. 1, pp. 1–7, 2015.
[11] Ö. KİLİÇASLAN, B. TÜREN, A. ÖZKAN, G. AK, R. C. TEMİZKAN, and K. KOCABAY, “Foreign body aspiration in children: A survey based study,” Balıkesir Med. J., vol. 5, no. 3, pp. 144–150, 2021.
[12] S. Yalçin, I. Karnak, A. O. Ciftci, M. E. Senocak, F. C. Tanyel, and N. Büyükpamukçu, “Foreign body ingestion in children: an analysis of pediatric surgical practice.,” Pediatr. Surg. Int., vol. 23, no. 8, pp. 755–761, Aug. 2007.
[13] N. Sarabi and M. Nosratabadi, “Effectiveness of Video Education on Mothers’ Knowledge of Hazard Factors and First Aid Administration in Choking Incidents,” J. Compr. Pediatr., vol. 13, no. 2, 2022.
[14] A. Mahmud, Y. Mohammed, and A. Aluko, “Knowledge of foreign-body aspiration in children among caregivers in Kano Nigeria,” African J. Trauma, vol. 6, no. 2, pp. 42–46, Jul. 2017.

Assessment of level of knowledge about cryptorchidism and its complications among paternity age population in the western region of Saudi-Arabia. Cross-sectional Questionnaire based study

Faisal M. Alfadli [1], Abdulaziz S. Aljuaid [1], Muhanad A. Althbaiti [1], Abdulrahman D. Alhamyani [1], Ahmed S. Alsoaimi [1], Khalid M. Alzahrani [2]

(1) Medical Intern, Taif University, Saudi Arabia
(2) Assistant Professor, Department of surgery , College of medicine, Taif University, Saudi Arabia

Corresponding author:
Dr. Faisal M. Alfadli
Medical Intern, Taif University,
Saudi Arabia
Tel.:0541962193
Email: Faisalmajed.md@gmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Faisal M. Alfadli et al. Assessment of level of knowledge about cryptorchidism and its complications among paternity age population in the western region of Saudi-Arabia. Cross-sectional Questionnaire based study. World Family Medicine. 2022; 20(11): 121-127. DOI:10.5742/MEWFM.2022.95251368

Abstract

Background: Testicular descent failure causes cryptorchidism, which is the absence of one or both testicles in the scrotum. The cause of cryptorchidism is still unknown. This study aimed to assess knowledge about cryptorchidism and estimation of cryptorchidism in the Western region of Saudi Arabia.

Methods: A cross-sectional study was done on 427 participants through an electronic online questionnaire in the western region of Saudi Arabia. All parents with or without children, divorced or widowed, or widower were included.

Results: More than half of the participants (64.6%) were aged between 40 and 59 years. The prevalence of UDT was 8.4%. The mean knowledge score was 7.5 ±3,3; out of a total score of 20 (Range 2 – 18). Most of the participants (69.8%) have poor knowledge about UDT, while only (30.2%) have good knowledge about it. There was a significant association between educational level and level of knowledge about UDT (p value = 0.006). There was a non-significant association between age (p value = 0.562) and marital status (p value = 0.457) and level of knowledge.

Conclusion: Our results concluded that people from the western region of Saudi Arabia showed insufficient knowledge regarding UDT. The prevalence of UDT was relatively high.

Keywords: assessment, awareness, cryptorchidism, parents, western, Saudi

Introduction

Cryptorchidism which is referred to as undescended testicles (UDT) is the absence of one or both testicles in the scrotum due to failure of testicular descent. It's considered one of the most common genitourinary conditions in neonates. Insulin-like 3 peptide and steroid hormones generated in testicular Leydig cells, as well as many genetic and developmental variables, influence the descent of the testes during development [1].

Normal testicular descent occurs in the 25th to 35th weeks of gestation [2]. Testicular descent is essential for spermatogenesis. Scrotal temperature differs by 2-4 degrees below body temperature [3]. There's a difference in incidence between full-term and pre-term infants. The prevalence of cryptorchidism is estimated between 1% to 4% in full-term infants however, it reaches up to 45% in pre-term infants [4]. Cryptorchidism's etiology is still unknown, and various possibilities have been offered. Placental malfunction with diminished hCG secretion, for example, could be the cause of hormonal and other problems during fetal development [5]. According to some studies, the testis could be the primary source of the problem [6].

Some risk factors that can predispose to the condition include prematurity, intrauterine growth restriction (IUGR), perinatal asphyxia, Cesarean section, and congenital subluxation of the hip [7]. Cryptorchidism may lead to serious complications if not diagnosed and managed accordingly. One of the acute complications is testicular torsion [8]. Chronic complications are infertility and testicular germ cell tumors (TGCT) mainly seminomas. Bilateral cryptorchidism has a higher cancer risk than unilateral cryptorchidism. Some studies have found a link between the length of time the testis was in a cryptorchid position and the likelihood of developing TGCT. The results of surgical correction of cryptorchidism and the reduction of the risk of testicular cancer demonstrate this [9]. Early surgical intervention is necessary to preserve fertility and prevent further complications. In early discovered palpable cryptorchid testes, hormonal therapy should be initiated first to encourage descent however, Orchidopexy is the gold standard treatment [10].

In a Swedish study conducted between 1964 and 1999, about 17,000 males were treated for cryptorchidism in Sweden, with an average age of 8.6 years at the time of surgery. Sixty-six people in this cohort acquired testicular cancer. Individuals who received corrective surgery before the age of 13 had a 2.23 percent incidence rate, whereas those who were treated after the age of 13 had a 5.4 percent incidence rate [11].

A study was conducted in Hail (Saudi Arabia) to measure the prevalence and causes of late presentation of the cases with this condition. The study showed that in terms of overall awareness of UDT, roughly 53.2 percent had heard of it. Age groups, gender, having a child with UDT, and knowing a child with UDT all showed statistically significant differences. However, there was no statistically significant relationship between social and educational levels [4]. Another retrospective study was conducted to determine the mean age of presentation in patients with cryptorchidism. In a survey of 5,393 cases, only 0.98 percent of the general public knew about UDT, and none of them knew about the ideal age for orchidopexy. At the 1-4 month postnatal newborn check, healthcare providers informed 63.46 percent of them about the UDT. Furthermore, only 2% of healthcare providers were aware that the optimal age for orchidopexy was 6-9 months, and only 14.3% of them would make an immediate surgical referral to pediatric surgery at this time [12].

This study aimed to evaluate the overall knowledge about cryptorchidism and its prevalence among patients in the Western region of Saudi Arabia.

Subjects and Methods

Study design, allocation and timing: This was a cross-sectional study done in the western region of Saudi Arabia from June to September 2022.

Study population: The inclusion criteria were all parents of both genders, with or without children, divorced or widowed, or widower who live in the western region of Saudi Arabia and agreed to participate in the study. The exclusion criteria were any participant who is single and not living in the western region of Saudi Arabia.

Sample size: With a margin of error of 5% and a 95% confidence level, a minimum of 384 participants were required for this study. Using the Qualtrics calculator, the sample size was calculated.

Data collection: A self-administered,electronic online questionnaire was distributed to all parents in the western region of Saudi Arabia. A link to Google form was distributed using social media platforms (e.g., Twitter, Instagram, Linked-in, WhatsApp, …etc.). A common grading method was used for each variable in this questionnaire as follows: 2 points were given to the correct option, 0 for the incorrect answer, and 1 for neutral. After data collection, a participant who correctly answered 50% or more of the questions (10 points out of 20) was considered as having good knowledge about UDT.

The questionnaire included five sections; the first was designed to gather information about the respondents (age, gender, education level, etc.). In the second section, respondents were asked whether they have experience caring for a child with UDT. In the third part, the general knowledge of UDT (age group and recommended time of intervention) was discussed. In the fourth part, the importance of early intervention and the treatment options were discussed. The last part focused on the complications that can occur with untreated UDT.

Data analysis: Data was entered on the computer using the "Microsoft Office Excel Software" program (2016) for windows. Data was then transferred to the Statistical Package of Social Science Software (SPSS) program, version 23 (IBM SPSS Statistics for Windows, Version

23.0. Armonk, NY: IBM Corp) to be statistically analyzed. Qualitative data were expressed in the form of numbers and percentages while quantitative data was expressed in the form of mean and standard deviation. Chi-square ($\chi 2$) test was used to examine qualitative data between two groups. A p value < 0.05 was considered statistically significant.

Results

Characteristics of the respondents: a total of 427 participants were included in this study. In order to investigate the demographic data of responders more than half of participants (64.6%) were aged between 40 and 59 years; the majority of them are married (90.6%) and 91.1% have children. Regarding their educational level, most of them have a Bachelor's degree (66.3%). Concerning the geographic distribution of participants, we found that they are semi-equally distributed in Jeddah, Madina, Mecca, and Taif (Table 1).

Prevalence of cryptorchidism: While looking at the percentage of participants who have a child affected with UDT, the majority of participants haven't any child with UDT (91.6%) while only 36 (8.4%) have children affected with UDT (Figure 1).

Knowledge about UDT: Out of a total score of 20, the mean knowledge score was 7.5 ± 3,3 (Range 2 – 18). Regarding overview of knowledge about UDT, most participants (n=298, 69.8%) have poor knowledge about UDT, while only 129 (30.2%) have good knowledge about it (Figure 2).

Concerning participants' Knowledge about UDT half of participants had never heard about UDT (51.1%), and more than half of participants think the age of presentation with UDT is since birth (61.8%). Additionally, we found that (53.2%) of participants consider that UDT has complications, and most of them (68.7%) believe that this complication is infertility. Furthermore, our results revealed that the bulk of participants think that best management of UDT is surgery. Our results demonstrated that more than a third of participants don't know the suitable time for surgery while (22.5 %) think that the suitable time is one year and more. The majority of participants (69.3%) think that there is a real benefit from early treatment (Table 2).

Factors associated with Knowledge about UDT: When we were checking factors associated with knowledge about UDT we found that there's no significant association between age (P value = 0.562) or marital status (P value = 0.457) and level of knowledge, but there is a significant association between educational level and level of knowledge about UDT (P value = 0.006).

While assessing the association between the level of knowledge about UDT and places where participants live we found that there is no association between them (P value =0.235). No significant association was found between having children and level of knowledge about UDT (P value = 0.094), as well as no significant association was found between the level of knowledge about UDT and the number of children affected by UDT (P value = 0.236) (Table 3).

Table 1: Socio-demographic characteristics of the respondents (n=427)

Variable	Categories	Frequency	Percent
Age	20-25	38	8.9%
	26-39	96	22.5%
	40-59	276	64.6%
	60 years and above	17	4%
Marital status	Married	387	90.6%
	Divorced	29	6.8%
	Widowed	11	2.6%
Educational level	Elementary	19	4.4%
	Secondary school	54	12.6%
	Diploma	26	6.1%
	Bachelor	283	66.3%
	Postgraduate	45	10.5%
Where do you live?	Jeddah	91	21.3%
	Madina	91	21.3%
	Mecca	127	29.7%
	Taif	118	27.6%
Do you have any children?	Yes	389	91.1%
	No	38	8.9%

Figure 1: Prevalence of cryptorchidism among the study participants

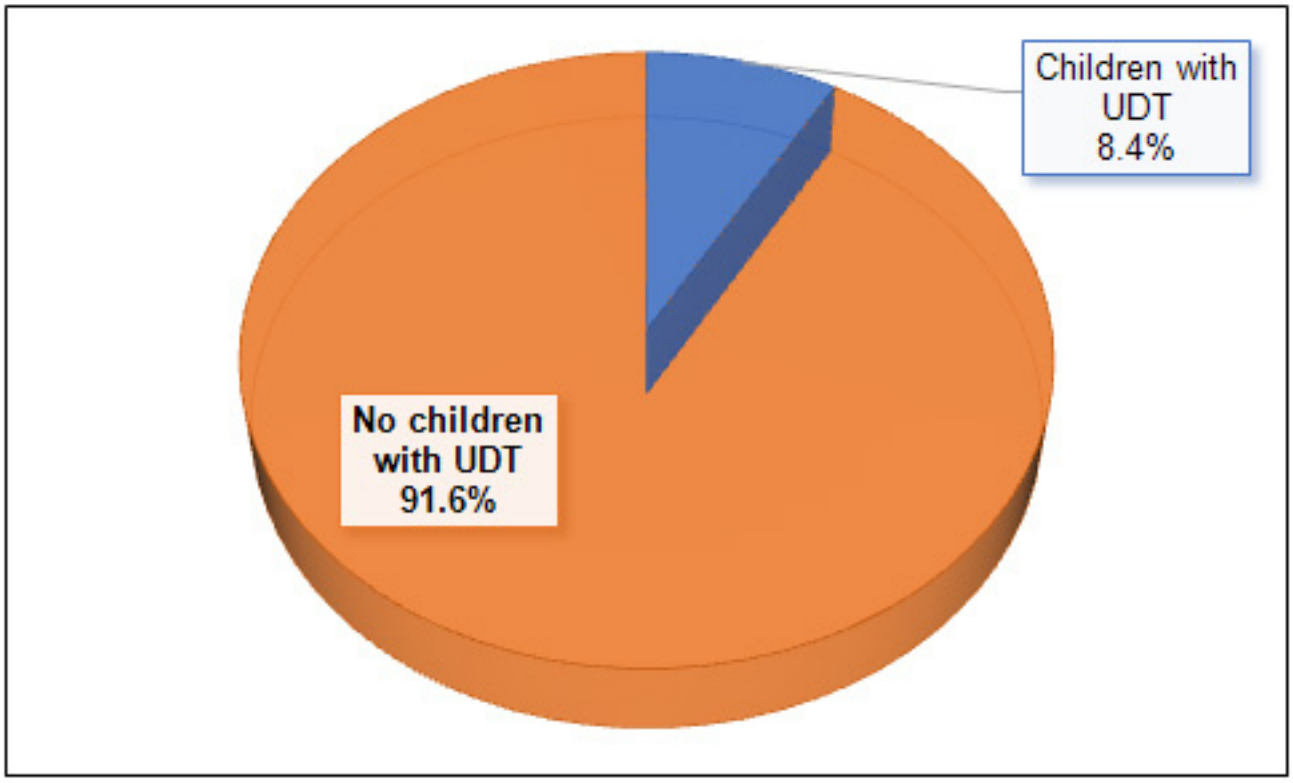


Figure 2: Overall knowledge about UDT

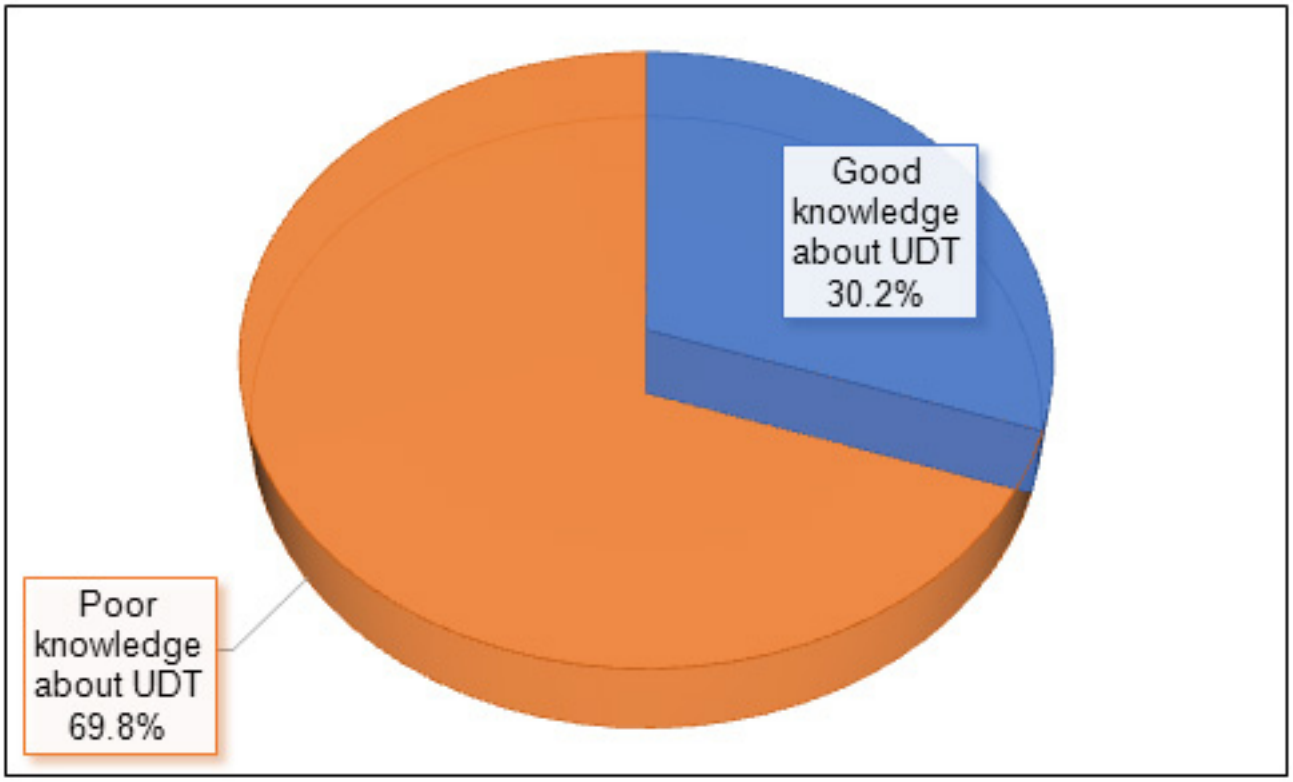


Table 2: Participants' Knowledge about UDT

Variable	Frequency	Percent
Have you heard about UDT?		
Yes	218	51.1%
No	209	48.9%
In your consideration what age do you think patients with UDT present at?		
Since birth	264	61.8%
Adolescence	31	7.3%
Elderly	2	0.5%
I don't know	130	30.4%
In your consideration do you think UDT has any complications?		
Yes	227	53.2%
No	21	4.9%
I don't know	179	41.9%
If you answered with yes, what are the complications you think will develop? (n=227)		
Infertility	156	68.7%
Inflammations	101	44.5%
Testicular torsion	78	34.4%
Tumors	43	18.9%
I don't know	24	10.6%
In your consideration which treatment option do you think can manage UDT?		
Oral medications	43	10.1%
Hormone therapy	17	4%
Surgery	281	65.8%
Does not need any therapy	14	3.3%
I don't know	133	31.1%
What time is appropriate for surgery		
After birth directly	45	10.5%
1st 6 months	83	19.4%
6 months – 1 year	64	15%
One year and more	96	22.5%
I don't know	139	32.6%
Do you think that there is a benefit from early treatment?		
Yes	296	69.3%
No	4	0.9%
I don't know	127	29.7%

Table 3: Factors associated with Knowledge about UDT

Variable	Categories	Level of Knowledge		P value
		Good	Poor	
		N (%)		
Age	20-25	15 (39.5)	23 (60.5)	0.562
	26-39	27 (28.1)	69 (71.9)	
	40-59	81 (29.3)	195 (70.7)	
	Above 60 years	6 (35.3)	11 (64.7)	
Marital status	Married	114 (29.5)	273 (70.5)	0.457
	Divorced	10 (34.5)	19 (65.5)	
	Widowed	5 (45.5)	6 (54.5)	
Educational level	Elementary	3 (15.8)	16 (84.2)	0.006
	Secondary school	9 (16.7)	45 (83.3)	
	Diploma	3 (11.5)	23 (88.5)	
	Bachelor	97 (34.3)	186 (65.7)	
	Postgraduate	17 (37.8)	28 (62.2)	
Where do you live?	Jeddah	34 (37.4)	57 (62.6)	0.235
	Madina	28 (30.8)	63 (69.2)	
	Mecca	31 (24.4)	96 (75.6)	
	Taif	36 (30.5)	82 (69.5)	
Do you have any children?	Yes	113 (29)	276 (71)	0.094
	No	16 (42.1)	22 (57.9)	
Do you have any children affected by UDT?	Yes	14 (38.9)	22 (61.1)	0.236
	No	115 (29.4)	276 (70.6)	

Discussion

The current study aimed to measure the overall knowledge of cryptorchidism and to estimate the prevalence of the disease among the general population in Saudi Arabia. One of the most common congenital disorders in males is cryptorchidism. It has been reported that undescended testis (UDT) affects 1.0-4.6% of full-term infants [13]. There is debate about the best way to treat an undescended testis, with surgical and medical options commonly offered. However, everyone agrees that cryptorchidism should be treated as soon as possible [14].

The current study discovered that more than half of the participants (64.6%) were between the ages of 40 and 59. This age distribution was older than in another study conducted in Saudi Arabia's Hail region [4]. However, like our study, this study revealed a high educational level with a majority of participants holding a Bachelor's degree.

Our results demonstrated that the Prevalence of cryptorchidism was found to be 8.4 %, whereas the vast majority of our respondents revealed that their children were not affected by cryptorchidism. Unfortunately, there have been no studies on the prevalence of UDT in Saudi Arabia. The frequency of UDT varies according to the literature. The actual frequency of acquired UDT is essentially unknown due to a lack of studies performed at older ages and studies reporting on previous testicular position. A previous systemic review found a lower prevalence than our study, which found that the UDT rate in premature and or birth weight 2.5 kg infants ranged from 1.1 to 45.3%. UDT in term and or birth weight >2.5 kg infants was seen in 1.0-1.5% of boys at 1 year, 0.0-2.6% at 6 years, 0.0-6.6% at 11 years, and 1.6-2.2% at 15 years. This indicates that the population's age and prematurity would have an impact on the study's findings [15].

Our results revealed that (69.8%) of respondents have poor knowledge about UDT, while only (30.2%) have good knowledge about it. Almost half of the participants had never heard about UDT. This is slightly higher than another study that was conducted in Saudi Arabia which reported that 46% hadnot heard about cryptorchidism before [4]. Moreover, our findings showed that more than half of participants think the age of presentation with UDT is since birth (61.8%). An earlier study in Saudi Arabia reported that 45% of the population has no idea about the typical age of presentation [4]. We found that (53.2%) of participants consider that UDT has complications, and most of them (68.7%) believe that this complication is infertility. This is confirmed by a previous study in Saudi Arabia [4]. More than a third of participants don't know the suitable time for surgery while (22.5 %) think that the suitable time is one year and more. The majority

of participants (69.3%) think that there is a real benefit from early treatment. Another study in Iran showed better results than our study which revealed that 49% of parents had the correct information for proper operation age and 40.6% of them had enough information about the necessity of surgery and side effects of disease [16].

Our results showed that there is a significant association between educational level and level of knowledge about UDT (p value = 0.006). This was inconsistent with findings of another study in Saudi Arabia which demonstrated that educational status was not statistically significantly related to level of knowledge about UDT. Furthermore, this previous study revealed another inconsistency with our findings, namely that a statistically significant difference was observed between age groups, gender, having a child, or knowing a child with UDT [4].

Our research had some limitations. Our study is limited by its retrospective nature, small sample size, and lack of generalizability.

Limitations

A limitation of this study was the usage of self-administered online questionnaire which was prone to recall bias. This study was planned to collect data from parents in the western region of Saudi Arabia which may not represent the total number of parents in Saudi Arabia.

Conclusion

Our results concluded that people from the western area of Saudi Arabia showed insufficient knowledge regarding UDT. The prevalence of UDT was relatively high. Further studies and research are needed. Future interventions showed focus on raising awareness of the general population. Education of society, particularly parents, as well as careful physical examination of babies at birth and regular follow-up until 18 months, can help to prevent UDT diagnosis and treatment delays.

Acknowledgment: The authors would like to acknowledge all the data collectors, Abdulrahman Raed Alshahrani, Afnan Saleh Aghashami, Walaa Abdulrahman Almeshhen, Faizah Mohammadjamal Makhdoum, Hala Emad Danish, Rahaf Issa Almughamsi and Amal Sayfuldeen Qari for their contribution and efforts provided in data collection.

References

1. Ferguson L, Agoulnik AI. Testicular cancer and cryptorchidism. Front Endocrinol (Lausanne) 2013;4(MAR):1–9. doi: 10.3389/fendo.2013.00032
2. Shin J, Jeon GW. Comparison of diagnostic and treatment guidelines for undescended testis. Korean J Pediatr 2020;63(11):415–421. doi: 10.3345/cep.2019.01438
3. Niedzielski JK, Oszukowska E, Słowikowska-Hilczer J. Undescended testis - Current trends and guidelines: A review of the literature. Arch Med Sci 2016;12(3):667–677. doi: 10.5114/aoms.2016.59940
4. Madni M, Alzimam M, Alfayez A, et al. Factors responsible for late presentation of undescended testis among hail community and estimation of public awareness about cryptorchidism, Saudi Arabia. Int J Med Dev Ctries.2021;5:870–875. https://www.ejmanager.com/mnstemps/51/51-1609751630.pdf?t=1662080773
5. Barteczko KJ, Jacob MI. The testicular descent in human. Origin, development and fate of the gubernaculum Hunteri, processus vaginalis peritonei, and gonadal ligaments. Adv Anat Embryol Cell Biol 2000;156:III–X, 1–98. https://pubmed.ncbi.nlm.nih.gov/11008363/
6. Skakkebaek NE, Rajpert-De Meyts E, Main KM. Testicular dysgenesis syndrome: an increasingly common developmental disorder with environmental aspects. Hum Reprod 2001;16(5):972–978.
7. Davies TW, Williams DR, Whitaker RH. Risk factors for undescended testis. Int J Epidemiol 1986;15(2):197–201. doi: 10.1093/humrep/16.5.972.
8. Kargl S, Haid B. Torsion of an undescended testis-A surgical pediatric emergency. J Pediatr Surg 2020;55(4):660–664. doi: 10.1016/j.jpedsurg.2019.06.018.
9. Batata MA, Whitmore WFJ, Chu FC, et al. Cryptorchidism and testicular cancer. J Urol 1980;124(3):382–387. doi: 10.1016/s0022-5347(17)55458-0.
10. Mathers MJ, Sperling H, Rübben H, et al. The undescended testis: diagnosis, treatment and long-term consequences. Dtsch Arztebl Int 2009;106(33):527–532. doi: 10.3238/arztebl.2009.0527.
11. Pettersson A, Richiardi L, Nordenskjold A, et al. Age at surgery for undescended testis and risk of testicular cancer. N Engl J Med 2007;356(18):1835–1841. https://www.nejm.org/doi/pdf/10.1056/NEJMoa067588?articleTools=true
12. Wei Y, Wu S, Wang Y-C, et al. A 22-year retrospective study: educational update and new referral pattern of age at orchidopexy. BJU Int 2016;118(6):987–993. doi: 10.1111/bju.13588.
13. Sijstermans K, Hack WW, Meijer RW, et al: The frequency of undescended testis from birth to adulthood: a review. Int J Androl 2008; 31:1-11. doi: 10.1111/j.1365-2605.2007.00770.x.
14. Hauff a BP . Why early surgery may not be enough: the search for new therapeutic strategies in cryptorchidism . Klin Padiatr 2008; 220 : 279 – 280. doi: 10.1186/s12891-017-1533-1
15. Sijstermans K, Hack WW, Meijer RW, et a. The frequency of undescended testis from birth to adulthood: a review. International journal of andrology. 2008;31(1):1-11. doi: 10.1111/j.1365-2605.2007.00770.x.
16. Shiryazdi SM, Modir A, Benrazavi S, et al. Causes of delay in proper treatment of patients with undescended testis. Iranian journal of reproductive medicine. 2011;9(1):37-40. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4212144/pdf/ijrm-9-037.pdf

Knowledge, attitudes, and practices of self-ear cleaning among the general population in Riyadh, Saudi Arabia

Khalid A. Bin Abdulrahman [1], Faisal A. Alhazani [2], Faisal T. Alayed [2], Abdulrahman A. Alomar [2], Abdulmajeed H. AlSarrani [2], Abdulaziz M. Albalawi [2], Firas O Alhussini [2]

(1) Department of Medical Education, College of Medicine, Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia
(2) College of Medicine, Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia

Corresponding author:
Khalid A. Bin Abdulrahman, MD, ABFM, MHSc (MEd)
Professor of Family Medicine and Medical Education
Department of Medical Education, College of Medicine,
Imam Mohammad Ibn Saud Islamic University,
Riyadh, Saudi Arabia
Tel.: +966-505445384
Email: kab@imamu.edu.sa
ORCID number 0000-0003-4756-552X

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Khalid A. Bin Abdulrahman et al. Knowledge, attitudes, and practices of self-ear cleaning among the general population in Riyadh, Saudi Arabia. World Family Medicine. 2022; 20(11): 128-135. DOI: 10.5742/MEWFM.2022.95251370

Abstract

Many people practice placing various things in their ears to remove earwax, known as self-ear cleaning. This study aimed to determine the knowledge, attitudes, and practices of self-ear cleaning of the community in Riyadh, Saudi Arabia.

Method: This cross-sectional study was carried out for more than six months. After institutional research ethics approval was obtained for the study, a structured self-response questionnaire was provided to the participants.

Results: 631 (70%) participants completed the study questionnaire. More than 42% of the participants agreed or strongly agreed that cotton buds should be used to clean the ears. Most participants disagreed with the statement that it is best not to clean the ears. More than two-thirds (75.8%) of the participants knew that cotton buds could cause ear infections, 78.9% knew that cotton buds could cause eardrum perforation, and 85.6% knew that cotton buds could push ear wax deeper into the ear. Considering the tool used for self-ear cleaning, almost two-thirds (68.6%) re-ported using cotton buds. No complications due to self-cleaning of the ear were reported in 65%, while 16.2% reported pain because of self-cleaning, while 16% of the participants reported otitis externa.

Conclusion: The general population in the Riyadh region had a moderate to a good level of knowledge about self-ear cleaning and its complications. However, a low attitude towards cleaning with a cotton bud was the primary tool used to clean the ear. About two-thirds (65%) of the participants reported complications due to self-cleaning. 16.2% reported having pain due to ear self-cleaning.

Keywords: Cotton Bud; Ear wax; Self-Ear Cleaning; Saudi Arabia.

Introduction

Ear wax is a natural and healthy material that serves a variety of tasks. It collects dirt, repels water, cleans, lubricates, and protects the lining of human ears. It usually degrades on its own and falls out of the ears in small flakes (1). Many people produce excessive cerumen, accumulating over time, which can become impacted, impeding sound transmission to the eardrum (2,3). Cerumen obstruction, also known as cerumen impaction, is a blockage of the ear canal that causes ear pain, itching and hearing loss (4). Cerumen impaction affects around 6% of the general population [4,5]. Physicians know the external auditory canal has an adequate self-cleaning mechanism (5). Cotton-bud-related medical problems were first described in 1972, including cases of perforation of the tympanic membrane, external otitis, and cerumen impaction. Cotton bud-related injuries are typical for ear, nose, and throat clinic visits (6). Many practices place various things in their ears to remove ear wax, known as self-ear cleaning. Some people believe that it is beneficial to ear hygiene and that it is necessary to remove extra ear wax (6,7). According to experts, manual ear cleaning increases the risk of perforating the eardrum, affecting delicate bones in that area, and increasing the odds of introducing this wax material into an intense place, which can cause itching, discomfort, and tinnitus (8). The use of ear-cleaning sticks is one of the leading causes of eardrum perforation, requiring surgery (9). Although ear diseases and injuries are major life events that cause morbidity and mortality, they are a neglected public health concern, particularly in underdeveloped countries (10,11). This ubiquitous technique, known as self-ear cleaning, is widespread in several countries (12,13). Various objects are placed into the ear of adults and children, either by the children or their parents. Wax impaction, ear infection, facial nerve palsy, dizziness, eardrum perforation, perilymphatic fistula, damage to the ear canal damage, and deafness are all linked to the unintentional and regular use of cotton buds, according to a growing body of research (4,14–18). The researchers found that more than 90% of people at the Aminu Kano Teaching Hospital, Kano, Nigeria, believe that ears should be cleaned to remove wax and that 76.3% of people use cotton buds once a day (12). Furthermore, in Nigeria, 68% reported using cotton buds in their ears, while 90% and 93.4% of respondents in the Kaduna and Osun states used cotton buds for self-ear cleaning (19). Increasing public awareness of the value of natural cerumen, the self-cleaning system, and the dangers of complete removal of cerumen can help to minimize the prevalence of these problems and enhance aural health care (20). Therefore, this study aimed to determine community-based knowledge, attitudes, and practices of self-ear cleaning in Riyadh, Saudi Arabia; furthermore, to investigate the knowledge level among the Saudi community about the hazards associated with using cotton buds when cleaning ears.

Materials and Methods

1. Study Design

A self-administered cross-sectional survey study was carried out on the general population of Riyadh, Saudi Arabia, from April 9 to April 25, 2022.

2. Study subjects

The study population consisted of Riyadh residents aged 18 10 to 65 years. Participants under 18 10 years and older than 65 years, and those who are not residents of the city of Riyadh were excluded. Purposive sampling was performed according to the subject's eligibility criteria. Participation was voluntary, and no incentives were used.

3. Sample size

The sample size was calculated using Raosoft (Raosoft Inc., Seattle, Washington, USA) based on a confidence interval of 95% and a 5% margin of error to meet the standard approximation assumption, which resulted in a sample size of 600 volunteer adults.

4. Study questionnaire

The questionnaire was validated by a pilot study on about 15 participants to recognize any issues with the questions and the language to help modify and improve the content. The questionnaire was obtained and collected from Alshehri et al. (21), Amutta et al. (22), and Hobson and Lavy (23). The questionnaire evaluated various aspects, including information regarding sociodemographic factors such as age, sex, and employment status. Other information obtained includes the knowledge, practices, and complications of self-cleaning the ears. Depending on their age, participants were classified into five groups: '10 -20, 20-30, 30-40, 40-50, ≥50". Educational levels were grouped as "Illiteracy," Elementary/intermediate, Secondary education, University degree, Higher education." To assess their knowledge in a Likert scale grading, participants were asked about the duration of cotton buds, frequency of using cotton buds for ear cleaning, and tools used for self-ear cleaning, to assess practices and attitudes. In addition, participants were asked if they had ever had complications with a cotton bud. For example, 'Otitis externa, Pain, Bleeding, Other, No complication". Nine hundred (900) targeted participants were emailed and reminded to participate. Participants were informed about the purpose of the study and given instructions on completing the questionnaires. Information confidentiality was also ensured. After voluntarily signing the informed consent form, participants were requested to complete the study questionnaire.

5. Data Analysis

MS Excel was used for data entry, cleaning, and coding. In contrast, the statistical package for social science (SPSS) version 26 was used for data analysis with the help of a data analysis expert. Data were expressed by frequency table, percentage, pie charts, and bar charts. Categorical variables were described as frequency and percent, while mean and standard deviation were used to describe continuous variables. The Five Likert scale was coded as strongly disagree (1), disagree (2), neutral (3), agree (4),

and strongly agree (5). The T-test and the chi-test were used to analyze the difference between the demographic variables considering knowledge. All statements were considered significant if the p-value was lower than or equal to 0.05.

Results

Out of the 900 randomly invited to participate in the survey, two-thirds (71.5%) were women, and 36.8% were aged between 21 and 30, while 25.4% were younger between 10 and 20. Furthermore, 92.6% of the participants were Saudi citizens, 51.2% reported having a university degree, and 46.9% were students at the study time (Table 1).

Table 1: The demographic factors of the participants

		Count	Column N %
Gender	Male	180	28.5%
	Female	451	71.5%
Age	10-20	160	25.4%
	21-30	232	36.8%
	31-40	61	9.7%
	41-50	64	10.1%
	> 50	114	18.1%
Nationality	Saudi	584	92.6%
	Non-Saudi	47	7.4%
Education	Elementary/intermediate	16	2.5%
	Secondary education	233	36.9%
	University degree	323	51.2%
	Higher education	59	9.4%
	Student	296	46.9%
Employment status	Unemployed	106	16.8%
	Retired	79	12.5%
	Employed	150	23.8%

Considering the knowledge of self-cleaning among the participants, we found that 31.5% agreed and 9.7% strongly agreed that cotton buds should be used to clean the ears. Furthermore, we found that 39.3% of them agreed, 15.4% strongly agreed that a damp towel or flannel should be used to clean the ears, while 35.5% disagreed and 10% strongly disagreed that water should be used for cleaning the ears. Additionally, we found that most participants disagreed with the statement that it is best not to clean the ears; however, 26.6% disagreed that cotton buds are effective in removing ear wax. Furthermore, 75.8% of the participants knew that cotton buds could cause ear infections, 78.9% knew that cotton buds could cause eardrum perforation, and 85.6% knew that cotton buds could push ear wax deeper into the ear (Table 2).

Considering the knowledge 31.5% agreed and 9.7% strongly agreed that cotton buds should be used to clean the ears. Furthermore, we found that 39.3% of them agreed, 15.4% strongly agreed that a damp towel or flannel should be used to clean the ears, while 35.5% disagreed and 10% strongly disagreed that water should be used for cleaning the ears. Additionally, we found that most participants disagreed with the statement that it is best not to clean the ears; however, 26.6% disagreed that cotton buds are effective in removing ear wax. Furthermore, 75.8% of the participants knew that cotton buds could cause ear infections, 78.9% knew that cotton buds could cause eardrum perforation, and 85.6% knew that cotton buds could push ear wax deeper into the ear (Table 2).

Table 2: Knowledge assessment of ear self-cleaning

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Cotton buds should be used to clean the ears	10.0%	23.5%	25.4%	31.5%	9.7%
A damp towel or flannel should be used to clean the ears	4.1%	18.4%	22.8%	39.3%	15.4%
Only water should be used to clean the ears	10.0%	35.5%	25.7%	18.7%	10.1%
It is best not to clean the ears	25.7%	44.5%	17.3%	9.2%	3.3%
Cotton buds are effective at removing ear wax	10.8%	26.6%	25.7%	30.3%	6.7%
Cotton buds can cause infection of the ear	0.8%	5.5%	17.9%	42.2%	33.6%
Cotton buds can cause a perforation (hole) of the eardrum	0.5%	5.9%	14.7%	39.1%	39.8%
Cotton buds can push ear wax deeper into the ear	1.0%	3.0%	10.5%	37.7%	47.9%

Taking into account the practices of self-cleaning the ear among the participants, we found that 54.7% of the participants reported cleaning both outside and inside the ear. In comparison, 42.5% reported cleaning the outside of the ear only. Furthermore, 93.0% of them reported cleaning both ears equally. In 65% of the participants, complications due to self-cleaning were reported in 65%, while 16.2% reported pain because of ear self-cleaning, while 16.0% of the participants reported otitis externa. Considering the tool used for self-ear cleaning, most participants (68.6%) reported using cotton buds. Furthermore, 62.4% of the participants reported using cotton buds for more than five years, and 76.2% of them reported occasionally using cotton buds for ear cleaning, while 19.4% used them daily (Table 3).

Table 3: Practices and attitude assessment of ear self-cleaning

		Count	Column N %
Practices ear self-cleaning:	Only clean the outside of the ear only	268	42.5%
	Clean inside of the ear only	18	2.9%
	Clean both the outside and inside of the ear	345	54.7%
Which ear is frequently cleaned	Clean both the ears equally	587	93.0%
	Clean the right ear more	35	5.5%
	Clean the left ear more	9	1.4%
Tools used for self-ear cleaning	Cotton bud	433	68.6%
	Key	6	1.0%
	Matchstick	5	0.8%
	Feather	4	0.6%
	Other objects	183	29.0%
Which complication do you have due to ear self-cleaning	Otitis externa	101	16.0%
	Pain	102	16.2%
	Bleeding	5	0.8%
	Other	13	2.1%
	No complication	410	65.0%
Duration of use of cotton bud (years)	Less than five years	163	37.6%
	More than five years	270	62.4%
Frequency of using cotton buds for ear cleaning:	Occasionally	330	76.2%
	Once-daily	84	19.4%
	Twice daily	7	1.6%
	At least thrice daily	12	2.8%

In a comparison of knowledge between the participants according to their demographic factors, we found that gender does not have a significant effect on most knowledge items; however, females tended to agree to accept that cotton buds should be used to clean the ears more than males (P=0.044). Being older, participants tend to agree that they should not clean their ears by themselves (P=0.000). Participants between 20-30 years were the highest group stating cotton buds could cause ear infections. Furthermore, it was found that the educational level of the participants did not significantly affect their level of knowledge (Table 4).

Table 4: The relation between the knowledge of the participants and their demographic factors

		Cotton buds should be used to clean the ears Mean	It is best not to clean the ears Mean	Cotton buds can cause infection of the ear Mean	Cotton buds can cause a perforation (hole) of the eardrum Mean	Cotton buds can push ear wax deeper into the ear Mean
Gender	Male	2.93	2.08	4.11	4.12	4.31
	Female	3.13	2.25	3.99	4.12	4.27
	P- value	0.044*	0.073	0.141	0.953	0.628
Age	10-20	3.16	1.96	3.98	4.01	4.33
	21-30	2.95	2.11	4.18	4.19	4.33
	31-40	3.30	2.33	3.85	4.05	4.02
	41-50	3.08	2.55	3.87	4.13	4.22
	> 50	3.09	2.46	3.94	4.16	4.31
	P-value	0.228	0.000*	0.017*	0.319	0.095
Education	Elementary / intermediate	3.19	2.19	4.19	4.00	4.31
	Secondary education	3.07	2.09	4.00	4.10	4.30
	University degree	3.05	2.28	4.05	4.17	4.30
	Higher education	3.17	2.20	3.93	3.95	4.15
	P- value	0.881	0.178	0.653	0.315	0.655

*The difference is significant with a p-value <0.05.

Discussion

The ear as an organ is responsible for the function of hearing and balance mechanism with a lubricating and immune system that is present as ear wax. Nevertheless, many people tend to self-clean ear wax at home for many reasons that may lead to further problems. In the present study, we assess the knowledge, attitude, and practice of self-ear cleaning among the general population in the Riyadh region, Saudi Arabia.

Taking into account the knowledge about self-cleaning of the ear among the participants, we found that 75.8% knew cotton buds could cause ear infections. In comparison, 78.9% knew cotton buds could cause eardrum perforation, and 85.6% knew cotton buds could push ear wax deeper into the ear. In a previous study carried out by Alwassel et al. about the knowledge of any complications that occur due to the use of cotton buds in the cleaning of the ears, the authors found that 28% of the participants think there are complications, and 72% deny any complications (24). Furthermore, in another study, the authors found that 55.8% knew cotton buds could damage the ear, and 51.6% knew that it had complications (25). In another study by Gabriel et al., it was found that 22.5% of the participants knew that cotton buds could cause complications, and almost half of the sample knew that they could cause damage.

In comparison, 61.2% of them reported that the use of cotton buds had some benefits (26). Furthermore, almost two-thirds of the sample thought cleaning the ear was better, and 37% thought cotton buds effectively removed the ear wax. In a previous study by Alshehri et al., the authors found that 55.1% believed self-cleaning is beneficial (21). Furthermore, in another study, 55.1% to 74.2% of the participants thought self-ear cleaning is not helpful and may even be harmful (18,25,27).

Taking into account the practices of self-cleaning the ear among the participants, we found that 54.7% of the participants reported cleaning both outside and inside of the ear, and 93.0% of them reported cleaning both ears equally. This finding is similar to the researchers' observations in previous studies (6,22,28,29). In a previous study by Adegbiji, the authors found that in 51.1% of cases, both ears were cleaned. In 29.6% of cases, the right ear was more prevalent than the left ear, which was seen in 19.3% of patients (16).

Considering the tool used for self-ear cleaning, most participants (68.6%) reported using cotton buds. This is similar to a previous study conducted among university students at King Khalid University in the Kingdom of Saudi Arabia that showed that the most commonly used instrument was a cotton bud (77.7%) (21). Furthermore, another study conducted by Aldawsari et al. at Majmaah University found that 65.5% of participants reported using cotton buds for self-cleaning (25). Moreover, another study by Adegbiji among patients in a tertiary hospital in Sub-Saharan Africa found that cotton buds were the most common material used in ear cleaning at 44.5% (16).

Furthermore, in our study, we found that 62.4% of the participants reported using cotton buds for more than five years, 76.2% reported occasionally using cotton buds for ear cleaning, and 19.4% used them daily. In a previous study by Adegbiji, the authors found that the frequency of ear cleaning among the participants was daily at 49.3%, weekly at 17.1%, monthly at 13.3%, and occasional at 20.4% [11]. Furthermore, a study by Amutta found that some respondents frequently cleaned both ears daily (22).

Cotton buds have been condemned as they cause several complications, including affected ear wax, infection, and trauma (23). In our study, no complications due to self-cleaning were reported in 65%, and 16.2% reported having pain due to self-cleaning of the ear. In comparison, otitis externa was reported in 16.0% of the participants. In a previous study, common complications associated with using cotton buds for self-cleaning were assessed as external auditory canal injury in 28.9%, foreign body in 25.6%, and traumatic perforated tympanic membrane in 6.2%. Therapy was moderate clinical treatment in 71.1% and unfamiliar body expulsion in 17.5% (13). However, the previous study was conducted among patients in a tertiary hospital, explaining the high prevalence of complications. Furthermore, in a previous study conducted by Alrajhi et al., the authors found that (18%) of the respondents had complications (and 41.2%) reported ear wax impaction as the most common complication, followed by ear pain (39.7%) (30).

Other studies have alluded to gender differences in the frequency of ear cleaning, with more women cleaning more frequently than men (16,31). In this study, gender does not affect the attitude or knowledge of students about ear self-cleaning; however, gender has a significant effect on practicing ear self-cleaning, as females cleaned more frequently than males. In our study, we found that the educational level did not significantly affect knowledge; however, in a previous study, students with a greater level of education had higher knowledge and less practicing (21).

This study had some unavoidable limitations. One of these limitations is the dependence on self-reported behavior of current and previous practices (i.e., ear self-cleaning), which can be easily influenced by social desirability and recall bias. Also, this study was conducted in a single region; therefore, we cannot generalize these results across the country. However, more studies should be conducted to assess the knowledge and practices of self-cleaning in different kingdom places.

Conclusions

The general population in the Riyadh region had a relatively good level of knowledge on self-ear cleaning and its complications. Nevertheless, we found a poor attitude toward cleaning with cotton buds as the primary tool for cleaning the ears. In 65% of the participants, complications due to self-cleaning were reported in 65%, while 16.2% reported pain because of ear self-cleaning, while 16% of the participants reported otitis externa.

Limitations

This study may have limitations. A potential for recall bias exists with self-reported information elicited from respondents. Thus, the method used cannot be guaranteed to be generalizable. This study may have limitations.

References

1. Oladeji S, Babatunde O, Babatunde L, Sogebi O. Knowledge of Cerumen and Effect of Ear Self-Cleaning among Health Workers in a Tertiary Hospital. J West Afr Coll Surg. 2015;5(2):117–33.
2. Sevy JO, Singh A. Cerumen Impaction Removal. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 [cited 2022 Sep 27]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK448155/
3. Adegbiji WA, Alabi BS, Olajuyin OA, Nwawolo CC. Earwax Impaction: Symptoms, Predisposing Factors and Perception among Nigerians. J Family Med Prim Care. 2014;3(4):379–82.
4. Michaudet C, Malaty J. Cerumen Impaction: Diagnosis and Management. afp. 2018 October 15;98(8):525–9.
5. Sevy JO, Singh A. Cerumen Impaction Removal. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 [cited 2022 October 3]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK448155/
6. Hobson JC, Lavy JA. Use and abuse of cotton buds. J R Soc Med. 2005 Aug;98(8):360–1.
7. Earwax build-up [Internet]. nhs.uk. 2017 [cited 2022 Oct 3]. Available from: https://www.nhs.uk/conditions/earwax-build-up/
8. Wright T. Ear wax. BMJ Clin Evid. 2015 July 27;2015:0504.
9. Dolhi N, Weimer AD. Tympanic Membrane Perforations. In: StatPearls [Internet]. Treasure Island (FL): StatPearls

Publishing; 2022 [cited 2022 October 3]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK557887/
10. Wiegand S, Berner R, Schneider A, Lundershausen E, Dietz A. Otitis Externa. Dtsch Arztebl Int. 2019 Mar;116(13):224–34.
11. Otitis Externa: Practice Essentials, Background, Anatomy. 2022 Apr 7 [cited 2022 Oct 3]; Available from: https://emedicine.medscape.com/article/994550-overview
12. Olaosun AO. Self-Ear-Cleaning among Educated Young Adults in Nigeria. J Family Med Prim Care. 2014;3(1):17–21.
13. Olajide T. Patterns of Self-Ear Cleaning among Otorhinolaryngology Patients in Developing Country. [cited 2022 Sep 27]; Available from: https://www.academia.edu/36824335/PATTERNS_OF_SELF_EAR_CLEANING_AMONG_OTORHINOLARYNGOLOGY_PATIENTS_IN_DEVELOPING_COUNTRY
14. Adegbiji WA, Alabi BS, Olajuyin OA, Nwawolo CC. Earwax Impaction: Symptoms, Predisposing Factors and Perception among Nigerians. J Family Med Prim Care. 2014;3(4):379–82.
15. Alvord LS, Farmer BL. Anatomy and orientation of the human external ear. J Am Acad Audiol. 1997 Dec;8(6):383–90.
16. Adegbiji W, Alabi B, Olajuyin O, Nwawolo C. Earwax impaction: Symptoms, predisposing factors and perception among Nigerians. J Family Med Prim Care. 2014;3(4):379.
17. Roland PS, Smith TL, Schwartz SR, Rosenfeld RM, Ballachanda B, Earll JM, et al. Clinical practice guideline: cerumen impaction. Otolaryngol Head Neck Surg. 2008 Sep;139(3 Suppl 2): S1–21.
18. Sevy JO, Singh A. Cerumen Impaction Removal. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 [cited 2022 Sep 27]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK448155/
19. Gadanya M, Abubakar S, Ahmed A, Maje A. Prevalence and attitude of self-ear cleaning with cotton bud among doctors at aminu Kano teaching hospital, Northwestern Nigeria. Nigerian Journal of Surgical Research. 2016 January 1;17:43.
20. Schwartz SR, Magit AE, Rosenfeld RM, Ballachanda BB, Hackell JM, Krouse HJ, et al. Clinical Practice Guideline (Update): Earwax (Cerumen Impaction). Otolaryngol Head Neck Surg. 2017 January 1;156(1_suppl): S1–29.
21. Alshehri A, Asiri K, Alahmari M, Alwabel H, Alahmari Y, Mahmood S. Knowledge, attitudes, and practices of self-ear cleaning among medical and nonmedical students at King Khalid University, Abha, Saudi Arabia. IJMDC. 2020;960–7.
22. Amutta SB, Yunusa MA, Iseh KR, Obembe A, Egili E, Aliyu D, et al. Sociodemographic Characteristics and Prevalence of Self Ear Cleaning in Sokoto Metropolis. IJOHNS. 2013;02(06):276–9.
23. Hobson JC, Lavy JA. Use and abuse of cotton buds. J R Soc Med. 2005 Aug;98(8):360–1.
24. Alwassel AI, Alateeq OM, Almuhaini MS. Knowledge and Awareness of Hazards Associated with Use Cotton Buds in Saudi Community. JMENAS. 2018 Feb;4(2):39–41.
25. Aldawsari SA, Aldawsari AA, Aljthalin AA, AlDossari FM, Alhammad MA, Shatri MSA, et al. Knowledge, Attitudes and Practices of Self-Ear Cleaning Among Medical Students, Majmaah University, Saudi Arabia. :7.
26. (PDF) Effectiveness of Same-Day Human Ear Wax Removal as an Office Procedure and Factors Associated with its Successful Removal [Internet]. [cited 2022 October 3]. Available from: https://www.researchgate.net/publication/321196353_Effectiveness_of_Same-Day_Human_Ear_Wax_Removal_as_an_Office_Procedure_and_Factors_Associated_with_its_Successful_Removal
27. Gabriel OT, Mohammed UA, Paul EA. Knowledge, Attitude and Awareness of Hazards Associated with Use of Cotton Bud in a Nigerian Community. IJOHNS. 2015;04(03):248–53.
28. Macknin ML, Talo H, Medendrop SV. Effect of cotton-tipped swab use on earwax occlusion. Clin Pediatr (Phila). 1994 Jan;33(1):14–8.
29. Crandell CC, Roeser RJ. Incidence of excessive/impacted cerumen in individuals with mental retardation: a longitudinal investigation. Am J Ment Retard. 1993 Mar;97(5):568–74.
30. Alrajhi MS, Alim BM, Aldokhayel SD, Zeitouni LM, Tawil LKA, Alzahrani FA. Knowledge, attitudes, and practices pertaining to cotton-bud usage and the complications related to their misuse among outpatients in an ear, nose, and throat clinic. Journal of Nature and Science of Medicine. 2019 Jan 10;2(4):220.
31. Moore AM, Voytas J, Kowalski D, Maddens M. Cerumen, Hearing, and Cognition in the Elderly. Journal of the American Medical Directors Association. 2002 May;3(3):136–9.

Assessment of patients' knowledge and attitudes towards self-insulin administration and skin manifestations in the regions of Aseer

Rawan Shawabkeh [1], Muteb Aldajam [2], Halimah Alshehri [2], Mohammed Muqri [2], Mohammed Mukharrib [3], Mahdi Alzamanan [4], Mona Alhamad [5], Sukayna Alhamad [6], Haya Alnumayr [7], Muidh Aldajam [8], Hisham Alqahtani [9]

(1) Consultant Endocrinology and Metabolism, Armed Forces Southern Region, Khamis Mushayt, Saudi Arabia
(2) Resident doctor Medicine Department, Armed Forces Southern Region, Khamis Mushayt, Saudi Arabia.
(3) Resident doctor Medicine Department, King Abdullah Hospital, Bishah, Saudi Arabia.
(4) Resident doctor, King Khalid Hospital, Najran, Saudi Arabia.
(5) Resident doctor, Safwa Primary Health Care, Saudi Arabia.
(6) Resident doctor, Primary Health Care, Qatif, Saudi Arabia.
(7) Student, Al Qassim University, Al Qassim, Saudi Arabia.
(8) Student, Albatterjee Medical College, Khamis Mushayt, Saudi Arabia.
(9) Student, King Khalid University, Abha, Saudi Arabia.

Corresponding author
Dr. Rawan Asad Salameh Shawabkeh
Medicine Department, Consultant Endocrinology and Metabolism Armed Forces Southern Region, Khamis Mushayt, Saudi Arabia
Mobile Number: 00966544068275
Email: rawanshawabkeh@yahoo.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Rawan Shawabkeh et al. Assessment of patients' knowledge and attitudes towards self-insulin administration and skin manifestations in the regions of Aseer. World Family Medicine. 2022; 20(11): 136- 143. DOI: 10.5742/MEWFM.2022.95251387

Abstract

Background: Diabetes Mellitus (DM) is one of the most widely prevalent diseases in Saudi Arabia. Health education is considered essential to improve knowledge and change behavior. People affected by diabetes often have inadequate knowledge about the nature of diabetes, its risk factors, and associated complications.

Methods: The study employed a cross sectional design and was conducted in Aseer, Saudi Arabia. We used a validated scale to measure the participants' knowledge. A sample of 182 patients was conveniently selected from primary health care centres.

Findings: Regarding the study participants' knowledge of diabetes mellitus, the results showed that 53.8% of patients are diagnosed with type I diabetes compared to 46.2% diagnosed with type II. Also, the study results revealed that 81.3% of patients have a positive family history of diabetes. Furthermore, 51.8% of patients have a controlled blood glucose level as evident by HBAIc being less than 7.

Conclusions: The injected insulin in the lipoatrophy area may lead to inappropriate absorption of the insulin and poor blood glucose level control with unpredictable hypoglycemia.

Keywords: Knowledge, attitude, insulin injection users, the skin manifestations, Saudi Arabia

Introduction

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia due to defects in insulin secretion, insulin action, or both. DM is classified into four classes; T1DM represents 10% of all cases and results from a cellular-mediated autoimmune destruction of the beta cells of the pancreas. They are insulin-dependent in this type of patient. T2DM represents >90% of all cases of diabetes and it is characterized by insulin resistance followed by reduced insulin secretion from beta cells. Patients of this type use oral hypoglycemic agents, and they mostly end up using insulin. Gestational diabetes is glucose intolerance with onset or diagnosis during pregnancy, and around 60% of women with GDM will develop T2DM in the ensuing 5–10 years. Other specific types of diabetes include those that result from genetic defects in insulin secretion or action (monogenic diabetes), endocrinopathies (e.g., Cushing syndrome, acromegaly), or drugs (corticosteroids, antiretrovirals, atypical antipsychotics) (1). Diabetes Mellitus (DM) is one of the most widely prevalent diseases in Saudi Arabia. Health education is considered essential to improve knowledge and change behavior. People affected by diabetes often have inadequate knowledge about the nature of diabetes, its risk factors, and associated complications (2). Skin lipodystrophy, its most prevalent (95%) form, is a frequent localized diabetes treatment complication, known since the beginning of insulin therapy. LH s are areas of thickened subcutaneous fat tissue confined to insulin injection sites in the form of painless induration, swelling, and nodules lacking an external capsule and steadily growing over time with repeated injections. They tend to shrink after patients stop using the area for injections after being taught correct administration techniques (3). To minimize DM morbidity and mortality by preventing or delaying complications, optimal glycemic management is essential (4). Only patients who adhere to self-management practices such as a nutritious diet, regular exercise, blood glucose monitoring, taking medicines as prescribed, the capacity to manage their diabetes, and good coping mechanisms may achieve optimal glycemic control. This study was to measure the knowledge level among diabetic patients about skin manifestations.

Materials and Methods

Research design

The study used cross section descriptive research design

Sample

The study employed a convenience sample of patients diagnosed with diabetes mellitus in Aseer region. A total of 182 patients diagnosed with diabetes were recruited in the period between April 2022 and June 2022. The sample size was calculated to detect correlation between variables with a medium effect size at 0.80 power, level of significance of 0.05 and p-value of 0.05 (Cohen, 1992). Inclusion criteria were, first, patients diagnosed with type I diabetes mellitus. Secondly, all participants should be able to read and write English or Arabic and be willing and able to consent. Patients were excluded if they had a learning disability, known organic mental disorder, or the presence of visual, language or communication difficulties.

Setting

The study was conducted at three outpatients' clinics operated by the MOH. These clinics were chosen because they serve the majority of patients diagnosed with diabetes and were easily accessed by the researcher.

Recruitment

Patients diagnosed with diabetes mellitus in Saudi Arabia typically visit outpatient clinics monthly. A poster was displayed in these clinics advertising the study and requesting volunteers. Interested participants received further information directly from a researcher. The study recruited acute or chronic patients being treated in these clinics when they attended for appointments. A study information package was given to each participant alongside a verbal explanation about the project. Sufficient time was afforded to each participant to read the study information. Participants were asked to return a signed consent form to the nursing department in the clinic. The researcher administered a study inclusion checklist to assess participants' eligibility. Ethical approval was obtained from the Scientific Research Committee of the MOH (Ref 157892).

Outcome Measures

Socio-demographic data

All participants completed a demographic information sheet, which included data on gender, age, education level, marital status, employment status, income, and BMI.

Participants knowledge about Diabetes Mellitus

The third part asked questions on the type of DM, BMI, and history of high cholesterol levels and their method of using insulin. The survey instrument was a self-administered anonymous questionnaire in Arabic. It contained questions regarding knowledge regarding insulin use and its side effects. This instrument has been employed previously among southern border people in Saudi Arabia. Data collection was done in the form of the participants' responses to the questions.

Results

A total of 182 patients completed the survey questionnaire. The results showed that half of the study participants were aged 34 or less. Moreover, more than half of the study participants were males. The results showed that 56.6% of patients are married, whilst 44.5% of them are single. In terms of economic status, the majority of the participants had medium or low economic status. The results also indicated that half of the study participants attained a secondary education level or less. Moreover, 65% of patients have a government job. Interestingly, more than half of patients had an average monthly income of less than 10,000 SAR. Almost all of the study participants (80%) reported being overweight, obese, or morbidly obese. However, 82.9% of study participants had dyslipidaemia. Table 1 presents the sociodemographic characteristics of the study participants.

Regarding the study participants' knowledge of diabetes mellitus, the results showed that 53.8% of patients are diagnosed with type I diabetes compared to 46.2% diagnosed with type II. The findings of the study indicated that 81.3% of patients have a positive family history of diabetes. Furthermore, 51.8% of patients have a controlled blood glucose level as evident by HBAIc being less than 7. The results of the study demonstrate that 55.4% of patients had a random blood glucose of less than 200 mg/dl, whilst 44.3% of patients had a blood glucose of 200 mg/dl or more. This is also reflected in the results of random blood sugar as 41.1% of patients had a random blood glucose level less than 125 mg/dl. 49.1% of patients believed that diabetes is treated by insulin injection, whilst 51.9% presented a contrasted view. 36.8% of patients had been using insulin for less than five years, while 63.2% had been using it for a long time. The most preferred site of insulin injection is the arm, as it is evident from their response of 47.8%, followed by the thigh at 31.8%, and the abdomen is the least preferred site. Likewise, the majority of patients use insulin more than once daily. 57.4% of patients mentioned that they used a mixed treatment approach to treat diabetic retinopathy. The results showed 71.4% of patients change needles frequently. 51.6% of patients keep a distance of two fingers between each injection. However, 70.9% of patients were not informed about the main complication of insulin injection, lipodystrophy.

Figure 1: Insulin injection-induced bruising in two subjects: in the abdominal wall on the left and on the arm in the right panel

Figure 2: Bruising at the injection site (a, b). Lateral view of an LH nodule coming together with bruising (c), best seen after magnification

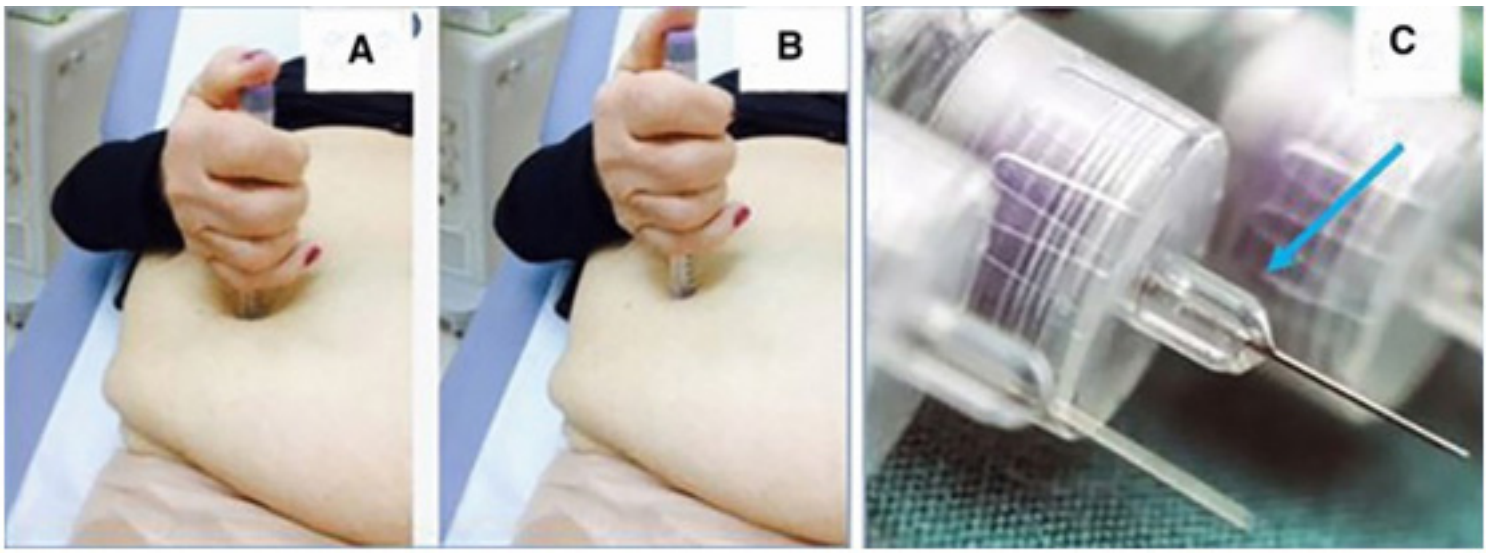


Table 1: Sociodemographic Characteristics of Participants (n = 182)

Characteristics	Frequency	Percentage
Age		
12-24	28	15.3%
25-34	70	38.4%
35-44	10	5.40%
45-54	27	14.8 %
>55	47	25.8%
Gender		
Male	108	59.3%
Female	74	40.7%
Marital Status		
Single	79	43.4%
Married	103	56.6%
Education level		
Primary	29	15.9%
Intermediate	19	10.4%
Secondary	45	24.7%
University	44	24.1%
Graduate	45	24.7%
Employment		
Governmental	120	65.9%
Private	28	15.3%
Military	21	11.5%
Students	6	3.2%
Others	7	3.8%
Income		
Less than 5000 SAR	52	28.5%
5000 -10,000 SAR	69	37.9%
10,000-20,000 SAR	49	26.9%
20,000 – 30,000 SAR	7	3.8%
>30,000 SAR	5	2.7%
Body Mass Index		
Less than Normal	28	15.3%
Ideal body weight	8	4.3%
Overweight	73	40.1%
Obesity	63	34.6%
Morbid obesity	10	5.4%
Do you have high lipid and cholesterol profile?		
Yes	151	82.9%
No	31	17.1%

Table 2: Study Participants Knowledge towards Diabetes

Subscale	Yes	No
Knowledge about diabetes		
What type of DM do you have?		
Type one	**98**	**53.8%**
Type two	**84**	**46.2%**
Is anyone in your family diagnosed with DM?		
Yes	**148**	**81.3%**
No	**34**	**18.7%**
HBA1c Level:		
4 – 5.6	**7**	**3.8%**
5.7 – 6.4	**23**	**12.6%**
6.5 – 7	**65**	**35.7%**
7 – 8	**32**	**17.5%**
8 – 9	**27**	**14.8%**
9 – 10	**20**	**10.9%**
+ 10	**8**	**4.30%**
Random blood sugar test		
Less than 140	**26**	**14.2%**
140 – 199	**75**	**41.2%**
200 – 300	**57**	**31.3%**
300 – 400	**18**	**9.8%**
More than 400	**6**	**3.2%**
Random blood sugar test		
Less than 140	**9**	**4.9%**
140 – 199	**66**	**36.2%**
200 – 300	**37**	**20.3%**
300 – 400	**35**	**%19.2**
More than 400	**35**	**19.2%**
Is the treatment for your DM Insulin?		
Yes	**144**	**79.1%**
No	**38**	**20.9%**
How many years have you used Insulin?		
Less than 5 years	**67**	**36.8%**
5 – 10 years	**64**	**35.1%**
more than 10 years	**51**	**28.0%**
Where is the Site of Insulin Injection?		
Arm	**87**	**47.8%**
Thigh	**58**	**31.8%**
Abdomen	**37**	**20.3%**
How many times do you need Insulin injection per day?		
1	**18**	**9.8%**
2	**78**	**42.8%**
3	**64**	**35.1%**
4	**22**	**12.1%**
Did you change the needle after injection?		
Yes	**130**	**71.4%**
No	**52**	**28.6%**
Do you inject in the same place frequently?		
Yes	**100**	**71.4%**
No	**82**	**28.6%**
Do you keep distance by two fingers between each injection?		
Yes	**94**	**51.6%**
No	**88**	**48.4%**
Have you heard about the Lipodystrophy and skin manifestations due to Insulin Injection?		
Yes	**53**	**29.1%**
No	**129**	**70.9%**

Discussion

First, insulin-delivery syringes were given to diabetic Mellitus (DM) patients in 1924. Since that time, disposable plastic syringes have replaced glass syringes as the primary delivery method for subcutaneous insulin, and insulin pumps have replaced insulin pens and needles. Drug delivery through pens for diverse insulin formulations is now possible due to their simplicity, convenience, and precision (1). Technology advancements made pens more precise and user-friendly about ten years ago, and shorter, sharper needles made injections simpler and more well-liked by patients (2).

182 patients from the Saudi Arabian province of Asser served as the subjects of our investigation. The majority of the study participants were Saudi Arabian, married, over 50, diabetic for longer than five years, and had been taking insulin injections for longer than five years. Most of them aren't properly informed about the risks associated with insulin injections. The majority of individuals experience discomfort and lipodystrophy (LD). Recommendation: By teaching optimal insulin injection techniques and disseminating written instructions, the Insulin Injection Techniques Education Program for Diabetics with Early Diabetes aims to raise patient understanding of insulin delivery and injection site care (press, leaflet).

Lipodystrophy (LD), a side effect of subcutaneous insulin that can manifest as PH , is a frequent complication. Even though the precise origin of PH is unknown, several local injection-related factors, including the extremely growth-promoting qualities of insulin, recurrent damage to the same place when patients do not alternate injections, and needle reuse, appear to be implicated (3). Instead, the immune response can be to blame for the lesions' scarring, which leads to atrophy of the subcutaneous adipose tissue (4). Standard methods call for ocular evaluation and palpation of the injection site to detect PH because some changes are easier to feel than to see. They are linked to all sizes of needles, probes, pens, syringes, and insulin pump cannulas, which are frequently positioned on the same area of skin (5). A large number of studies in the literature describes various rates of LD in various settings, including adult outpatients treated by general practitioners and other patients admitted to diabetes facilities, as well as children. The majority of them don't offer a lot of information on identification technology (6-8).

The Aseer area of Saudi Arabia was the subject of the first research of its sort on knowledge, attitudes, and skin complaints related to insulin injections. It was performed at a specialist medical facility, such as a diabetic department. The multivariate analysis supported our findings, which differed from other studies that discovered some variations between generalist and specialized observations. Another unique element of this study is the first clinical evaluation of skin bruises at the injection site [Figures 1 and 2].

Several studies report skin manifestations like bruises (4, 9, 10). Given the risks associated with insulin injections and the lack of a recognised treatment, this side effect is particularly concerning. Unfortunately, issues with injections have a detrimental influence on the overall amount of injections that diabetics are willing to get, which is unfortunate for both patients and medical personnel. In several trials, even though half of the patients said they had discussed these matters with their doctor, they still had pain and bruises as a result (11). Therefore, unpleasant injection site responses such as pain, redness, bleeding, and particularly bruising pose a significant obstacle to patient compliance with several daily injections. This is crucial in situations when doctors and/or healthcare workers lack the skills or expertise necessary to offer a specific service or where the doctor-patient relationship is poor (12).

An interesting interchange of patient experiences has started over the past few years through several networks, including the American Diabetes Association group. Patients can self-suggest appealing therapies on these noticeboards, including the careful rotation of injection sites, the use of thin, short needles, and the timing of injections. To further understand the reasons behind these injection challenges and discover evidence-based therapies to help patients adhere to their insulin medication, more thorough research is required. To uncover potential tactics to increase patients' knowledge, associated variables of their knowledge were found.

Patients who have never been married may be young people with comparatively higher educational status and likely high rates of type 1 DM who might benefit from further schooling. Employees of the government and non-governmental organizations are often educated individuals who may have greater access to information as well as superior comprehension. Similar to this, urban inhabitants and patients with at least a high school diploma or equivalent had more knowledge than their comparators by 2.25, 3.25, and 4.35 points, respectively. Research at the Hawasa Referral Hospital revealed a similar result. Patients who had at least finished their elementary school may have a larger likelihood of exposure to various communication aids including pamphlets, periodicals, and books , which might be the cause. Aside from their capacity to understand previously provided information, individuals may have minimal obstacles in interacting with the medical staff. It's interesting how many people abuse the insulin pen by not finishing the injection or by using their hands. Most frequently, they destroy the needle cone by pressing the pen too firmly on the skin. Our senior patients who have joint issues in their hands or who are anxious about injections experience this the most frequently. Case studies must be used to back up such anecdotal claims.

Limitations

While the observations noted are interesting, the study population is mainly from a single center and is not representative of the general population in Aseer region.

Conclusion

The injected insulin in the lipoatrophy area may lead to inappropriate absorption of the insulin, poor blood glucose level control with unpredictable hypoglycemia. Future studies should include large subjects, multiple centers, and regions to detect differences between groups.

Acknowledgement
We would like to thank the participants who contributed to our study.

Ethical Approval
The study was approved by the Institutional Review Armed Forces Hospitals Southern Region (Research Project Code: AFHSRMREC/2022/MEDICINE/632).

References

1. Aanstoot H-J, Rodriguez H, Weinzimer S, Vint N, Koeneman L. Precision dosing of rapid-acting insulin matters. Diabetes Technology & Therapeutics. 2020;22(5):346-51.
2. Veasey R, Ruf CA, Bogatirsky D, Westerbacka J, Friedrichs A, Abdel-Tawab M, et al. A review of reusable insulin pens and features of TouStar—a new reusable pen with a dedicated cartridge. Diabetology & Metabolic Syndrome. 2021;13(1):1-7.
3. Berg AK, Nørgaard K, Thyssen JP, Zachariae C, Hommel E, Rytter K, et al. Skin problems associated with insulin pumps and sensors in adults with type 1 diabetes: a cross-sectional study. Diabetes technology & therapeutics. 2018;20(7):475-82.
4. Deeb A, Abdelrahman L, Tomy M, Suliman S, Akle M, Smith M, et al. Impact of insulin injection and infusion routines on lipohypertrophy and glycemic control in children and adults with diabetes. Diabetes Therapy. 2019;10(1):259-67.
5. Regittnig W, Tschaikner M, Tuca AC, Simic A, Feiel J, Schaller-Ammann R, et al. Insulin induces a progressive increase in the resistance of subcutaneous tissue to fluid flow: Implications for insulin pump therapy. Diabetes, Obesity and Metabolism. 2022;24(3):455-64.
6. Klimontov VV, Lazarev MM, Letyagin AJ, Bulumbaeva DM, Bgatova NP. Lipodystrophy at the insulin injection sites: current trends in epidemiology, diagnostics and prevention. Diabetes mellitus. 2020;23(2):161-73.
7. Tsadik AG, Atey TM, Nedi T, Fantahun B, Feyissa M. Effect of insulin-induced lipodystrophy on glycemic control among children and adolescents with diabetes in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. Journal of Diabetes Research. 2018;2018.
8. Özen S, Akıncı B, Oral EA. Current diagnosis, treatment and clinical challenges in the management of lipodystrophy syndromes in children and young people. Journal of Clinical Research in Pediatric Endocrinology. 2020;12(1):17.
9. Neo NW, Seow PY, Tho PC. Reducing bruising and pain through enhancement of subcutaneous anticoagulant injection techniques: a best practice implementation project. JBI Evidence Implementation. 2021;19(1):94-104.
10. Heinemann L. Bruising—An Ignored Issue? : SAGE Publications Sage CA: Los Angeles, CA; 2021. p. 19322968211065066.
11. Kamrul-Hasan A, Paul AK, Amin MN, Gaffar MAJ, Asaduzzaman M, Saifuddin M, et al. Insulin injection practice and injection complications–results from the Bangladesh insulin injection technique survey. European Endocrinology. 2020;16(1):41.
12. Sexson K, Lindauer A, Harvath TA. Administration of Subcutaneous Injections: Nurses can help family caregivers enhance their knowledge, experience, and skill in managing injectable treatments. Home healthcare now. 2022;40(2):70-4.

The Knowledge and Attitude of Precautionary Measurements for COVID-19 Pandemic Among College Students: A Cross-Sectional Study in Jeddah City, Saudi Arabia

Anas S. Alyazidi [1], Mahmoud A. Gaddoury [2], Hussain A. Alkhalifah [1], Fahad A. Alotibi [1], Hani A. Turkstani [3], Abdulaziz T. Jambi [1], Waheeb S. Aggad [4]

(1) Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
(2) Department of Community Medicine, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
(3) Department of Anatomy, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
(4) Department of Anatomy, Faculty of Medicine, University of Jeddah, Jeddah, Saudi Arabia

Corresponding author:
Anas S. Alyazidi
Faculty of Medicine, King Abdulaziz University
Saudi Arabia
Email: aalyazidi0015@stu.kau.edu.sa

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Anas S. Alyazidi et al. The Knowledge and Attitude of Precautionary Measurements for COVID-19 Pandemic Among College Students: A Cross-Sectional Study in Jeddah City, Saudi Arabia. World Family Medicine. 2022; 20(11): 144-157. DOI: 10.5742/MEWFM.2022.95251371

Abstract

Introduction and Research Problem: Since SARS-CoV-2 virus spread, 190 countries have reported over 84 million confirmed cases. Many countries took certain precautionary measurements. The balance between maintaining the educational process and protecting the lives of millions at risk remains a debate and whether to maintain public attendance or promote virtual learning.

The goal of this study is to evaluate the knowledge and attitude of college students in Jeddah, Saudi Arabia, towards COVID-19 precautionary measurements in both public and private spaces.

Materials and Methods: A cross-sectional study for an epidemiological investigation in compliance to STROBE criteria and based in King Abdulaziz University, was conducted during the period of June 2021 looking at percentage of compliance to different precautionary measurements by college students and an analysis of their behavior. A total number of 606 college students were selected on random sampling technique from both genders in 12 different universities. Microsoft software was used with a 95% confidence level and a 5% error margin. Data input and statistical analysis were done by Excel and SPSS.

Summary of Results: 51.32% of the participants were males while 48.68% were females. Mean participants' age was 21.01±2.828. Participants were grouped according to their age into, 21> group and 21≤ group. Groups participated according to their enrolled universities where students enrolled at King Abdulaziz University contributed the most to the questionnaire.

Conclusion and Recommendations: Measuring the knowledge and attitude of college students is essential to understand the virus' social course among this population. Findings were encouraging in terms of their knowledge and attitude. However, periodic training is required based on the previous experience. Social media proved to be a main source in obtaining information. Almost all institutions eventually applied a hybrid model of online/in person classes. This study also bridges the current gap in local research related to the acceptability of the COVID-19 vaccine among university students.

Though the sample has been collected from all major universities in Jeddah, sample sizes from different universities varied. Moreover, the study focuses on the knowledge of the population in the recent days of the pandemic (June 2021) and therefore might not be generalizable outside the domain of the defined population and scope of the present study.

Keywords: coronavirus, SARS-CoV-2, attitude, knowledge, students, precautionary measurements, Saudi Arabia

Introduction

In late December 2019, a report of the novel coronavirus (2019-nCoV)-infected pneumonia (NCIP) was reported among 138 hospitalized patients in Wuhan, China (1). The World Health Organization (WHO) on March 11, 2020, declared the coronavirus disease 2019 (COVID-19) outbreak a global pandemic. On the same day, it was announced that there were now over 118,000 confirmed cases distributed among 114 countries worldwide (2). Since the initial spread of the SARS-CoV-2 virus that causes COVID-19 and as of week 2021-16, the world hit a record of 147,443,848 confirmed cases (3). As of the fourth week of 2021, it was reported that that virus has spread in over 222 countries and territories (4). As the disease spread among millions around the world it is also now evident that individuals with fever or chills, dry cough, shortness of breath or difficulty breathing, new loss of taste or smell and nausea or vomiting are most likely to be diagnosed with COVID-19. This put a burden and a challenge to government bodies worldwide to maintain certain measurements to protect the public and especially towards groups at risk. According to the WHO, risk groups in our communities which include adults over the age of 60, as well as those with health issues including lung or heart disease, diabetes, or immune system disorders (5) are highly exposed as the virus spreads relatively easy and can be acquired through direct, indirect, or close contact with infected people via contaminated secretions, which include saliva, respiratory secretions, or their respiratory droplets, which can be emitted when an infected person coughs, sneezes, speaks, or sings. (6-7). As this study handles the knowledge and attitude of college students towards COVID-19 precautionary measurements; their commitment is essential and can impact the community as a whole with both close contact transmission and household transmission representing two of the most common modes of transmission. The more we know about the virus, its variants, severity and mode of transmission; the more challenges we, as people and governments, confront. Governments that handle economic, health and social issues are now required to maintain the balance of normal social routine and healthcare services. Countries that provide free or universal health care systems are exposed to increased challenges to maintain these charge-free health services to their population. The Kingdom of Saudi Arabia is an example of a country which provides a national healthcare system as well as free health care services through a number of government agencies that handle the ongoing pandemic in a proactive manner which led to the announcement of multiple precautionary measurements nationwide. As early as February 27, 2020, Saudi authorities halted entry for Umrah in Makkah and tourism from coronavirus-hit states. On March 4, 2020, Saudi authorities suspended Umrah for both nationals and residents over coronavirus concerns and as of March 8, 2020 school attendance was suspended and all schools were closed from physical attendance until further notice due to rising concern and confirmed cases of coronavirus disease 2019 (8). Ever since March 8 of the same year and until the midterm break which starts on the two first weeks of 2021, school, college and public educational institutions remained closed and were guided to use distant learning methods. Although there isn't a reliable source on the total number of college and university students in the Kingdom of Saudi Arabia; the General Authority for Statistics released a summary in 2015 stating there are over 1.9 million enrolled college students nationwide (9). With this massive number of college students, it was critical to maintain certain social precautionary measurements that ranged from school closure, social distancing in public spaces, temporary episodes of curfew and mandatory face masks, all to maintain the balance of resuming the educational process and to not overwhelm healthcare facilities. In September 2021, in-person attendance was announced publicly and officially for students aged 12 years and older followed by in-person attendance for students younger than 12 years old on October 30th, 2021 and on October 15th of the same year, the Saudi Minister of Interior announced reducing the restrictions in public precautionary measurements which include removing the mandatory wearing of face masks and social distancing instructions in open areas starting from October the 17th, 2021 (10). According to the WHO, the transmission of SARS-CoV-2 virus (which causes coronavirus disease 2019) in schools remains one of the most concerning questions. In early 2020, few outbreaks were reported in schools worldwide. In most infections or COVID-19 cases reported in children, the infection was acquired at home and at higher rates in high schools than primary and elementary schools. In places where attendance is still partially held as in many colleges in Saudi Arabia, it is highly recommended to maintain personal hygiene, to continue cleaning and disinfecting the surrounding environment and maintain social distancing in all areas. In view of this, we decided to measure the overall adherence and especially the knowledge and attitude of college students enrolled in universities and colleges based in Jeddah towards these precautionary measurements for COVID-19 as it is vital to control the spread of the virus.

Methodology

Study design and samples:

STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines were used in this epidemiological cross-sectional study. A total number of 606 currently enrolled college students selected on random sampling technique basis, both males and females, in 12 different universities and colleges all located in Jeddah city responded to an online questionnaire and consent to provide their data by a non-probability convenience sampling method in June 2021. A total of 606 participants met the inclusion criteria and gave their consent to participate. The data were collected online, by a questionnaire containing 19 questions using Google form which was electronically distributed to college students in both Arabic and English languages. The questionnaire was randomly distributed to students studying in a university/college in Jeddah, Saudi Arabia. The developed questionnaire for this research consisted of four parts: The first part included consent to use the data provided by

the participants. The second part was targeted to collect both personal and demographic variables which included age, gender and current college/university of enrollment. The third part consisted of a mix of 6 close-ended and checklist type multiple-choice questions that assessed the participants' general knowledge of the pandemic which included route of transmission, WHO's recommendations, most common symptoms, participation's in educational courses, how important is the community education in the participant's opinion and assessing their knowledge on approaching COVID-19 after acquiring its symptoms or signs. The fourth part consisted of a mix of 8 close-ended and checklist type multiple-choice questions that assessed the participants' attitude towards the COVID-19 precautionary measures in both public and private spaces. The questions in this part assessed the frequency of leaving their houses, what they carry upon leaving their houses, how often do they maintain social distancing, their behavior towards maintaining face masks and nose covers, other general precautionary measurements, their social behavior with their friends and family, their compliance to new-tech services launched by public authorities and their vaccine adherence. Questions with Yes/No options were coded 1 for Yes and 0 for No. In every question there was a Yes/No/Sometimes options. The Sometimes option was coded 0 as we were focusing on full adherence to the knowledge and attitude. Raosoft® software was used to compute the sample size, which was based on a 95% confidence level and a 5% margin of error. The survey received 606 responses, which was sufficient to form a broad conclusion on college students' understanding and views of COVID-19 precautionary measurements. The questionnaire was written in English initially, then translated into Arabic by the first author and all co-authors who were fluent in both Arabic and English, ensuring that the translation was accurate and comprehensive. One of the co-authors, a public health specialist, reviewed the questionnaire and agreed that it was clear and relevant. Before being distributed, the questionnaire was evaluated on a group of university students to verify that it was clear. Finally, the target demographic received both an English and an Arabic version of the questionnaire simultaneously.

Eligibility criteria

Included candidates were selected according to the following criteria:

- College students
- Enrolled in colleges based in Jeddah, Saudi Arabia

Candidates excluded from the survey:

- Academics and university/college employees not enrolled in a learning program/course
- Students attending universities/colleges outside of Jeddah city

Statistical analysis:

The collective knowledge assessment questions (Q1-Q6) were assembled and given responders a score of 1 when answering every correct option which were as following; for Q1, a score of 1 was given to participants who only chose all three options. In Q2, a score of 1 was given to participants who only chose every option beside the "to use antipyretic when you have a fever" and "the consumption of orange juice rich in Vitamin C" as it was specified to choose the answers according to the WHO guidelines which included all options except for those two options. In Q3, a score of 1 was given to participants who only chose "fever", "cough" and "fatigue" together. From Q4-Q6, a score of 1 was given to participants who answered "Yes". The optimum score is 6/6. The comparison included the gender i.e. male and female, different age i.e. 21 years and older and 20 years and younger, students enrolled in King Abdulaziz University (KAU) and other universities, students enrolled in King Abdulaziz University (KAU) and King Saud bin Abdulaziz University for Health Sciences (KSAUHS), University of Jeddah (UJ) and King Saud bin Abdulaziz University for Health Sciences (KSAUHS). Afterward, a descriptive analysis was performed to describe the students included in the sample based on demographic variables. For categorical variables, frequencies and percentages were calculated. For continuous variables, the mean and standard error were calculated. For inferential statistics, a multiple-linear regression analysis was constructed to model the linear relationship between different independent variables and the outcome (dependent) variable of knowledge and attitude total score. This analysis predicted the total score of knowledge and attitude from; age, gender, and universities groups. Other models were also constructed to determine the predictors of the three different knowledge and attitude constructs (Age, Gender, and University [KAU and others]). The level of significance was set at P-value ≤ 0.05. A Shapiro-Wilk test of normality was done for the sum of questions Q1-Q6 to collect the knowledge score and Q9-Q14 to collect the attitude score. In regards to Q12, we stated a specific and important statement which was (I don't wear a mask when I meet friends or family who don't live at the same house with me) and asked participants to choose "True" if they agree, "False" if otherwise or "Sometimes" if the statement was partially applicable. Furthermore, we explored the relationship between the sum of these questions (continuous dependent variable) and age, gender, universities (independent variables). Microsoft Excel 2016 was used for data entry, and statistical analysis was performed using IBM© SPSS© Statistics version 21 (IBM© Corp., Armonk, NY, USA).

Results

A total number of 606 college students in Jeddah participated and completed the distributed questionnaire (Table 1). 100% of the participants consented to use the provided data for research purposes. Of these, 51.32% (n = 311) were males and 48.68% (n = 295) were females. The mean age of the participants was found to be 21.01±2.828. The participants were grouped according to their age into, 21> group (n= 274) and 21≤ group (n= 332). Groups participated according to their enrolled colleges and universities where students enrolled at King Abdulaziz University contributed the most in participating in the questionnaire (Table 1). The location distribution in the city of Jeddah for the universities and colleges in the targeted population were divided into north, south, east and center (Figure 1).

Table 1. The distribution of participants according to their characteristics.	
Demographic characteristics	**Participants n (%)**
Gender	
Male	311 (51.32)
Female	295 (48.68)
Age in years	
17	2 (0.33)
18	41 (6.77)
19	104 (17.16)
20	127 (20.96)
21	156 (25.74)
22	98 (16.17)
23	23 (3.80)
24	18 (2.97)
25	14 (2.31)
26	7 (1.16)
27	3 (0.50)
28	2 (0.33)
29	3 (0.50)
30	2 (0.33)
31	1 (0.17)
32	2 (0.33)
44	1 (0.17)
46	1 (0.17)
54	1 (0.17)
Current university/college of enrollment	
King Abdulaziz University	342 (56.44)
University of Jeddah	119 (19.64)
King Saud bin Abdulaziz University for Health Sciences	104 (17.16)
Batterjee Medical College	11 (1.82)
Ibn Sina National College for Medical Studies	7 (1.16)
University of Business and Technology	7 (1.16)
Effat University	5 (0.83)
Arab Open University	4 (0.66)
Jeddah College of Technology	4 (0.66)
Dar Al-Hekma University	2 (0.33)
Alfaisal University	1 (0.17)
University/college location (Jeddah city, Figure 1)	
North	18 (2.98)
South	357 (58.93)
East	108 (17.82)
Center	123 (20.30)

Figure 1. Courtesy of Wikimedia Commons. Map of Jeddah, KSA with universities/colleges approximate location distribution.

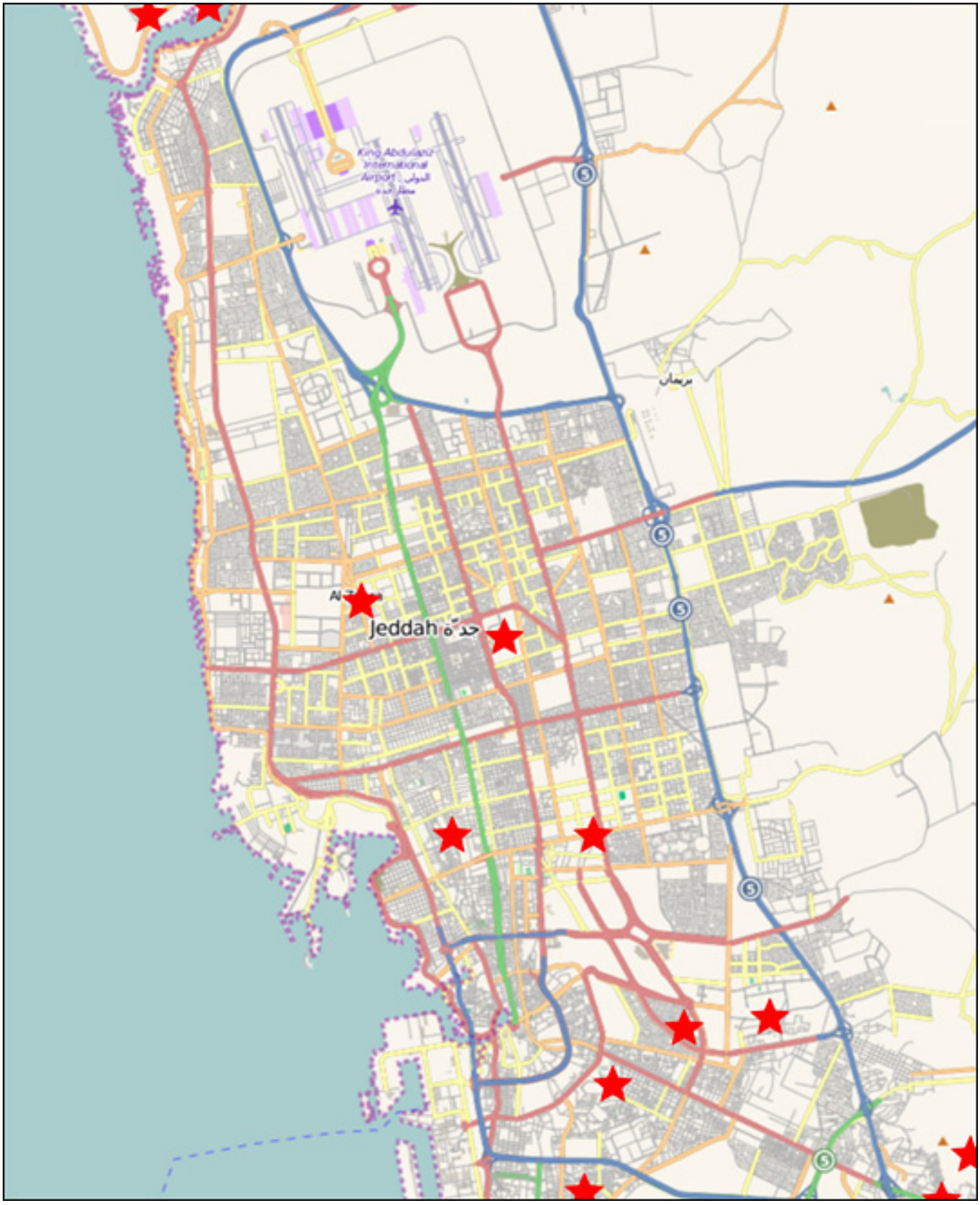


Table 2. Responses to questions assessing the knowledge of Jeddah college students to recommended precautionary measurements in the COVID-19 pandemic.

Knowledge variables	Choices	Total number of responses n (%)
Q1. Choose the ways you think COVID-19 virus is spread by - select all applicable	Through inhaling the virus directly	519 (85.64)
	Through the touch of the virus on contaminated surfaces	515 (84.98)
	Through handshake of an infected individual	519 (85.64)
Q2. According to the World Health Organization (WHO) what are the necessary precautions you should follow to prevent you from getting the virus? - select all applicable	Wash your hands regularly with soap and water	563 (92.90)
	Maintain social distancing	578 (95.40)
	Avoid touching the face	500 (82.51)
	To use antipyretic when you have a fever	140 (23.10)
	The consumption of orange juice rich in Vitamin C	205 (33.83)
	Cover your mouth and nose when coughing or sneezing	561 (92.57)
	Stay home if you feel unwell	527 (86.96)
Q3. What are the COVID-19 most common symptoms? - select all applicable	Fever	583 (96.20)
	Cough	479 (79.04)
	Fatigue	280 (46.20)
	Episodes of Syncope	25 (4.13)
Q4. Did you attend any educational courses on COVID-19?	Yes	205 (33.83)
	No	401 (66.17)
Q5. Do you believe it is important to educate the public on COVID-19?	Yes	577 (95.21)
	No	29 (4.79)
Q6. Do you know what to do if you have signs or symptoms of COVID-19?	Yes	592 (97.69)
	No	14 (2.31)

In response to Q1 (Table 2) (Choose the ways you think COVID-19 virus is spread by - select all applicable) in the knowledge assessment section, The majority of the respondents had an overall knowledge and understanding of the transmission of SARS-CoV2 by choosing the answers of: direct inhaling of the virus, touching contaminated surfaces and hand shaking infected individuals with a percentage of 85.64%, 84.98% and 85.64% respectively. However, 15% of respondents chose only a single or double choice, meaning a lack of full understanding of the entire transmission mode even among the educated population of currently enrolled university/college students. In Q2 which directly assessed the participants knowledge of the WHO's guidelines on necessary precautions an individual should follow to avoid the viral infection, a mass majority (92.90%) were aware of the recommendation of constant hand hygiene using soap and water. Moreover, an even bigger majority (95.40%) chose the answer of maintaining social distancing to avoid the viral infection. Although 95.40% were knowledgeable of the importance of social distancing and it was the third highest answered question in the entire knowledge assessment section; only 68.32% of respondents to Q9 were practicing this knowledge when asked "Do you maintain social distancing outside your house?" and 30.03% practiced it sometimes. In Q2, a lower percentage (82.51%) chose the answer of avoiding face touching leaving a percentage of (17.49%) possibly unaware of the possibilities of hands-face transmission route. Around a quarter of respondents (23.27%) believed that the WHO guidelines' include using antipyretic to control fever. One third of respondents (33.83%) had another misconception by thinking that drinking orange juice rich in percentage dropped to 79.04% for cough and 46.20% for fatigue. The previous mentioned symptoms are indeed part of the U.S. CDC's table for most common symptoms. The fourth choice which was "episodes of syncope" was chosen by approximately 25 persons (4.13%) but it is not part of the US CDC's table of common symptoms. For Q4 we asked if participants had attended any educational courses on COVID-19 and it was found that only 205 participants (33.83%) took an educational course of any form but with a majority of 401 participants (66.17%) not taking any educational courses on COVID-19. When linking this finding to Q6 we can find that most of the community

might "think" that they know about COVID-19 but without a scientific background. In Q6 we asked if participants knew what to do if they acquired signs or symptoms of COVID-19. 592 respondents (97.69%) claim that they knew what to do while 66.17% of respondents never took any educational courses. The same question (Q4) can be linked to Q5 where 95.21% of respondents believe it is important to educate the public on COVID-19 but with only 33.83% of respondents actually taking educational courses.

In Table 3 the results are expressed and a comparison of the total knowledge score according to the different demographic characteristics is included. Total knowledge score was significantly higher in students with age groups ≤ 20 years versus students with age groups ≥ 21 years (P <0.000), in students in KSAUH than students in KAU (P =0.003) and in students in UJ than students in KSAUH (P <0.000).

Table 3. Data were expressed as mean +/- standard deviation. Significance was made using Mann Whitney test as data not normally distributed.

Characteristics	Total knowledge score	Significance
Gender		***P* = 0.004**
Female (n= 295)	3.53±1.186	
Male (n= 311)	3.80±1.161	
Age group		***P* = 0.000**
≤ 20 years (n= 274)	3.41±1.079	
≥ 21 years (n= 322)	3.88±1.217	
King Abdulaziz University (KAU) and other universities' respondents		***P* = 0.677**
KAU (n= 342)	3.65±1.184	
Other universities (n= 264)	3.69±1.177	
King Abdulaziz University (KAU) and King Saud bin Abdulaziz University for Health Sciences (KSAUH) respondents		***P* = 0.003**
KAU (n= 342)	3.65±1.184	
KSAUH (n= 104)	4.06±1.261	
University of Jeddah (UJ) and King Saud bin Abdulaziz University for Health Sciences (KSAUH) respondents		***P* = 0.000**
UJ (n= 119)	3.45±0.945	
KSAUHS (n= 104)	4.06±1.261	
King Abdulaziz University (KAU) and University of Jeddah (UJ) respondents		***P* = 0.060**
KAU (n= 342)	3.65±1.184	
UJ (n= 119)	3.45±0.945	

Table 4. Responses to questions assessing the attitude of Jeddah college students towards precautionary measurements in the COVID-19 pandemic.

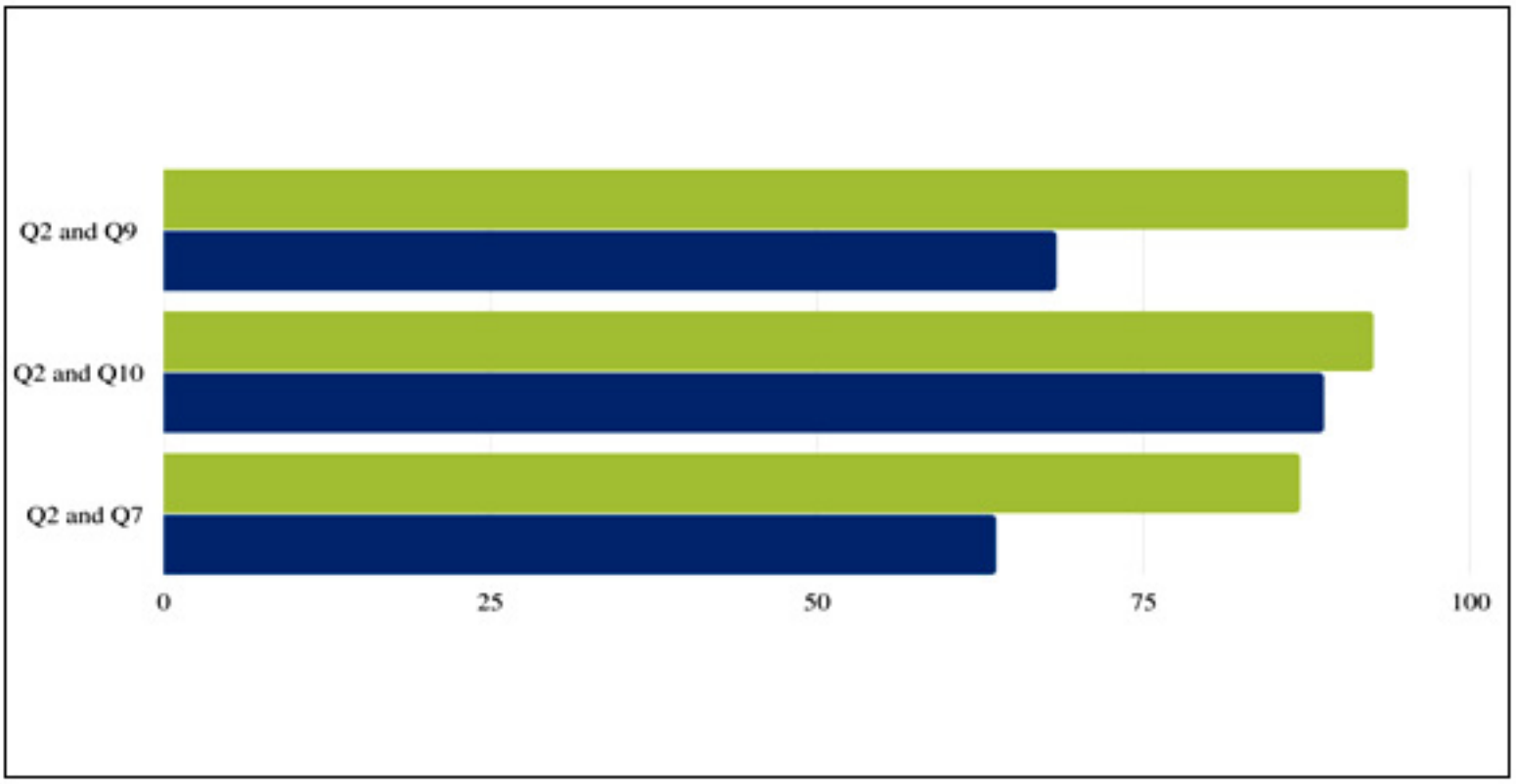
Attitude evaluation	Choices	Total number of responses n (%)
Q7. How many times do you currently leave your house?	More than once a day	179 (29.54)
	Once a day	207 (34.16)
	Weekly basis	182 (30.03)
	Monthly basis	32 (5.28)
	I don't leave my house at all	6 (0.99)
Q8. Choose what you currently carry whenever you leave your house- select all applicable	Face mask	598 (98.68)
	Hand gloves	30 (4.95)
	Sanitizer	410 (67.66)
	Wet Wipes	119 (19.64)
Q9. Do you maintain social distancing outside your house?	Yes	414 (68.32)
	No	10 (1.65)
	Sometimes	182 (30.03)
Q10. Do you maintain face mask covering both nose and mouth at all time?	Yes	538 (88.78)
	No	9 (1.49)
	Sometimes	59 (9.74)
Q11. Do you take any precautionary measurements inside your house?	Yes	136 (22.44)
	No	290 (47.85)
	Sometimes	180 (29.70)
Q12. I don't wear a mask when I meet friends or family who don't live at the same house with me	True	349 (57.59)
	False	90 (14.85)
	Sometimes	167 (27.56)
Q13. I downloaded all mobile applications launched by the Ministry of Health in regards to COVID-19 precautions	Yes	504 (83.17)
	No	102 (16.83)
Q14. I'm now willing to take COVID-19 vaccine	True	552 (91.09)
	False	54 (8.91)
Q15. In case you chose "False" as your answer to the previous question, please mention your reasons		48 (7.92)*

*out of the 54 participants who answered the question of “I’m now willing to take COVID-19 vaccine” with “False”, 48 participants answered the question of “In case you chose “False” as your answer to the previous question, please mention your reasons” which showed a compliance rate of 88.89%. Answers included (but not only) the following; “Lies”, “not comfortable with taking the vaccine”, “fearing the long term side effects which have not been clinically proven”, “Pregnant and I fear the side effects”, “I implement precautionary measurements” and “Because it is not mandatory”.

In response to precautionary measurements imposed to minimize viral spread, participants were asked to self-report behavior (Table 4). In Q8 we asked participants on what they carry when they leave their house. Other positive practices including using a hand sanitizer and wet wipes were found among 67.66% and 19.64% respectively. In Q11 (Do you take any precautionary measurements inside your house?) 47.85% of the participants do not take any forms of precautionary measurements inside their houses and a percentage of 52.14% either constantly or occasionally take certain preventive measurements. Results were 57.59%, 14.85%, and 27.56% to Q12 choices respectively. In Q13, a response rate of 83.17% downloaded every application launched by the Ministry of Health during the COVID-19

pandemic and 16.83% either downloaded some of these applications or have not downloaded any application at all. Finally, Q14 and Q15 assessed the respondents' attitude towards the vaccine where of 91.09% of respondents stated that they are willing now to take the vaccine and only 8.91% stating otherwise.

Figure 2. Relationship between knowledge- and practice-based questions.



In Table 5 the results are expressed and a comparison of the total attitude score according to the different demographic characteristics is included. Total attitude score was significantly higher in females versus males (P <0.0001), in students with age groups ≤ 20 years versus students with age groups ≥ 21 years (P <0.0001), in students in other universities than students in KAU (P =0.003).

After controlling confounding factors in multiple-linear regression analyses, Table 6 displays the predictors of the knowledge and attitude assessment, and its three constructs (Age, Gender & University). Regarding the knowledge assessment, (B = 0.1515, 95% CI: 0.001, 0.017) were the Age predictors, (B = 0.129, 95% CI: -0.014, 0.077) were the Gender predictors, (B = -0.021, 95% CI: -0.014, 0.011) were the University predictors. Regarding the attitude assessment, (B = -0.040, 95% CI: -0.134, -0.024) were the Age predictors, (B = -0.034, 95% CI: -0.169, -0.172) were the Gender predictors, (B = 0.001, 95% CI: -0.065, 0.050) were the University predictors. Finally, regarding the knowledge and attitude assessment, (B = 0.111, 95% CI: -0.133, -0.007) were the Age predictors, (B = 0.094, 95% CI: -0.183, -0.095) were the Gender predictors, (B = 0.020, 95% CI: -0.079, 0.062) were the University predictors.

Table 5. Comparison of total attitude score according to different demographic characteristics. Data were expressed as mean+/- standard deviation. Significance was made using Mann Whitney test as data are not normally distributed.

Characteristics	Total attitude score	Significance
Gender		*P* <0.0001
Female (n=295)	3.37±1.92	
Male (n=311)	2.73±1.94	
Age group		*P* <0.0001
≤ 20 years (n=274)	3.39±1.88	
≥ 21 years (n=322)	2.75±1.96	
King Abdulaziz University (KAU) and other universities' respondents		*P* =0.003
KAU (n=342)	2.86±1.95	
Other universities (n=264)	3.27±1.94	
King Abdulaziz University (KAU) and King Saud bin Abdulaziz University for Health Sciences (KSAUH) respondents		*P* =0.081
KAU (n=342)	2.86±1.95	
KSAUH (n=104)	3.18±1.99	
University of Jeddah (UJ) and King Saud bin Abdulaziz University for Health Sciences (KSAUH) respondents		*P* =0.321
UJ (n=119)	3.47±1.84	
KSAUHS (n=104)	3.18±1.99	
Respondents who attended any educational courses on COVID-19?		*P* =0.581
No (n=401)	3.04±1.89	
Yes (n=205)	3.04±2.07	

Table 6. Responses to questions assessing the knowledge and attitude assessment of Jeddah college students towards precautionary measurements in the COVID-19 pandemic.

Construct	Knowledge assessment		Attitude assessment		Total knowledge and attitude assessment	
Variable	B (significance)	95% CI	B (significance)	95% CI	B (significance)	95% CI
Age	0.1515 (P =0.219)	0.001-0.017	-0.040 (P =0.428)	-0.134- -0.024	0.111 (P =0.647)	-0.133- -0.007
Gender	0.129 (P= 0.268)	-0.014-0.077	-0.034 (P =0.163)	-0.169- -0.172	0.094 (P =0.431)	-0.183- -0.095
University (KAU and others)	-0.021 (P =0.244)	-0.014-0.011	0.001 (P =0.459)	-0.065-0.050	0.020 (P =0.704)	-0.079-0.062

Discussion

Saudi Arabia is the second largest country in the Arab world with a population exceeding 34 million and with a majority of people between 15-64 years. Casting a shadow over the college student's knowledge and attitude in the middle of this pandemic is essential to understand the social and community course and behavior of this pandemic. Saudi Arabia as a country has taken multiple restrictive measurements which included travel ban to China (11), mandatory social distancing, face masking and multiple precautions based on the available knowledge. This study which was the first study to assess the knowledge and practice of college students in Jeddah revealed curious findings. In Q2, the question and choices were based on the WHO guidelines and recommendations in the pandemic and multiple other esteemed health institutions worldwide including Harvard Medical School recommendations. Choices included common recommendations for maintaining a distance of at least six feet between an individual and others alongside other preventive measures (12). In the same question, a percentage of (23.27%) had the misconception that using antipyretic to control fever is part of WHO guidelines. Although this might be true in some cases and some physicians might advise patients to self-medicate for COVID-19 fever in this approach; this is not a recommendation in the WHO guidelines and there isn't any current evidence which supports routine antipyretic administration to treat fever in acute respiratory infections and COVID-19 (13). One intriguing finding was in respect to Q3 where 96.20% of responders showed positive knowledge that fever is a common symptom of COVID-19 but this percentage dropped to 79.04% for cough and 46.20% for fatigue meaning there is a partial lack of clear knowledge of the symptoms for SARS-CoV2 infections for about 17.16% and 50% of respondents. In Q4, 205 respondents resembling a total percentage of 33.83% took an educational course on COVID-19 in contrast to the other 401 respondents who constituted a majority of 66.17%. When linking this finding to Q6 where we asked if participants knew what to do when acquiring a symptom of COVID-19; 592 respondents (97.69%) claim that they knew what to do while 66.17% of respondents never took any educational courses. This linkage suggests that with the increasing trend of COVID-19 campaign especially on social media platforms and private gatherings; many misunderstood concepts might be acquired and used as scientific knowledge. This finding is enhanced by [Al-Hanawi et al, 2020] (14) results where a question regarding the participants' sources of knowledge signify that most students sought and received their knowledge from social media rather than newspaper or television. When linking Q4 with Q5 where 95.21% of Q5 responders believed that it is important to educate the public on COVID-19 but only 33.83% of respondents actually took an educational course. These findings suggest that respondents believe in the importance of spreading knowledge about COVID-19 but with a smaller portion of them actually taking the initiative to do so. This might suggest a lack of access to educational courses or further social causes that requires further analysis and observation. This next section which includes questions from Q7-Q15 mainly aimed at assessing the individual behavior towards certain precautionary measurements focusing on social distancing, masks and hygiene, and other daily routine practices. Some of these practices were already discussed and linked to the knowledge. In Q8, we found that 4.95% wear hand gloves though they are not mandatory requirements in many guidelines as for face masks. This practice is even claimed that it gives a false sense of security where the virus might adhere to the gloves and eventually touch the face or phone. Consequently, hand gloves should be worn whenever instructed depending on your place and occupation. We further assessed different demographic characteristics based on their answers on questions from Q9-Q14 which assessed the population adherence to maintaining social distancing outside their houses. We also assessed their adherence to face covering outside their house which has proven to be one of the most protective approaches to decrease the spread of the respiratory transmitted disease. This question is important since we specifically asked about covering both the nose and mouth where we can notice a large portion of people wearing mask only covering one of those two organs. Another question directly asked if they maintain any precautionary measurements inside their houses since it was one of the major risk factors for spreading the disease in Saudi Arabia. We requested participants to directly answer if they wear a mask or otherwise when meeting a friend or a family member who does not live in the same house as them, hence they are not fully aware of the other person's behavior and how well they maintain precautionary measurements with strangers and in the public space. Since we targeted a younger population with higher chances of using smartphones and social media we asked if they have downloaded the mobile applications created by the Ministry of Health as part of their efforts to control the spread of the disease. This gives a hint of the practice of the population even for non-compulsory measurements such as downloading these apps. Finally we included a question which directly asked about their willingness to take the vaccine. These combined questions are collectively required to maximize our outcomes in controlling this disease. This is consistent with the WHO recommendation labeled "Do it all!" (15) which recommended that mask wearing should be part of a wider and more comprehensive approach which includes physical distancing, avoiding crowds, closed and close-contact settings, good ventilation, cleaning hands, covering sneezes and coughs, and more. In the Saudi government's efforts to maintain the spread of the disease and control the pandemic, the Saudi Ministry of Health launched a series of initiatives and public procedures including the use of modern technologies and phone applications for various reasons (e.g. case detection, health status, vaccine and PCR appointments and etc…). In Q8, the attitude of 98.68% showed a high commitment level to public instructions and carrying a face mask whenever they leave their houses. This shows a positive correlation not only with local public instructions but with esteemed international health organizations and institutions which

recommend mask wearing to reduce the spread of COVID-19. In Q12, results were 57.59%, 14.85%, and 27.56% respectively which suggested that half of the sample population do not take a simple yet effective procedure of mask wearing with people that they do not know who they meet and how far did they implement preventive measurements on themselves. In Q13 we assessed the sample's attitude towards these applications and asked if they had downloaded every mobile application launched by the Ministry of Health during the COVID-19 pandemic. A high response rate (83.17%) showed compliance to downloading every application launched by the Ministry of Health during the COVID-19 pandemic and a smaller fraction (16.83%) either downloaded some of these applications or have not downloaded any application at all. In the last two questions which addressed the participants' tendency towards receiving the vaccine, around 91.09% were positive to do so with 8.91% stating otherwise. We followed up with the 8.91% to inquire about their reasons in Q15 and received a response rate of 88.89% (among the 8.91%) stating different reasons. When conducting the association analysis it was found based on the P-value there was a very significant relationship among male and female participants when assessing their attitude to questions Q9-Q14. The relationship was also significant between the age group of 20 years old and younger and 21 years old and older participants as well as when comparing participants enrolled at King Abdulaziz University with students from the other universities and colleges (Figure 3). In the last question within the questionnaire, it was found that around 91.09% of the targeted population were willing to take the COVID-19 vaccine. In contrast to [Alduwayghiri and Khan, 2021] (16) findings where in regards to the acceptance and attitude of the 31-45 year old population, concluded a negative attitude towards receiving the vaccinations, mostly due to the participants' fear of the vaccine's side effects making it the most chosen reason to reject being vaccinated. This comparison reveals that a younger population (university/college) might have a more positive response towards vaccination. This finding can be strongly supported by the findings of [Almalki et al, 2021] (17) research where he assessed the acceptability of the COVID-19 vaccine and its determinants among university students in Saudi Arabia and it was concluded that 90.4% of participants who were not vaccinated stated they would receive the vaccine. More than three-quarters of the participants declared their trust in the COVID-19 vaccines used in Saudi Arabia. The primary factor for the participants' trust in the COVID-19 vaccine used in Saudi Arabia was their confidence in the government and the healthcare system. However, upon comparing the results with a similar population in a different country, we find an overall low intent to get COVID-19 vaccines (34.9%) by university students in Jordan as investigated by [Sallam et al, 2021] (18). In the same study, it was found that college students enrolled in health faculties tended to have a higher acceptance rate (43.5%) compared to their peers in Scientific or Humanities Schools (23.6%). This can be related to their higher knowledge about the disease (19). Finally, when conducting a multiple-linear regression analysis (Table 6) to display the predictors of the knowledge and attitude assessment and its three constructs, a statistical significant outcome was undetected. This can be explained by the similar level of knowledge and attitude across the sample population (college students) regardless of their age, gender or enrolled university. However, this can also be explained by the positive approach in which the local authorities have taken by making public instruction (attitude) and information (knowledge) accessible to the entire population regardless of the different sociodemographic variables. This finding, disregarding that it lacks significance statistically, when interpreted, can be reassuring that the included sample obtained a decent level of knowledge and a compliance towards the precautionary measurements.

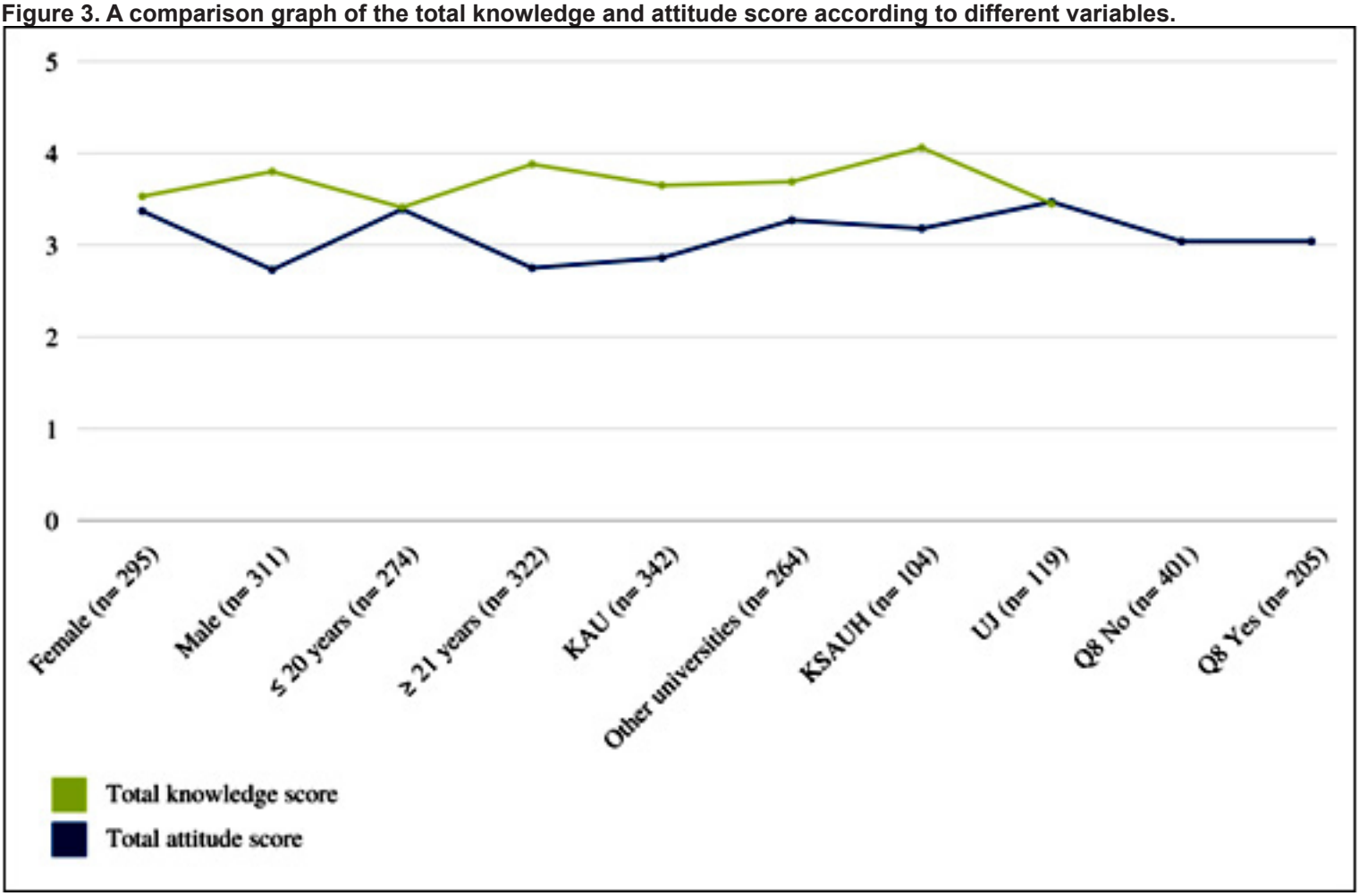
Limitations of this study:

Despite the fact that the sample was drawn from all of the city's main colleges, sample sizes at each differed, which might be a drawback of the current study. Furthermore, because the study solely focuses on general public knowledge in the early days of the pandemic (June 2021), it may not be generalizable outside the specific demographic and scope of the current study. Furthermore, maintaining good hand hygiene is a socially acceptable habit. As a result, in a self-reported research, respondents may over-report hand-washing routines, resulting in exaggerated results. Non-obtrusive monitoring studies may produce more impartial data and provide a more accurate portrayal of actual participant behavior. However, in the midst of the epidemic, such a method of data collecting proved to be ill-advised. With a greater grasp of the disease, more in-depth knowledge assessment and analysis is necessary.

Conclusion

In this study, although the findings were encouraging in terms of college student's knowledge and attitude towards the COVID-19 pandemic, however, periodic and sufficient training to effectively cope with such diseases in the future is required based on the lessons obtained from the previous approaches. Social media has proven to be a main source for a majority of college students and the younger generation when it comes to obtaining information and knowledge, and hence, efforts to increase community awareness about the pandemic will be more effective if social media platforms are incorporated into the strategy for distributing information and educating the public. Furthermore, in this research we managed to demonstrate a strong association between male and female attitudes and practices during the pandemic as well as in different age groups and in students attending different universities and colleges. The association found that college students have a favorable attitude toward precautionary measures and vaccinations. This is likely owing to the fact that university students are a more educated and higher awareness group of the society, with a more positive attitude. As a result, students may play a key role in fostering a positive public sphere. The outcomes of this study will aid researchers and government agencies

Figure 3. A comparison graph of the total knowledge and attitude score according to different variables.



in comprehending the existing scenario, particularly since Saudi colleges seek to implement in-person education beginning in 2022. During the prior period of the pandemic, almost all educational institutions used remote education, which later evolved into a hybrid approach of online/in-person attendance. This study will also bridge the current gap in local literature related to the COVID-19 vaccine's acceptance among university students.

Acknowledgment:
Authors would like to express their special thanks of gratitude to Majed Osylan and Rakan Abu Alqam for their role as data collectors/curation and for their efforts in distributing the questionnaire as well for organizing and preparing the obtained data. They are also grateful to all participants who filled in the questionnaire for providing their valuable time and contribution in this work.

Ethical approval:
Ethical approval for the study protocol, questions and consent statement was granted by the Faculty of Medicine Ethics Committee at King Abdulaziz University with the reference number (317-21). Individuals willing to participate in this survey and consent to use the data provided for research purposes were needed to click the "Yes" button and only then would be directed to the questionnaire. This research was also registered at the Public Health Authority, Public Health Analytics and Research with registration number (202106171)

References

1. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. JAMA - Journal of the American Medical Association. 2020 Mar 17;323(11):1061–9.
2. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. World Health Organization. (https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020).
3. Epidemiological curves Geographic distribution of COVID-19 14-day COVID-19 case notification rate per 100, 000, weeks 45-46 [Internet]. Available from: https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases
4. COVID-19 Weekly Epidemiological Update Global epidemiological situation.
5. Western Pacific [Internet]. Available from: https://www.who.int/westernpacific/emergencies/covid-19/information/high-risk-groups
6. Luo L, Liu D, Liao XL, Wu XB, Jing QL, Zheng JZ, et al. Modes of contact and risk of transmission in COVID-19 among close contacts. medRxiv. 2020;
7. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia. New England Journal of Medicine. 2020 Mar 26;382(13):1199–207.

8. Timeline: Here are all the measures taken by Saudi Arabia to combat the coronavirus by Ismaeel Naar, Al Arabiya English. (https://ara.tv/bfw3z).
9. Statistical Summary Of Higher Education Students. 2015. General Authority for Statistics, Saudi Arabia. (https://www.stats.gov.sa/ar/3218).
10. Harvard Health Publishing. https://www.health.harvard.edu/diseases-and-conditions/preventing-the-spread-of-the-coronavirus.
11. Algaissi AA, Alharbi NK, Hassanain M, Hashem AM. Preparedness and response to COVID-19 in Saudi Arabia: Building on MERS experience. Vol. 13, Journal of Infection and Public Health. Elsevier Ltd; 2020. p. 834–8.
12. Preventing the spread of the coronavirus Physical distancing, masks, vaccines, and other preventive measures [Internet]. 2021. Available from: https://www.health.harvard.edu/diseases-and-conditions/preventing-the-spread-of-the-coronavirus.
13. Park S, Brassey J, Heneghan C, Mahtani K. Managing Fever in adults with Managing Fever in adults with possible or confirmed COVID-19 in Primary Care [Internet]. 2020. Available from: https://www.racgp.org.au/afp/2015/januaryfebruary/a-is-for-aphorisms/].
14. Al-Hanawi MK, Angawi K, Alshareef N, Qattan AMN, Helmy HZ, Abudawood Y, et al. Knowledge, Attitude and Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study. Frontiers in Public Health. 2020 May 27;8.
15. Mayo Clinic Staff B. How well do face masks protect against coronavirus? How well do face masks protect against coronavirus? Get answers to your questions about face masks, including how to use them properly. Related information.
16. Alduwayghiri EM, Khan N. Acceptance and Attitude toward COVID-19 Vaccination among the Public in Saudi Arabia: A Cross-sectional Study LinkOut-more resources Medical MedlinePlus Health Information [Internet]. Vol. 22. 2021. Available from: https://pubmed.ncbi.nlm.nih.gov/34615775/
17. Almalki MJ, Alotaibi AA, Alabdali SH, Zaalah AA, Maghfuri MW, Qirati NH, et al. Acceptability of the COVID-19 vaccine and its determinants among university students in Saudi Arabia: A cross-sectional study. Vaccines. 2021;9(9).
18. Sallam M, Dababseh D, Eid H, Hasan H, Taim D, Al-Mahzoum K, et al. Low covid-19 vaccine acceptance is correlated with conspiracy beliefs among university students in Jordan. International Journal of Environmental Research and Public Health. 2021 Mar 2;18(5):1–14.
19. Sallam M, Dababseh D, Yaseen A, Al-Haidar A, Ababneh NA, Bakri FG, et al. Conspiracy beliefs are associated with lower knowledge and higher anxiety levels regarding covid-19 among students at the university of Jordan. International Journal of Environmental Research and Public Health. 2020 Jul 2;17(14):1–15.

Experience of undergraduate medical students of Al-Imam Mohammad ibn Saud Islamic University (IMSIU) about the international summer elective program (ISEP)

Khalid Bin Abdulrahman [1], Alswayed, Khalid E. [2], Alomar, Naif A. [2], Al Thaqfan, Naif A. [2] Abozaid, Hesham S. [2]

(1) Department of Medical Education and Department of Internal Medicine, College of Medicine, Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia;
(2) College of Medicine, Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia

Corresponding author:
Khalid Ebrahim Alswayed
Medical intern
College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU)
Saudi Arabia
Email: khalid_alswayed@hotmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Khalid Bin Abdulrahman et al. Experience of undergraduate medical students of Al-Imam Mohammad ibn Saud Islamic University (IMSIU) about the international summer elective program (ISEP). World Family Medicine. 2022; 20(11): 158-164. DOI: 10.5742/MEWFM.2022.95251373

Abstract

Background: An approach to a way of learning that is not considered as a necessary part of the medical curriculum credits is by having an additional medical course program referred to as 'elective', which is usually conducted in a period other than the yearly academic calendar. Electives are selected based on student interest, whether it be a research type or clinical rotations.

Purpose: to understand the student's perception about the experience of the International Summer Elective Program (ISEP) in year 2017 from 1st year to 4th year on the students selected and who traveled for this study.

Methods: An online form questionnaire was sent to students during February 2019 from 1st year to 4th, with 21 items, to study their experience of the International Summer Elective Program (ISEP)

Results: Twenty-one of the participants (47.7%) stated that their elective scientific research standards had met their expectations, while 9 out of the total participants (20.5%), stated the (ISEP) program was above their standards. Also, 18 students (40.9%) believe they had gained 'good' quality research skills throughout the International Summer Elective Program (ISEP).

Conclusion: The International Summer Elective Program (ISEP) study on Al-Imam Muhammad Bin Saud Islamic University College of Medicine students provided a positive impact on multiple areas. We recommend Saudi medical colleges consider initiating international electives courses for their students for a broadly positive effect on multiple areas to maximize the full potential of their future physicians to serve the Kingdom of Saudi Arabia.

Keywords: Elective summer program, medical students, extracurricular activities, Saudi Arabia

Introduction

International health electives are initiated by many medical colleges as part of their curricula, whether during the pre-clinical phase or the clinical phase, to strengthen their student's knowledge and enhance their communication skills (1). The general medical council (GMC) defines an elective as 'A period of clinical experience that the student chooses and is often taken outside the U.K.,' allowing them to form their learning experience (2).

Besides the formal medical knowledge learning process, International health electives play a role in preparing students to face different public health challenges and provide them to face new cultural perspectives, making their future career goals more transparent and more defined (3).

A fair number of medical students from developed countries prefer to have their summer electives in a foreign country to be exposed to various regional outbreaks or country-specific disease cases even though some ethical difficulties and different health risks issues may arise in some developing nations (4).

Students who take health electives abroad have the chance to develop their résumés uniquely, solidifying their research skills and their connection network by establishing multi-aspect projects about certain medical cases that tend to occur in developing or rural areas of the elective country, as well as providing medical care to low resource populations under different health care systems which are not what they are like in their home country(5-6).

The international health electives could be applied to different fields, such as the Pharmaceutical field, clinical practice elective and research-based electives. This can provide insight about the importance of the health electives for the undergraduate medical students in different health care fields in order to allow them to excel in their future career academically and clinically while discovering new cultures.

The Liaison Committee on Medical Education (LCME) states that 'accreditation standards affirm that the medical school curriculum should include elective courses to supplement the required courses and provide opportunities for students to pursue individual academic interests'. International health electives can support different aspects of the medical school curriculum (7-8).

Al-Imam Mohammad Ibn Saud Islamic University (IMSIU) College of Medicine had a summer elective program that provides students with multiple experiences to practice their clinical and research knowledge in many medical fields. We aim by doing this research to find the influence of our international health electives on medical students who enrolled in our programs through either positive or negative results and their overall experience.

Material and Methods

Study design: a cross-sectional study to assess the perceptions of participating students in this study through a survey questionnaire that evaluates the experience of the International Summer Elective Program (ISEP).

Regarding the validity and the methodology of the questionnaire, it was adopted from a previous study conducted in King Saud University medical college after gaining permission for use and editing from the author Prof. Mona M. Soliman before initiating this study(1). Revised sessions were conducted to reevaluate the validity of the questionnaire before initiating this study.

Study instrument:
A self-administered questionnaire in English language consisting of 19 items divided into 3 parts. The first part is about demographics, the second part consists of 13 questions in a five point Likert scale to assess the experience and perceptions of 44 medical students at Imam Mohammad Ibn Saud Islamic University College of Medicine and the last part was the student's recommendation of the elective itself.

The students were informed about the purpose of the study. Instructions regarding the questionnaires were provided to volunteering students; also the confidentiality of information was ensured.

Once students voluntarily signed the informed consent, they were requested to fill in the study questionnaires. All students were emailed to participate and were reminded by emails and via an SMS web link.

Research participants
The questionnaire survey was sent in February 2019 to a total number of 60 students who had taken part in the (ISEP), in the summer of 2017 and who participated to the end of the electives. The criteria of selection was based on multiple points (academic performance, extracurricular activities and Curriculum Vitae); reminders were sent to them every three days. Out of a total of 60 students, complete responses were provided by 44 respondents (73%); 12 (27.3%) were from the 1st year, and six respondents (13.3%) from the 4th year, as represented in Table 1. The participants were contacted by their emails and contact information that the student affairs of the college provided.

Students who were enrolled but didn't travel for any different reason were excluded from the study, as well as incomplete responses.

Data analysis
Data analysis was carried out with a chi-square test of independence variables using the SPSS program. This test allows the researcher to gauge whether there is a relationship between two categorical variables of interest. When interpreting the chi-square independence test, adjusted standardized means can be helpful guidelines

to pinpoint what categories are most influential – that is, where is the most significant deviation from the expected average.

Ethical approval

The study was conducted after approval from the IMSIU IRB committee project number 75-2019 session number 27, dated 17 November 2019. The study has followed the guidelines of the Helsinki declaration.

Results

Table (1) shows the demographics of the participants and their distribution into different categories which are gender, academic year, times of elective experienced, countries of elective travelled and the number of publications at the time of taking the survey.

The most significant number of the study sample were elected after their 2nd year with percentage of 34.1% followed by 1st year with percentage of 27.3%, then 3rd year with 25% and 4th year with 13.6%, while 65.9% of the study sample individuals were elected once for summer international health elective, and 34.1% of the study sample individuals were elected twice for the summer international health elective.

The most students traveled abroad to the United Kingdom for their elective with a percentage of 40.9%, followed by the United States of America; United Kingdom with percentage of 25%, equals the percentage of Spain, followed by the United States of America alone with a percentage equal to 2% . Moreover, the highest percentage of students recommend continuing the ISEP program, with (33) 75% saying yes.

Table 1 shows the demographics of the participants

Factor	Category	N	Percent %
Gender	Male	44	100
	Female	0	0
Academic year	1st year	12	27.3 %
	2nd year	15	34.1%
	3rd year	11	25.05%
	4th year	6	13.6%
Times of elective experience	Once	29	65.9%
	Twice	15	34.1%
Country of elective	Spain	11	25.0%
	Spain; United Kingdom	1	2.3%
	Spain; United States of America	1	2.3%
	United Kingdom	18	40.9%
	United States of America	2	4.5%
	United States of America; United Kingdom	11	25.0%
	Total	44	100%
Publication status from the elective project	Yes	8	18.2%
	No	26	59.1%

Table 2 perceptions of students on International Summer Elective Program (ISEP)

Item	Mean	SD	Strongly agree, n (%)	Agree, n (%)	Neutral, n (%)	Disagree, n (%)	Strongly disagree, n (%)	x2 (*P*-value)
1-The quality of logistics in your (ISEP) (language barriers, food-chain availability, accommodation, preparations, transportation. etc.) was suitable.	4.05	0.81	14 31.8%	19 43.2%	10 22.7%	1 2.3%	0 0.0 %	15.818 (p<0.001)
2-The ISEP program gave you a chance to be aware of different cultures	3.98	0.70	9 20.5%	26 59.1%	8 18.2%	1 2.3%	0 0%	30.727 (P < 0.001)
3-the (ISEP) PROGRAM met your scientific research target standards?	2.95	0.78	1 2.3%	9 20.5%	21 47.7%	13 29.5%	0 0%	18.909 (P < 0.001)
4-You had adequate supervision during (ISEP) program	3.70	0.90	7 15.9%	22 50.0%	11 25.0%	3 6.8%	1 2.3	31.455 (P < 0.001)
5-Do you agree that your experience with (ISEP) was better than if have a similar program but in Saudi Arabia?	3.45	1.27	10 22.7%	15 34.1%	8 18.2%%	7 15.9%	4 9.1	7.591 (.108)
6-the quality of research skills you think you've gained throughout your (ISEP) program is suitable	3.61	0.89	7 15.9%	18 40.9%	14 31.8%	5 11.4%	0 0%	10.000 (.019)
7-you have the opportunity and support to continue your research in your home country after returning from the (ISEP) program.	2.68	1.27	2 4.5%	13 29.5%	9 20.5%	9 20.5%	11 25.0	7.818 (.098)
8-You are overall satisfied with the country's experience where your elective was conducted (not the ISEP program itself).	4.05	0.89	16 36.4%	16 36.4	10 22.7%%	2 4.5%	0 0%	12.000 (.007)
9-the (ISEP) program made you aware of what future career/specialty to chase?	2.59	1.17	2 4.5%	7 15.9%	17 38.6%	7 15.9%	11 25.0	14.182 (.007)
10-You feel you have become more advanced in research skills in comparison with my other colleagues after the (ISEP) program.	3.66	0.99	11 25.0%	12 27.3%	16 36.4%	5 11.4%	0 0%	5.636 (0.131)
11-you've got an idea on what are the trends globally about research topics after you completed the (ISEP) program	3.32	0.93	3 6.8%	18 40.9%	14 31.8%	8 18.2%	1 2.3	23.500 (P < 0.001)
12- you are still connected with research/faculty members since you finished your (ISEP) program.	2.55	1.25	3 6.8%	7 15.9%	13 29.5%	9 20.5%	12 27.3	7.364 (.118)
13-You are overall satisfied with your experience from the (ISEP) program.	3.55	0.90	7 15.9%	15 34.1%	17 38.6%	5 11.4%	0 0%	9.455 (.024)
Mean all	3.40	0.56						

Regarding the student's perception of International Summer Elective Program (ISEP), Table (2) demonstrates their agreement levels on a five point Likert scale from strongly disagree to strongly agree in thirteen different statements of their experience regarding the elective, with the statistical significance for each statement.

Individuals in the study sample who are students in the medical college show that students' perceptions contribute to the International Summer Elective Program's necessity; the mean of all phrases is 3.40, with a standard deviation of 0.56. This Mean lies in the third category of Five Scale which indicates most of study sample individuals agree and the results are as follows:

- Where the phrase "The quality of logistics that were in your (ISEP) (language barriers, food-chain availability, accommodation preparations, and transportation. etc.) was good?" shows that the student agrees on the quality of logistics with a mean value equal to 4.05 ($p<0.001$) and the phrase "Your overall experience of the country your elective was in (not the ISEP program itself)." came in the first rank with mean value equal 4.05 out of 5 ($p<0.05$), which shows that the students agree the country of participation has a strong effect for them.

- The phrase "The ISEP program gave you a chance to be aware of different cultures " came in the second rank with a mean value equal to 3.98 out of 5 ($p<0.001$), showing that the students agree that the election gave them a chance to be aware of different cultures.

- The phrase "You had adequate supervision during (ISEP) program " came in the third rank with a mean value equal to 3.70 out of 5 ($p<0.001$), which shows that the students agree that the election gave them a chance to be aware of different cultures.

- The phrase "You feel you have become more advanced in research skills in comparison with other colleagues after the (ISEP) program. " was in the mean value equal 3.66 out of 5, which was not statistically significant.

Table 3 shows the students recommendation regarding the continuation of the International Summer Elective Program (ISEP) or not, with multiple written responses from the students.

75% of the study sample individuals recommend continuing the ISEP program in our college.

Recommendations regarding (ISEP) program:

- The International Summer Elective Program (ISEP) should be taking place every year to help students be aware of a different culture.
- The International Summer Elective Program (ISEP) orientation sessions should be periodically for the students, should be organized more often with advanced tools such as online registration for elective selection to improve accessibility.
- ISEP program should be advertised more prominently and offered to the students at an older stage of their academic year, i.e., fourth and fifth years.
- Increasing the number of spots of students to allow further students to benefit from the program.
- Involving additional countries for the International Summer Elective Program (ISEP) to increase students' benefit from the program.
- It encourages the students to participate in the ISEP program where it improves their experience.

Qualitative analysis of the study :

A few students respond freely about their experience, and some of those follow

A: 'It would be better if publication were a mandatory point from the hosting institute.'

B: 'Continuous support and supervision from "our college " is significant for a good outcome to be observed; because it was almost nonexistent after the program.'

C: 'It was an honor and pleasure to be part of this program and college; it was an excellent experience that I will remember and helpful. What I would recommend is that it focus more on how to conduct a good research article. '

D: 'Personal improvement exceeds research skills benefits.'

Discussion

International health electives demonstrated different ways on how students can develop their skills, whether in research or preparing their clinical skills in other countries while interacting with vulnerable communities or among cultural differences, encouraging them to expand their awareness on how they can deal with more compassion and empathy. However establishing a framework of the health elective like three stages of "Pre-departure planning and briefing, in-country experiences and returning from the elective evaluation." promotes a promising role in ensuring medical students are "safe, and healthy" during their elective work and 'do no harm' when facing ethical issues when dealing with things beyond their clinical scope of training. Also to prepare the students before their elective it's essential to review applicants academic records and their professional history as well as past extracurricular activities. Moreover, students willing to take their electives in developing countries need to obtain medical evacuation insurance with specific prophylaxis such as HIV and antimalarial medications for their safety measures (10).

Medical students may face ethical and moral dilemmas because the geographical settings are not very familiar; as in our results, 22 students (50%) agree they had adequate supervision during their ISEP program (P-value of <0.05). Even if the student's response is still valuable, other studies highlight the critical aspect of the host's experience with elective programs(11-12).

In contrast, our students strongly agree (36.4%), and agree (36.4%) to have had a satisfying experience in countries in which their elective was conducted (P-value of <0.05).

Table 3 shows recommendations of study sample individuals to continue the ISEP program

	Frequency	Percent (%)	Some Student responses
yes	33	75.0 %	- I think the program was about opening doors and horizons for the student that he knew not to exist more than developing skills. -It was an honor and pleasure to be part of this program and college; it was an excellent experience that I will remember and helpful. What I would recommend is that to focus more on how to conduct a good research article. - Personal Improvement exceeds research skills benefits.
No	1	2.3 %	
Maybe	10	22.7 %	- Continuous support and supervision from "our college "is significant for a good outcome to be observed; because it was almost nonexistent after the program. -It should be more organized, with clear goals, the students, and the research center. -It was biomedical research. It should be medical. That's my point.
Total	44	100.0 %	

Health electives also influence students' career choices in the future and provide hindsight guidance to their decision, especially toward public health practice or physician-scientist, while also raising the Interpersonal skills, Improvement of resourcefulness, and cost-effectiveness of the student's perspective. However, maximum benefits could be earned if pre-, intra-, and post-elective training programs were applied to the students to have fixed guidelines of health electives for the upcoming challenges and minimize the negative points like health and safety risks (13).

With the growth of global health importance, many U.S. institutions and organizations emphasize programs to improve the outcome of health state among individuals in the United States and around the world (14).

Training medical students is the leading way to get different experiences in the medical field. The training programs should be under the supervision of institutions that guide the process of training (15).

Regarding career choices, only two students (4.5%) strongly agree, and 7 (15.9%) agree they are aware of future career choices (P-value of <0.05). Furthermore, another study demonstrates that Surgical program electives played a vital role in developing medical students' ethical and surgical skills in underdeveloped countries that may positively influence their practice in the future (16).

Most of the medical students who have taken international health electives in our college were satisfied with the overall experience of global health electives ($P < 0.05$), also many of our student participants, 33 (75%), recommended continuing (ISEP) program in our college. Furthermore, compared to the analysis of the elective curriculum in undergraduate medical education, the Croatia study, suggests that the majority of the students decided to take the most self-preferred elective for them 611 (73.3%) if they have the chance to do so (17).

Another study outlined that all the students (100%) out of (8) responses strongly agreed that the elective course increased their awareness of pharmacists' needs on

on medical outreach teams and would recommend this elective course to other students. It's an opportunity to gain specific skills, knowledge, and even confidence regarding the health care system (18).

Moreover, our students report they gained relevant research skills from their elective ($P < 0.05$).

The value and the benefit of this study is to shed some light on how student's exposure to different challenges under various cultures could provide them with a different source of learning, which enabled them to apply problem solving strategies and ideas that they've adopted from outside their home country into their daily or future academic and non-academic life.

Furthermore, we do recommend other national medical colleges to consider initiating international health electives for their students.

Study limitations

Students' experience was evaluated two years after their elective program was conducted, which may cause recall bias. Country of elective may have had a role toward students' perception as a whole and it should be put into consideration as well as the number of electives encountered for each individual.

Acknowledgement:

We would thank all the participants who put their work into the study and all the faculty members, and Prof. Mona M. Soliman, MBBS, MSc, Ph.D., for permitting us to use their validated Questionnaire.

References

1- Neel AF, AlAhmari LS, Alanazi RA, Sattar K, Ahmad T, Feeley E, Khalil MS, Soliman M. Medical students' perception of international health electives in the undergraduate medical curriculum at the College of medicine, King Saud university. Advances in medical education and practice. 2018;9:811.

2- Hastings A, Dowell J, Eliasz MK. Medical student electives and learning outcomes for global health: A commentary on behalf of the UK Medical Schools Elective Council. Medical teacher. 2014 Apr 1;36(4):355-7.

3- Vora N, Chang M, Pandya H, Hasham A, Lazarus C. A student-initiated and student-facilitated international health elective for preclinical medical students. Medical education online. 2010 Jan 1;15(1):4896.

4- Miranda JJ, Yudkin JS, Willott C. Nuffield Trust Fellowship projects carried out by students from Tanzania and UK. Travel Medicine and Infectious Disease. 2005;3(3):133-41.

5- Bales AM, Oddo AR, Dennis DJ, Siska RC, VanderWal E, VanderWal H, Dlamini N, Markert RJ, McCarthy MC. Global health education for medical students: when learning objectives include research. Journal of Surgical Education. 2018 Jul 1;75(4):1022-7.

6- Carter C, Hunt BH, Mukonka PS, Viveash S, Notter J, Toner L. 'I'll never be the same': the impact of an international elective. British Journal of Nursing. 2019 Feb 14;28(3):186-92.

7- Schellhase EM, Miller ML, Ogallo W, Pastakia SD. An elective pharmaceutical care course to prepare students for an advanced pharmacy practice experience in Kenya. American Journal of Pharmaceutical Education. 2013 Apr 12;77(3).

8- Eckhert NL, Bennett NM, Grande D, Dandoy S. Teaching prevention through electives. Academic Medicine. 2000 Jul 1;75(7):S85-9.

9- Thomas ST, Thomas ET, McLean M. Working in global health: a planning and implementation framework for international electives. Medical Teacher. 2018 Oct 3;40(10):1055-9.

10- Imperato PJ, Bruno DM, Monica Sweeney M. Ensuring the health, safety and preparedness of US medical students participating in global health electives overseas. Journal of community health. 2016 Apr;41(2):442-50.

11- Wiskin C, Dowell J, Hale C. Beyond 'health and safety'–the challenges facing students asked to work outside of their comfort, qualification level or expertise on medical elective placement. BMC medical ethics. 2018 Dec;19(1):1-0.

12- Bozorgmehr K, Menzel-Severing J, Schubert K, Tinnemann P. Global Health Education: a cross-sectional study among German medical students to identify needs, deficits and potential benefits (Part 2 of 2: Knowledge gaps and potential benefits). BMC Medical Education. 2010 Dec;10(1):1-9.

13- Lu PM, Park EE, Rabin TL, Schwartz JI, Shearer LS, Siegler EL, Peck RN. Impact of global health electives on US medical residents: a systematic review. Annals of Global Health. 2018;84(4):692.

14- Bailey LC, Mager NA. Global health education in doctor of pharmacy programs. American Journal of Pharmaceutical Education. 2016 May 25;80(4).

15- Heck JE, Wedemeyer D. International health education in US medical schools: trends in curriculum focus, student interest, and funding sources. Family Medicine. 1995 Nov 1;27(10):636-40.

16- Moren A, Cook M, McClain M, Doberne J, Kiraly L, Perkins RS, Kwong K. A pilot curriculum in international surgery for medical students. Journal of Surgical Education. 2015 Jul 1;72(4):e9-14.

17- Koceic, A., Mestrovic, A., Vrdoljak, L., Vukojevic, K., Barac-Latas, V., Drenjancevic-Peric, I., Biocina-Lukenda, D., Sapunar, D. and Puljak, L., 2010. Analysis of the elective curriculum in undergraduate medical education in Croatia. Medical Education, 44(4), pp.387-395.

18- Perry E, Storer A, Caldwell D, Smith J. A medical outreach elective course. American Journal of Pharmaceutical Education. 2013 May 13;77(4).

Efficacy of Dienogest for Prevention of Endometriosis Recurrence: A Systematic Review and Meta-Analysis

Hussain MA Assiri [1], Mashail AS Alomari [2], Atheer DM Alshehri [3], Asma SY Alahmari [3], Manal M Alasmari [4]

(1) Obstetrics & Gynecology Specialist, Khamis Mushayt Maternity & Children Hospital
(2) Obstetrics & Gynecology Resident, Abha Maternity & Children Hospital
(3) Obstetrics & Gynecology Resident, Khamis Mushayt Maternity & Children Hospital
(4) Reproductive Endocrinology and Infertility Consultant, Abha Maternity & Children Hospital

Corresponding Author
Dr. Hussain MA Assiri
Email: hussainassiri91@gmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Hussain MA Assiri, Mashail AS Al-Omari, Manal Alasmari. Efficacy of Dienogest for Prevention of Endometriosis Recurrence: A Systematic Review and Meta-Analysis. World Family Medicine. 2022; 20(11): 165-171.
DOI: 10.5742/MEWFM.2022.95251391

Abstract

Aim of Study: To evaluate the efficacy of postoperative dienogest for prevention of endometriosis recurrence.

Methods: Several databases were used to search for recent studies (i.e., published in 2016-2020). The search keywords included: “dienogest,” and “endometr*,” Patients who were not treated with dienogest were considered controls. Reviews, comments, animal trials, case reports, abstracts, single-arm studies, low-quality studies, and non-English articles were excluded. The primary outcome of interest was to determine the odds of recurrence in patients who received dienogest compared to controls who were managed expectantly, or offered a substitute hormonal therapy. Secondary outcomes included pain improvement and side effects of received treatment.

Results: Included studies comprised three retrospective cohort studies, and two prospective cohort studies. These studies included 608 patients; 216 were managed in the Dienogest Group, while 392 were managed in the Control Group (163 received hormonal suppression, and 228 received no treatment). Overall, the recurrence rate of endometriosis in patients receiving Dienogest was 8/216, i.e., 3.7 events per 100 treated women over a mean duration of 28.5 months, and 1.3 recurrences per 1000 woman-months. On the other hand, the recurrence rate of endometriosis in the Control Group was 69/392 recurrences over a mean duration of 29.3 months, i.e., 17.6 per 100 women (6.0 recurrences per 1000 women-months). Difference in recurrence rates between study groups was statisticallysignificant (X^2=24.3, p<0.001). Reported recurrence rates were significantly less among patients in the Dienogest Group than those in the Control Group, with a pooled estimate of RR = 0.239, and 95% CI: 0.119-0.488. Generally, patients in the Dienogest Group experienced less pain and less side effects than those in the control group.

Conclusions: Endometriosis patients who receive dienogest following conservative surgery have a significantly lower rate of recurrence, better pain control, and less side effects than their control counterparts.

Key Words: Endometriosis, Dienogest, Goserelin, Systematic Review, Meta-Analysis,

Introduction

Endometriosis is a chronic, estrogen-dependent disease that affects 10-15% of women in their reproductive age (1). It is characterized by the presence of endometrial-like tissues outside the uterine cavity that induce chronic inflammation, ovarian cyst formation, and fibrosis (2). Dysmenorrhea and chronic non-menstrual pelvic pain are the most prevalent symptoms. A common pathogenic mechanism shared by all forms of endometriosis is the impact of estradiol (3).

The licensed pharmaceutical agents for treatment of endometriosis are still limited (4). For medical treatment of endometriosis associated pain is based on suppression of estrogen production and induction of amenorrhea (5), and treatments are often accompanied by clinically relevant side effects (6).

Dienogest is a unique 4th generation synthetic progestogen, which has been approved as a treatment for endometriosis and as part of combined hormonal contraception (7). Studies have demonstrated its high specificity for progesterone receptors, strong anti-proliferative effects on endometriosis implants, as well as anti-androgenic, anti-angiogenic, and anti-inflammatory properties (8).

Dienogest has high tolerability and effectiveness. Therefore, it has become an important choice for management of endometriosis (9). Until recently, dienogest has been the only available oral, disease-specific agent in the treatment of endometriosis (10).

Several medications, besides dienogest have been investigated for prevention of recurrence of endometriosis, e.g., the combined hormonal contraception, levonorgesterel intra-uterine contraceptive device, and GnRH-a therapy, with varying degrees of success (11-12). However, the choice of medication is dependent upon many factors including patient, clinician, and disease characteristics.

A systematic review evaluating the evidence for post-operative hormonal suppression for endometriosis revealed no evidence of decreased disease recurrence; however, data were limited, and none examined the use of dienogest (13). Nevertheless, guidelines and expert opinion continue to recommend the use of post-operative suppression for secondary prevention (14).

Therefore, the present systematic review and meta-analysis was undertaken to evaluate the efficacy of postoperative dienogest for prevention of endometriosis recurrence.

Materials and Methods

Search Strategy

The PubMed, Medline, and EMBASE databases were used to search for recent studies (i.e., published between 2016-2020). The search keywords included: “dienogest,” and “endometr*,” Types of included studies were retrospective, prospective studies and randomized controlled trials that compared dienogest treatment (G1, study group) with other treatments (G2, Control Groups) in patients with endometriosis following surgery.

The researchers started by reading the titles and abstracts of retrieved articles, then reviewing the full text of relevant articles. Studies were included if they met the following inclusion criteria: Full text, English language, patients are premenopausal women undergoing surgery for endometriosis, one group is treated with dienogest, and at least one group who received other treatments, regardless of dosage, duration of treatment, and adverse effects. All included patients should have been followed up for at least 12 months postoperatively.

Patients who were not treated with dienogest were considered controls. On the other hand, reviews, comments, animal trials, case reports, abstracts, single-arm studies, low-quality studies, and non-English articles were excluded.

The primary outcome of interest in this systematic review and meta-analysis was to determine the odds of recurrence in patients who received dienogest compared to controls who were managed expectantly, or offered a substitute hormonal therapy. Recurrence was defined by three studies (15-17) as the ultrasound detection of an ovarian endometrioma measuring greater than 2 cm in diameter in the treated ovary; by one study (18) as an endometrioma that was larger than 20 mm in diameter on transvaginal ultrasonography and persisted for more than 2 months; and by one study (19) as the presence of a persistent ovarian cyst with a minimum diameter of > 15 mm based on non-invasive imaging (e.g., ultrasound and MRI),

On the other hand, secondary outcomes included pain improvement and side effects of received treatment.

The guidelines for the “Preferred Reporting Items for Systematic Reviews and Meta-Analyses” (PRISMA) were followed to conduct this systematic review of the literature. Given the nature of the present study, with no involvement of direct patient engagement, an Institutional Review Board approval was not a necessary prerequisite for the completion of this study.

Two researchers (HA and MO) independently reviewed articles’ titles and abstracts for initial screening, and then conducted full text reviews to identify studies for inclusion. Any conflicts were resolved by a third reviewer (ME).

Extracted data were analyzed with 95% confidence interval using the Statistical Package for Social Sciences (IBM, SPSS, version 25). Relative risk of recurrence was calculated and reported in addition to 95% confidence interval.

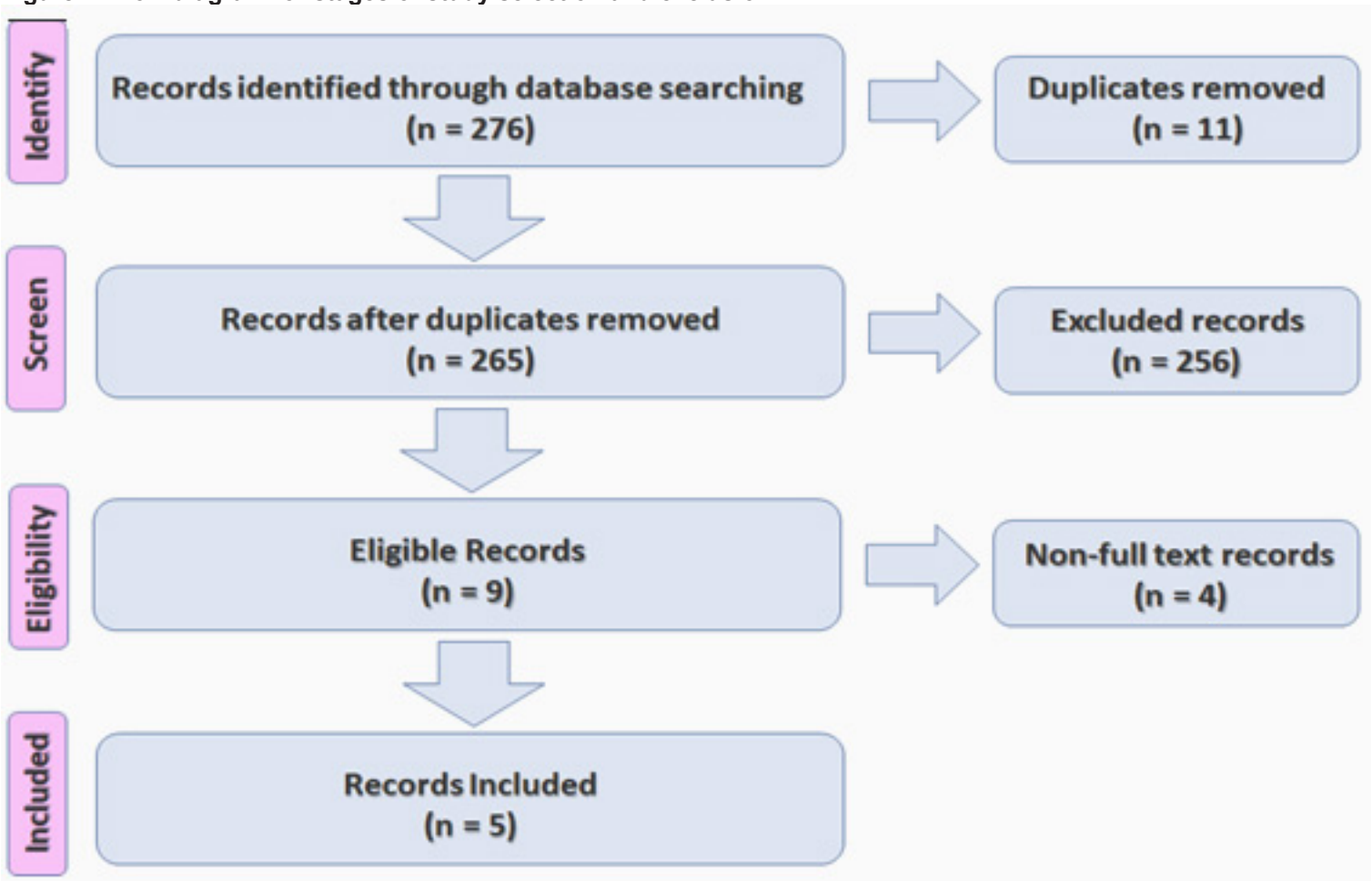
Results

Study Selection and Characteristics
The initial database search yielded 276 studies. However, after exclusion of duplicates, title and abstract screening, and applying the inclusion criteria, five studies, which had both intervention and control arms, were assessed for full text review (Figure 1). The exclusions were based on: the outcome of interest (i.e., recurrence) was not assessed, data could not be extracted, intervention did not meet the study criteria, or heterogeneous study population. Study characteristics and main results are summarized and presented in Table (1).

Included studies comprised three retrospective cohort studies, and two prospective cohort studies, but no controlled trials were included. These studies included 608 patients; 216 were managed in the Dienogest Group, while 392 were managed in the Control Group (163 received hormonal suppression, and 228 received no treatment).

Follow-up period and assessment of outcomes ranged from 12 months (17) to 60 months (18). The mean follow-up period was 28.5 months.

Figure 1: Flow diagram for stages of study selection and exclusion



Primary outcome
Overall, the recurrence rate of endometriosis in patients receiving Dienogest was 8/216, i.e., 3.7 events per 100 treated women over a mean duration of 28.5 months, and 1.3 recurrences per 1000 woman-months. On the other hand, the recurrence rate of endometriosis in the Control Group was 69/392 recurrences over a mean duration of 29.3 months, i.e., 17.6 per 100 women (6.0 recurrences per 1000 women-months). Difference in recurrence rates between study groups was statistically significant (X^2=24.3, p<0.001).

Within the Control Group, women who received hormonal suppression (n=163) had 28 recurrences (i.e., 17.2 events per 100 women, and 5.7 recurrences per 1000 woman-months), while those who received no treatment (n=229) had 41 recurrences (i.e., 17.9 events per 100 women, and 5.7 recurrences per 1000 woman-months). Difference in recurrence rates between these two groups was not statistically significant (X^2 =0.03, p=0.852).

Figure 2: Forest Plot for recurrence rates among patients in the Dienogest and Control Groups

Study	Dienogest(n/N)	Control (n/N)	RR	95% CI
Adachi et al., 2016	0/40	8/41	0.072	0.004-1.206
Takaesu et al., 2016	4/55	25/134	0.431	0.157-1.187
Yamanaka et al., 2017	3/59	21/67	0.203	0.063-0.650
Koshiba et al., 2018	1/27	15/115	0.310	0.043-2.248
Ozaki et al., 2020	0/35	0/35	1.000	0.020-49.042

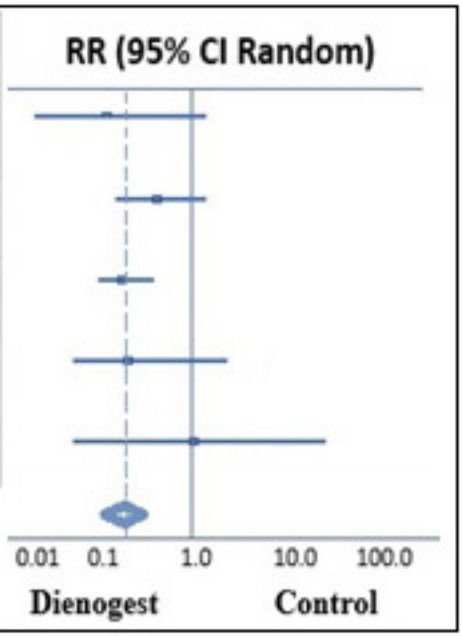


Figure (2) shows reported recurrence rates were significantly less among patients in the Dienogest Group than those in the Control Group, with a pooled estimate of RR = 0.239, and 95% CI: 0.119-0.488.

.

Secondary outcomes

Regarding pain improvement, one study reported experiencing significantly less pain among patients in the Dienogest Group than those in the Control Group (16). Another study reported that pain was reduced in patients receiving Dienogest & Goserelin, while a third study reported reduced pain in patients receiving Dienogest (19). Moreover, side effects of received treatment were stated by one study (15), which reported less side effects among patients receiving dienogest than those receiving goserelin.

Discussion

Endometriosis is a chronic disease characterized by high rates of post-operative recurrence. Therefore, patients need safe, long-term maintenance options for its management (20).

The present systematic review and meta-analysis included five studies (three retrospective cohort, and two prospective cohort). It included 608 patients, of whom 216 were managed in the Dienogest Group, while 392 were managed in the Control Group (163 received hormonal suppression, and 228 received no treatment). The follow up period of studies included in the present systematic review ranged from 12 to 60 months, with an average of 28.5 months. The two groups had comparable average durations of follow up (29 months and 29.3 months).

By the end of the follow-up periods, it was shown that side effects of dienogest were less than those associated with hormonal suppression or goserelin, while experienced pain was less among patients in the Dienogest Group than those in the Control Group.

Our systematic review showed significantly lower endometriosis recurrence rates among patients in the Dienogest Group (8/216, i.e., 3.7 events per 100 treated women over a mean duration of 30.4 months, and 1.23 recurrences per 1000 woman-months) than those in the Control Group (8/216 and 69/392 respectively, p<0.001), while, recurrence rates within the Control Group (patients receiving hormonal suppression vs. those not receiving treatment) did not differ significantly (28/163 and 41/229, respectively). These findings support the use of dienogest for postoperative management of endometriosis.

Murji et al. (21) noted that there are limited data, as far as the long-term experience with dienogest treatment, with most studies extending to 15 months of treatment. Zakhari et al. (7) described two large-scale post-approval studies that are still underway, which are evaluating the safety and tolerability of dienogest for management of endometriosis over extended periods of time (i.e., up to 6 years) (22-23). Results of these two studies are expected to guide counselling and clinical decision making of patients with endometriosis.

Despite the finding in our systematic review, that women who received dienogest had significantly better outcome than those in the control group, medical options that were used by women in the control group, e.g., combined hormonal contraceptives (18), and gonadotrophin-releasing hormone agonist (i.e., goserelin) have also shown favorable effects, e.g., reducing recurrence and pain symptoms (15; 17). This offers both clinicians and patients the option to tailor prescribed suppressive therapy to individual needs (15; 24-25).

However, some studies raised concerns over bone mineral density changes associated with prolonged use of dienogest. Decreased bone mineral density has been reported with prolonged treatment (up to 52 weeks). However, partial recovery was observed to follow cessation of its use, but the clinical significance of these findings is still uncertain (26-28). Therefore, further long-term studies on the possible side effects associated with dienogest therapy are needed.

The strength features of our systematic review include the systematic nature of the literature review, which elicited clinically relevant outcomes with follow-up that ranged from 12 to 60 months. Moreover, the broad inclusion criteria enabled us to synthesize relevant outcome data from different studies.

However, it is to be noted that "recurrence" was defined radiologically by all included studies. However, Zakhari et al. (7) argued that this limited definition may give rise to lower sensitivity, with under-reporting of recurrence of endometriosis among patients' with lesions that are undetectable by imaging, or alternatively, it may give rise to lower specificity, by inflating a truly lower risk of recurrence for other clinical forms of endometriosis. They stressed that, beside radiological endpoints, the definition of recurrence must also include patient symptoms such as pain (e.g., dysmenorrhea, or pelvic pain), or clinical findings.

Moreover, the research design of studies included in our systematic review was mainly retrospective (three studies). This may raise the possibility of selection bias, since patients with more extensive endometriosis may have preferentially received suppressive therapy, and become more encouraged to comply with long-term treatment.

It is also to be noted that, one of the studies included in our systematic review (19) used dienogest medication in one arm and there was no alternative treatment in the control arm. This design allows for the possible placebo-effect to contribute to the perceived efficacy of dienogest administered to the treatment group.

Conclusion

Patients who receive dienogest following conservative surgery for endometriosis have a significantly lower rate of recurrence, better pain control, and less side effects than their untreated counterparts or those receiving treatment with hormonal suppressive drugs or oral contraceptives. In view of our findings, further studies are needed to determine the feasibility and side effects of long-term treatment with dienogest, to identify whether a particular group of patients is more likely to benefit from dienogest, and to specify the optimal postoperative medical regimen associated with less disease recurrence.

References

1- Giudice LC. Clinical practice. Endometriosis. N Engl J Med. 2010; 362:2389–2398. doi: 10.1056/NEJMcp1000274.
2- Bulun SE, Cheng YH, Pavone ME, Xue Q, Attar E, Trukhacheva E, Tokunaga H, Utsunomiya H, Yin P, Luo X, et al. Estrogen receptor-beta, estrogen receptor-alpha, and progesterone resistance in endometriosis. Semin Reprod Med. 2010;28(1): 36–433.
3- Donnez J, Dolmans MM. Endometriosis and Medical Therapy: From Progestogens to Progesterone Resistance to GnRH Antagonists: A Review. Clin Med. 2021; 10(5): 1085. doi: 10.3390/jcm10051085
4- Heinemann K, Imthurn B, Marions L, Gerlinger C, Becker K, Moehner S, et al. Safety of Dienogest and Other Hormonal Treatments for Endometriosis in Real-World Clinical Practice (VIPOS): A Large Noninterventional Study. Adv Ther 2020; 37:2528–2537 https://doi.org/10.1007/s12325-020-01331-z.
5- Bedaiwy MA, Alfaraj S, Yong P, Casper R. New developments in the medical treatment of endometriosis. Fertil Steril. 2017;107(3):555–65.
6- Dunselman GA, Vermeulen N, Becker C, CalhazJorge C, D'Hooghe T, De Bie B, Heikinheimo O, Horne AW, Kiesel L, Nap A, et al. ESHRE guideline: management of women with endometriosis. Hum Reprod. 2014;29(3):400–12.
7- Zakhari A, Edwards D, Ryu M, Matelski JJ, Bougie O, Murji A. Dienogest and the Risk of Endometriosis Recurrence Following Surgery: A Systematic Review and Meta-Analysis. Recurrence Following Surgery: A Systematic Review and Meta-Analysis. Journal of Minimally Invasive Gynecology, (), S1553465020302387. doi:10.1016/j.jmig.2020.05.007
8- Miyashita M, Koga K, Takamura M, Izumi G, Nagai M, Harada M et al. Dienogest reduces proliferation, aromatase expression and angiogenesis, and increases apoptosis in human endometriosis. Gynecological Endocrinology 2014; 30:644-8.
9- Schindler AE. Dienogest in long-term treatment of endometriosis. International journal of women's health 2011; 3:175.
10- Lamb YN. Elagolix: first global approval. Drugs 2018; 78:1501-8.
11- Seracchioli R, Mabrouk M, Manuzzi L, Vicenzi C, Frasca C, Elmakky A et al. Post-operative use of oral contraceptive pills for prevention of anatomical relapse or symptom-recurrence after conservative surgery for endometriosis. Human reproduction 2009; 24:2729-35.
12- Koga K, Takamura M, Fujii T, Osuga Y. Prevention of the recurrence of symptom and lesions after conservative surgery for endometriosis. Fertility and Sterility 2015; 104:793-801.
13- Furness S, Yap C, Farquhar C, Cheong YC. Pre- and post-operative medical therapy for endometriosis surgery. Cochrane Database of Systematic Reviews 2004.
14- Kuznetsov L, Dworzynski K, Davies M, Overton C. Diagnosis and management of endometriosis: summary of NICE guidance. BMJJ 2017; 358: j3935.
15- Takaesu Y, Nishi H, Kojima J, Sasaki T, Nagamitsu Y, Kato R et al. Dienogest compared with gonadotropin-releasing hormone agonist after conservative surgery for endometriosis. Journal of Obstetrics and Gynaecology Research 2016; 42:1152-8.
16- Adachi K, Takahashi K, Nakamura K, Otake A, Sasamoto N, Miyoshi Y, et al. Postoperative administration of dienogest for suppressing recurrence of disease and relieving pain in subjects with ovarian endometriomas, Gynecological Endocrinology, 2016. DOI: 10.3109/09513590.2016.1147547.
17- Ozaki R, Kumakiri J, Jinushi M, Ikuma S, Murakami K, Kawasaki Y, et al. Comparison of effect of preoperative dienogest and gonadotropin-releasing hormone agonist

administration on laparoscopic cystectomy for ovarian endometriomas. Archives of Gynecology and Obstetrics 2020. https://doi.org/10.1007/s00404-020-05691-3.
18- Koshiba A, Mori T, Okimura H, Akiyama K, Kataoka H, Takaoka O et al. Dienogest therapy during the early stages of recurrence of endometrioma might be an alternative therapeutic option to avoid repeat surgeries. Journal of Obstetrics and Gynaecology Research 2018; 44:1970-6.
19- Yamanaka A, Hada T, Matsumoto T, Kanno K, Shirane A, Yanai S et al. Effect of dienogest on pain and ovarian endometrioma occurrence after laparoscopic resection of uterosacral ligaments with deep infiltrating endometriosis. European Journal of Obstetrics & Gynecology and Reproductive Biology 2017; 216:51-5.
20- Saunders PTK, Horne AW. Endometriosis: Etiology, pathobiology, and therapeutic prospects. Cell 2021; 184(11):2807-2824. doi: 10.1016/j.cell.2021.04.041.
21- Murji A, Biberoğlu K, Leng J, Mueller MD, Römer T, Vignali M et al. Use of dienogest in endometriosis: a narrative literature review and expert commentary. Current Medical Research and Opinion 2020; 36(5): 895-907. Do i:10.1080/03007995.2020.1744120.
22- Heinemann K, Imthurn B, Marions L, Faustmann T. VIPOS: A large non-interventional study examining the safety of dienogest and other hormonal treatments for endometriosis in real-world clinical practice. The Society of Endometriosis and Uterine Disorders, 25-28 April, 2018, Florence, Italy.
23- Techatrasisak K, Lee BS, Hestiantoro A, Ruey S, Banal-Silao MJ, Seok Ju S et al. Quality of life in Asian women with endometriosis - Interim results from a prospective cohort study under real-life clinical practice in Asia (ENVISIOeN). Poster presented at the Royal College of Obstetricians and Gynaecologists World Congress, March 21-24, 2018 2018.
24- Vercellini P, Somigliana E, Daguati R, Vigano P, Meroni F, Crosignani PG. Postoperative oral contraceptive exposure and risk of endometrioma recurrence. American journal of obstetrics and gynecology 2008; 198:504. e1-e5.
25- Cucinella G, Granese R, Calagna G, Svelato A, Saitta S, Tonni G et al. Oral contraceptives in the prevention of endometrioma recurrence: does the different progestins used make a difference? Archives of Gynecology and Obstetrics 2013; 288:821-7.
26- Momoeda M, Harada T, Terakawa N, Aso T, Fukunaga M, Hagino H et al. Long-term use of dienogest for the treatment of endometriosis. Journal of Obstetrics and Gynaecology Research 2009; 35:1069-76.
27- Ebert AD, Dong L, Merz M, Kirsch B, Francuski M, Böttcher B et al. Dienogest 2 mg daily in the treatment of adolescents with clinically suspected endometriosis: the VISanne study to assess safety in ADOlescents. Journal of pediatric and adolescent gynecology 2017; 30:560-7.
28- Seo JW, Lee D-Y, Yoon B-K, Choi D. Effects of long-term postoperative dienogest use for treatment of endometriosis on bone mineral density. European Journal of Obstetrics & Gynecology and Reproductive Biology 2017; 212:9-12.

Table 1: Summary of the main results of included studies

Study	Research design	Dienogest (G1)		Control (G2)			Recurrence (G1)/(G2)	Pain	Side Effects
		No.	FU	Received treatment	No.	FU			
Adachi et al., 2016	Retrospective	40	21	Expectant management	41	18.6	(0)/(8)	G2>G1	--
Takaesu et al., 2016	Prospective	55	24	Goserelin/ No treatment	134: 55/79	24	(4)/(8,17)	Reduced in patients receiving Dienogest & Goserelin	Goserelin more than Dienogest
Imanaka et al., 2017	Retrospective	59	35	No treatment	67	28	(3)/(21)	Reduced in G1	--
Koshiba et al., 2018	Retrospective	27	60	Oral contraceptives/ No treatment	115: 32/83	60	(1)/(12,3)	Not stated	Not stated
Ozaki et al., 2020	Prospective	35	12	Low-dose sustained-release goserelin acetate	35	12	(0)/(0)	Not stated	Not stated
Overall		216	28.5	Hormonal suppression/ No treatment	392: 163/229	29.3: 30.4/28.5	(8)/(28,41)	G2 more than G1	G2 more than G1

U: Mean follow up period (in months) G1: Dienogest Group G2: Control Group

Empathy level among Saudi medical students using the Toronto empathy scale

Khalid A. Bin Abdulrahman [1], Majed A. Alsharidah [2], Badr A. Alobaida [2], Yazeed N. Alabbadi [2], Faisal I. Almohsen [2], Tamim A. Abahussain [2], Faisal S. Alahmari [2]

(1) Department of Medical Education, College of Medicine, Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia
(2) College of Medicine, Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia

Correspondence:
Khalid Bin Abdulrahman, MD
Professor of Family Medicine & Medical Education
Department of Medical Education, College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU).
P.O. Box: 7544 – Othman Bin Affan Rd, Al-Nada, Riyadh 13317 – 4233, Saudi Arabia
Mobile: +966 505445384
Email: kab@imamu.edu.sa

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Khalid A. Bin Abdulrahman et al. Empathy level among Saudi medical students using the Toronto empathy scale. World Family Medicine. 2022; 20(11): 172-180. DOI: 10.5742/MEWFM.2022.95251392

Abstract

Background: Empathy is a crucial component of professionalism in medicine, having a solid relationship with improved patient outcomes. The current study aims to examine the factor structure of the Toronto Empathy Questionnaire (TEQ) with a sample of Saudi medical students and to assess the differences in empathy scores by gender, year of study, and future career preference.

Methods: A cross-sectional study was performed using anonymous self-administered online questionnaires. The study tool targeted a random sample of medical students in public and private Saudi medical schools in five regions (North, South, East, West, and Central) of Saudi Arabia.

Results: 941 Saudi medical students enrolled in the study. 52.3% were male students, and 30.6% of the students were from the central region of Saudi Arabia. The most desired specialties were general surgery (19.2%), internal medicine (12.5%), and family medicine 8.2%. The average TEQ score was 42.31%, with 67.1% scoring low to average empathy levels. About one-third (32.9%) scored high empathy levels; females scored a higher average on the empathy score compared to males (43.48 vs. 41.24) P-value <0.001. The never-married students also scored higher empathy than married students 42.53 vs. 38.78) P-value <0.00. The region with the highest empathy scores was the central province, 44.72%.

Conclusion: Different factors could influence empathy scores, such as gender, marital status, GPA, and study year. Female students had a higher empathy score compared to male students. Senior medical students scored lower on the scale than younger students, and could be associated with a higher level of burnout. Further empathy-based discussions should be inserted into the Saudi medical curricula.

Keywords: professionalism, Toronto empathy scale, medical students, Saudi Arabia.

Introduction

Empathy is a crucial component of professionalism in medicine, having a solid relationship with improved patient outcomes (1–3). The leading indicator of an excellent physician is clinical skills and a good character, with empathy as the main element (4,5). Empathy is the "objective awareness of and insight into other people's feelings, emotions, and behavior and their meaning and significance" (6,7). Based on the available literature, empathy is significantly related to patient outcomes, better compliance, clinician and patient satisfaction, and reduced medical-legal difficulties or litigation (8). The revised Kuwaiti medical curriculum for undergraduates includes several educational training sessions on communication skills and ethics, aiming to develop an excellent doctor-patient relationship, training that is expected to guarantee pre-graduates not only have clinical skills but also an emotional capacity to connect them with their patients, such as, what is the patient-facing and going through, and to optimize the feeling of comfort for the patients with a bad prognosis (9). Maternal bonding and their personality impact the level of empathy of medical students and are equally important (10–12). Studies have shown that Doctor's empathy for patients improves patients' gratification, well-being, and trust (13,14). Doctors who established good trust with their patients were found to have very cooperative patients who would be more open to giving detailed information about their condition, thus enabling a better clinical diagnosis and having the patients more involved in the decision-making (15,16). Empathy given by doctors to patients would make them believe in their ability to cope in a specific situation, thus facilitating adherence to their therapy (17,18).

Doctors being empathic with their patients and making them feel better can be therapeutic (19,20). Four schools in the UK and one in New Zealand scored an average response of 55% (n=652) for fresh students who started medical school and 48% (n=487) for senior students in their final years; students revealed no significant differences in the level of empathy scores for students reaching the last years of their medical school with new students who are just starting. On the other hand, the gender variable showed a significant empathy score, with females outperforming males in the scoring (21). In a recent study published in 2020 by Sadia Riaz in Lahore-Pakistan, they reported a statistically significant link between the levels of empathy and their academic year, a significant difference in mean empathy scores between first and third-year students, the fourth and second-year students, fourth-year and third-year students, and fourth-year and final-year students. Gender was also substantially related to empathy, with women having higher mean Toronto Empathy Questionnaire (TEQ) scores than males. The permanent residence of students and their relationship with empathy were also significant (22).

As future medical leaders, empathy levels have been the focal point of instructional activities and educational efforts (23). However, no previous studies have evaluated the empathy levels of Saudi medical students. The current study aims to examine the factor structure of the TEQ with a sample of Saudi medical students and to assess the differences in empathy scores by gender, year of study, and future career preference.

Methods

Study design and setting:
This was a cross-sectional study of a random sample of medical students in public and private Saudi medical schools in five regions (North, South, East, West, and Central) of Saudi Arabia, using the Toronto Empathy Questionnaire (TEQ) to determine empathy levels among students. TEQ scores were calculated. We evaluated the association between the mean Toronto empathy score and sociodemographic variables.

Study subjects:
Inclusion criteria: Medical students in public and private Saudi medical schools from all regions of Saudi Arabia (North, South, East, West, and the center).
Exclusion criteria: Post-graduate students and incomplete questionnaires.

Sample size:
The sample size was estimated using the sample size formula, assuming that 50% is the response distribution, 95% confidence level, and 5% margin of error, resulting in a sample size of 379.

Data collection methods, instruments used, measurement, and sampling technique:
An electronic questionnaire was sent to Saudi medical students using the SurveyMonkey. Toronto empathy questionnaire (TEQ) was included with additional sociodemographic variables that were part of the questionnaire to determine the association between it and the sociodemographic variables.

Data Management and Analysis Plan:
Means and standard deviations were used to describe continuous variables and the frequencies and percentages for categorically measured variables. Histograms and the Kolmogorov-Smirnov test were used to assess the statistical normality assumption of the continuous variables, and the Levine test of equal variance for determining the homogeneity of variance assumption of continuous variables across categorically measured variables. The Cronbach's alpha test was used to assess the reliability of measured constructs/scales. The TEQ score was calculated by adding the student's perceptions to the sixteen indicators after reverse-coding the negatively worded statements within the questionnaire. The Independent samples t-test and the one-way ANOVA tests were used to test the statistical significance of mean differences in the total empathy score across the levels of categorically measured variables. Multivariate linear regression analysis assessed combined and individual associations between medical students' measured sociodemographic and academic characteristics with their mean perceived empathy score. Associations between

predictor variables with the analyzed outcome were expressed as the Beta coefficient with its associated 95% confidence interval. The IBM SPSS Statistical computing program Version 21 was used for statistical data analysis, and alpha significance was considered at the 0.050 Level.

Results

Nine hundred and forty-one (941) Saudi medical students enrolled in the study and completed and returned the online survey. Table 1 displays the medical students sociodemographic and academic characteristics of medical students. More than half (52.3%) of the students were males, and the majority never married. About one-third (30.6%) of them resided in the Central Province of Saudi Arabia. Around half (46%) were senior medical students.

Medical students were asked to indicate their desired general future specialty, and the findings showed that 24.9% dreamed of being medical specialists. However, most of them wanted general surgical specialties. Figure A shows the medical students desired future subspecialties; it is evident that most of them preferred general surgical specialties. However, many chose other subspecialties, including dermatological and neurological subspecialties, emergency medicine, psychiatry, pediatrics, and ophthalmology. On the contrary, few medical students preferred to specialize in urology, radiation oncology, physical and Rehabilitation, and preventive and nuclear medicine. The academic GPA achievement scores were as follows: 2.3% of the students had a GPA <=2.99 points, another 19.2% of them had a GPA between 3-3.99 points, and 27.9% had a GPA of between 4-4.49 points but 23.4% of them had a GPA between 4.50-4.74 points and 27.1% had a GPA >=4.75 out of five points.

The Cronbach's alpha test of internal consistency showed that the TEQ was read, understood, and rated equally reliably by the Saudi medical students, Cronbach's alpha= 0.76.

Table 2 displays the medical student's perceptions of the indicators of empathy measured by the Toronto Empathy Questionnaire. The column is labeled. The rank denotes the descending rank (from the highest mean score to the minor mean score) for the TEQ indicators. The top perceived indicators of empathy of medical students were: Enjoying making others happy (mean score = 3.37/4), then feeling upset to see someone being treated with disrespect (mean score = 3.27/4), and getting a strong urge to help others when seeing someone else upset (mean score= 2.69/4) then feeling protective over others who are taken advantage of (mean score =2.56/4) then getting excited when seeing other persons excited too (mean score = 2.55/4).

On the contrary, the lowest perceived indicators of empathy by the medical students were the following: Not feeling pity for others who are maltreated (mean score = 1/4), then steering the conversations away toward other subjects when friends talk about their problems (mean score = 1.16/4), and remaining unaffected when someone else who is close to them is unhappy (mean score = 1.19/4) then finding it silly to see people cry out of happiness (mean score = 1.25/4) and disinterest in how others feel (mean score = 1.29/4). However, the remainder of indicators of empathy (lack of sympathy for people who cause themselves illness, lack of affection for people's misfortunes, and feeling irritated by other's tears and crying as well as finding oneself in tune with others' moods as well as tenderness toward the misfortune people) were rated midway between these top and bottom perceived empathy indicators.

The overall Toronto Empathy scale score of medical students was measured with a mean score of 42.31/64 points, SD= 7.86 points, denoting a level of widespread substantial empathy perceived by medical students. When considering the median value for medical students (Median=43 points) as a value cut, the dichotomized medical students' empathy score showed that most of them, 67.1%, had low to moderate empathy levels, and 32.9% of them were considered to have relatively high levels of empathy.

The descriptive analysis of the student's overall perceived empathy score is shown in Table 3.

Table 4 displays the resulting bivariate analysis of the mean perceived empathy score across the levels of their demographic and academic characteristics. An independent t-test showed that female medical students had significantly higher empathy (Mean empathy = 43.48) than male medical students, p<0.001. Furthermore, the independent samples t-test showed that the never-married medical students perceived a significantly higher mean perceived empathy (mean empathy = 42.53) compared to medical students who were married (Mean score=38.78), p-value=0.001. Additionally, a one-way ANOVA test showed that the medical students residing in different Saudi Arabian provinces measured significantly different perceived empathy levels, f(4,936)=15.10, p-value<0.001, but a Bonferroni adjusted post hoc pairwise comparison test showed that medical students of the central regions had measured significantly higher mean empathy when pairwise compared to medical students residing in all other Saudi provinces, p<0.040 each respectively, also medical students perceived significantly higher mean empathy compared to those from Northern regions, p-value =0.001. Likewise, Western medical students had a significantly higher empathy score than those from the Northern provinces, p-value= 0.003. The medical student's study levels and years did not converge significantly on their mean perceived empathy score. Also, medical students' desired future general and subspecialties did not correlate significantly with their mean perceived empathy.

However, another one-way ANOVA test showed that the medical students' academic achievement was significantly correlated with their mean perceived empathy score, f(4,936)=4.60, p-value=0.001. However, a Bonferroni

adjusted post hoc pairwise test comparing the students with different GPA levels on their mean perceived empathy scores showed that medical students with a GPA >=4.75 had perceived significantly higher mean empathy compared to those with a GPA between 4.4 and 4.49 points, p-value= 0.004, also the medical students with a GPA >=4.75 had perceived significantly higher empathy compared to students with a GPA between 3-3.99 points, p-value =0.002. Moreover, the other pairwise comparisons between the other medical students with different GPA scores showed that these students might not differ significantly in their mean perceived empathy scores compared to pairwise.

The multivariate linear regression analysis is shown in Table 5. The medical student's sex had correlated significantly with their total empathy score. Male students perceived significantly lower mean empathy scores compared to females, with beta coefficient= —1.835, p<0.001. Furthermore, the medical students who were ever married perceived significantly lower mean empathy than their never-married peers, with a beta coefficient = -3.546, p-value =0.001. Moreover, the analysis model showed that medical students with a GPA academic achievement score between 4.75-5 points had measured significantly higher than the other medical students whose GPA was <=4.74 in general, with a beta coefficient= 1.736, p-value= 0.003. Additionally, the results of the multivariate analysis showed that the medical students residing in the eastern, western, northern, and southern Saudi provinces had significantly lower mean empathy than those living in the central Saudi Arabian region, p<=0.004 each, respectively. Not unexpectedly, junior medical students (preparatory year + first-year level) had a significantly lower empathy when compared to sophomore and senior medical students on average, with a beta coefficient = -1.434, p-value = 0.038.

	Frequency	Percentage
Sex		
Female	449	47.7
Male	492	52.3
Marital state		
Never married	886	94.2
Ever married	55	5.8
Living region		
Central Region	288	30.6
Eastern Provinces	195	20.7
Western Provinces	166	17.6
Northern Provinces	109	11.6
Southern Provinces	183	19.4
Study year		
Preparatory	51	5.4
1st Year	107	11.4
Second Year	144	15.3
Third Year	206	21.9
Fourth Year	140	14.9
Fifth Year	226	24
Interns & Graduates	67	7.1
Study Level		
Junior: preparatory 1st year	158	16.8
Sophomore: 2nd-3rd year	350	37.2
Senior: 4th-5th year	433	46
The intended future primary specialty		
Medical	234	24.9
Surgical	707	75.1
Intended future specialty		
Allergy and Immunology	15	1.6
Anesthesiology	15	1.6
Dermatology	70	7.4
Diagnostic Radiology	17	1.8
Emergency Medicine	60	6.4
Family medicine	77	8.2
Internal medicine	118	12.5
Medical genetics	10	1.1
Neurology	60	6.4
Nuclear medicine	1	0.1
Obstetrics and Gynecology	32	3.4
Ophthalmology	50	5.3
Other specialties	97	10.3
Pathology	11	1.2
Physical medicine and rehab	6	0.6
Preventive medicine	5	0.5
Psychiatry	55	5.8
Radiation Oncology	7	0.7
General Surgery	181	19.2
Urology	7	0.7
Academic GPA score		
2.99 or less	22	2.3
3 - 3.99	181	19.2
4 - 4.49	263	27.9
4.50 - 4.74	220	23.4
4.75 - 5	255	27.1

Table 1: Descriptive analysis of the medical student's sociodemographic and academic characteristics.

Table 2: Descriptive analysis of medical students' perceptions of the indicators of the Toronto empathy scale

	Mean	SD	Rank
1. When someone else is feeling excited, I tend to get excited too.	2.55	1.01	6
2. Misfortunes of other people do not disturb me a great deal	1.85	0.94	10
3. It bothers me to see someone being treated disrespectfully.	3.27	1.04	2
4. I remain unaffected when someone close to me is happy	1.19	1.07	14
5. I like to make other people feel better	3.37	0.91	1
6. I have tender, concerned feelings for people less fortunate than me	2.36	1.06	7
7. When a friend starts to talk about their problems, I try to steer the conversation towards something else	1.16	1.09	15
8. I can tell when others are sad even when they do not say anything	2.6	0.99	4
9. I find that I am 'in tune with' other people's moods	2.27	0.92	8
10. I do not feel sympathy for people who cause serious illnesses	1.42	1.13	11
11. I become irritated when someone cries	2.2	1.17	9
12. I am not interested in how other people feel	1.29	1.08	12
13. I have a strong urge to help when I see someone who is upset	2.69	1	3
14. When I see someone being mistreated, I do not feel very much pity for them	1	1.11	16
15. I find it silly for people to cry out of happiness	1.25	1.22	13
16. When I see someone being taken advantage of, I feel kind of protective toward them	2.56	1.04	5

Table 3: Descriptive analysis of the student's overall perceived empathy score

	Mean	SD
The total score of the Toronto Empathy questionnaire total score	42.31	7.86
Empathy score Level, n(%)		
Low to Average Empathy	631	67.1
High Empathy	310	32.9

Table 4: Bivariate analysis of the perceived total empathy score

	Mean (SD) -Perceived Empathy score	test statistic	p-value
Sex			
Female	43.48 (7.75)	**t(939)=4.40**	<0.001
Male	41.24 (7.81)		
Marital state			
Never married	42.53 (7.79)	**t(939)=3.45**	0.001
Ever married	38.78 (8.02)		
Living region			
		f(4,936)=15.1	
Central Region	44.72 (7.84)	**0**	<0.001
Eastern Provinces	42.37 (7.36)		
Western Provinces	42.06 (8.10)		
Northern Provinces	38.66 (6.79)		
Southern Provinces	40.86 (7.65)		
Study year			
Preparatory	42.69 (7.42)	**f(6,934)=1.60**	0.146
1st Year	41.69 (7.96)		
Second Year	42.85 (7.89)		
Third Year	42.74 (8.29)		
Fourth Year	43.46 (8.07)		
Fifth Year	41.29 (7.62)		
Interns & Graduates	41.55 (6.61)		
Study Level			
Junior: preparatory $ 1st year	42.01 (7.79)	**f(2,938)=1.02**	0.361
Sophomore: 2nd-3rd year	42.79 (8.12)		
Senior: 4th-5th year	42.03 (7.67)		
The intended future primary specialty			
Medical	42.99 (7.64)	**t(939)=1.53**	0.126
Surgical	42.08 (7.92)		
Academic GPA score			
2.99 or less	43.45 (9.07)	**f(4,936)=4.60**	0.001
3 - 3.99	41.10 (7.39)		
4 - 4.49	41.46 (7.96)		
4.50 - 4.74	42.39 (7.89)		
4.75 - 5	43.88 (7.72)		

Table 5: Multivariate Linear Regression Analysis of the Medical Student's Perceived Mean Empathy (TEQ) score.

	Unstandardized Beta Coefficients	95.0% CI for B Lower Bound	95.0% CI for B Upper Bound	p-value
(Constant)	45.316	44.256	46.376	<0.001
Sex=Male	-1.835	-2.824	-.847	<0.001
Marital state= ever married	-3.545	-5.634	-1.456	.001
Academic GPA=5 4.75 - 5	1.736	.584	2.888	.003
Residence= Eastern Region	-2.063	-3.452	-.673	.004
Residence= Western Region	-2.369	-3.817	-.921	.001
Residence= Northern Region	-5.351	-7.031	-3.670	<0.001
Residence=Southern Region	-3.104	-4.535	-1.673	<0.001
Study level = junior students (preparatory + 1st year)	-1.434	-2.786	-.083	.038

Dependent outcome variable = Total Toronto empathy scale score. Model R=0.31, Adjusted R-squared=0.10

Discussion

This study aimed to measure the level of empathy among medical students and to determine the association between the level of empathy and different sociodemographic variables. The mean empathy score in Saudi medical students was 42.31. This is similar to the reported findings of Sadia Riaz et al. in Lahore-Pakistan (22). However, it is lower than the mean score of Turkish medical students at Akdeniz University (24) and in other studies from Malaysia, Serbia, and The Caribbean (25–27). This variation in empathy scores could be explained by the cultural differences between countries and regions. Our study's differences in empathy levels were consistent with other studies in that female medical students were more empathetic (21,22,24,28). In the current study, there was no significant correlation between the intended future medical specialty and the mean empathy score, this finding is in line with what S. Hasan et al. reported at Kuwait University (28); in contrast to studies from Malaysia and the US reported otherwise (10,25).

Furthermore, a significant correlation was found between academic achievement and the mean empathy score. Medical students with a GPA between 4.75-5 points had a higher empathy score than medical students with a GPA <=4.74. This is in contrast to the finding reported at Kuwait University (28). However, it is consistent with earlier research in the US (11). Furthermore, we found that Sophomore and senior medical students have higher empathy scores than junior medical students, with a peak in the mean empathy score during the fourth year. Studies in Kuwait, Pakistan, and the Caribbean reported similar findings [15,17,21]. However, studies in Turkey, Malaysia, and Serbia showed no significant correlation between the study year and the mean empathy score [18,19,20]. The peak of empathy scores during the sophomore years was explained in the literature by several factors, including implementing subjects such as ethics, professionalism, and doctor-patient communication. Another factor is the increased contact with patients, which requires students to develop critical social skills and be more empathetic towards patients to perform a physical examination and establish excellent history skills [15,17].

The association of differences between empathy scores in married and non-married students is controversial. The previous literature did not find a statistically significant correlation between the two [24,25]. However, our results show a statistically significant difference between the two, with non-married students scoring higher than married students. Additionally, senior medical students had a lower score than sophomores, which was hypothesized to be the result of exhaustion and burnout [15,17].

Concluion

This study concludes that different demographics and academic characteristics, such as gender, marital status, region, and GPA, can affect empathy levels. Female scores were statistically significantly higher than males on the scale, and non-married students have a higher perceived empathy score compared to married students; study year also contributes to fluctuations in the score, as interns and fifth-year medical students scored the lowest, which could be linked to exhaustion and burnout. Also region is a factor that affects the empathy score, with the central province being the highest scoring region and the northern province scored the lowest. Based on these results, the authors agree that further emphasis on empathy should be instilled in the curriculum of medical students.

Limitations

One limitation of this study is the use of a self-reported scale; the extent to which scales measure empathy in clinical practice is controversial, as empathy is subjective towards cultural ideals and upbringing to the extent that a slight deviation of demographics can cause drastic changes. However, evidence supports the validity and

reliability of the Toronto Empathy questionnaire [26,27]. Another weakness is the low response rate from different provinces, such as the northern and southern provinces. A further weakness was the low response rate of preparatory and first-year students compared to seniors and the low response rate of medical interns.

References

1. Paro HBMS, Silveira PSP, Perotta B, Gannam S, Enns SC, Giaxa RRB, et al. Empathy among medical students: is there a relation with quality of life and burnout? PLoS One. 2014;9(4):e94133.
2. Moudatsou M, Stavropoulou A, Philalithis A, Koukouli S. The Role of Empathy in Health and Social Care Professionals. Healthcare (Basel). 2020 Jan 30;8(1):26.
3. Decety J, Fotopoulou A. Why empathy has a beneficial impact on others in medicine: unifying theories. Front Behav Neurosci. 2015 Jan 14;8:457.
4. Neumann M, Scheffer C, Tauschel D, Lutz G, Wirtz M, Edelhäuser F. Physician empathy: Definition, outcome-relevance and its measurement in patient care and medical education. GMS Z Med Ausbild. 2012 Feb 15;29(1): Doc11.
5. Charon R. The patient-physician relationship. Narrative medicine: a model for empathy, reflection, profession, and trust. JAMA. 2001 Oct 17;286(15):1897–902.
6. Venes D, Thomas CL, Taber CW, editors. Taber's cyclopedic medical dictionary. Ed. 19, illustrated in full color. Philadelphia: F.A.Davis Co; 2001. 2654 p.
7. Empathy - an overview | ScienceDirect Topics [Internet]. [cited 2022 Oct 6]. Available from: https://www.sciencedirect.com/topics/medicine-and-dentistry/empathy
8. Epstein RM, Siegel DJ, Silberman J. Self-monitoring in clinical practice: a challenge for medical educators. J Contin Educ Health Prof. 2008;28(1):5–13.
9. Hasan S, Al-Sharqawi N, Dashti F, AbdulAziz M, Abdullah A, Shukkur M, et al. Level of Empathy among Medical Students in Kuwait University, Kuwait. Med Princ Pract. 2013 Jun;22(4):385–9.
10. Hojat M, Zuckerman M, Magee M, Mangione S, Nasca T, Vergare M, et al. Empathy in medical students as related to specialty interest, personality, and perceptions of mother and father. Personality and Individual Differences. 2005;39:1205–15.
11. Hojat M, Gonnella JS, Nasca TJ, Mangione S, Veloksi JJ, Magee M. The Jefferson Scale of Physician Empathy: further psychometric data and differences by gender and specialty at item level. Acad Med. 2002 Oct;77(10 Suppl): S58-60.
12. Charitou A, Fifli P, Vivilaki VG. Is empathy an important attribute of midwives and other health professionals?: A review. Eur J Midwifery [Internet]. 2019 Feb 12 [cited 2022 Oct 6];3(February). Available from: http://www.europeanjournalofmidwifery.eu/Is-empathy-an-important-attribute-of-midwives-and-other-nhealth-professionals-A-review,100612,0,2.html
13. Thom DH, Stanford Trust Study Physicians. Physician behaviors that predict patient trust. J Fam Pract. 2001 Apr;50(4):323–8.
14. Kim SS, Kaplowitz S, Johnston MV. The effects of physician empathy on patient satisfaction and compliance. Eval Health Prof. 2004 Sep;27(3):237–51.
15. Derksen F, Bensing J, Lagro-Janssen A. Effectiveness of empathy in general practice: a systematic review. Br J Gen Pract. 2013 Jan;63(606):e76-84.
16. Zachariae R, Pedersen CG, Jensen AB, Ehrnrooth E, Rossen PB, von der Maase H. Association of perceived physician communication style with patient satisfaction, distress, cancer-related self-efficacy, and perceived control over the disease. Br J Cancer. 2003 Mar 10;88(5):658–65.
17. Bandura A. Self-efficacy: The exercise of control. New York, NY, US: W H Freeman/Times Books/ Henry Holt & Co; 1997. ix, 604 p. (Self-efficacy: The exercise of control).
18. Vermeire E, Hearnshaw H, Van Royen P, Denekens J. Patient adherence to treatment: three decades of research. A comprehensive review. J Clin Pharm Ther. 2001 Oct;26(5):331–42.
19. Del Canale S, Louis DZ, Maio V, Wang X, Rossi G, Hojat M, et al. The relationship between physician empathy and disease complications: an empirical study of primary care physicians and their diabetic patients in Parma, Italy. Acad Med. 2012 Sep;87(9):1243–9.
20. Price S, Mercer SW, MacPherson H. Practitioner empathy, patient enablement and health outcomes: a prospective study of acupuncture patients. Patient Educ Couns. 2006 Oct;63(1–2):239–45.
21. Quince TA, Kinnersley P, Hales J, da Silva A, Moriarty H, Thiemann P, et al. Empathy among undergraduate medical students: A multi-centre cross-sectional comparison of students beginning and approaching the end of their course. BMC Medical Education. 2016 Mar 15;16(1):92.
22. Iqbal S, Bilal K, Ahmad W, Haroon Ur Rasheed M, Nazir U, Javed Z, et al. Empathy among medical students: A cross-sectional survey. J Ayub Med Coll Abbottabad. 2020 Dec;32(Suppl 1)(4): S681–5.
23. Pohontsch NJ, Stark A, Ehrhardt M, Kötter T, Scherer M. Influences on students' empathy in medical education: an exploratory interview study with medical students in their third and last year. BMC Med Educ. 2018 Oct 5;18:231.
24. Akgün Ö, Akdeniz M, Kavukcu E, Avcı HH. Medical Students' Empathy Level Differences by Medical Year, Gender, and Specialty Interest in Akdeniz University. J Med Educ Curric Dev. 2020 Dec;7:2382120520940658.
25. Haque M, Lutfi SNNB, Othman NSAB, Lugova H, Abdullah SLB. Empathy level among the medical students of national defense university of Malaysia consuming the Toronto empathy scale. Acta Medica International. 2018 Jan 1;5(1):24.
26. Pantovic-Stefanovic M, Dunjic-Kostic B, Gligoric M, Lackovic M, Damjanovic A, Ivkovic M. Empathy predicting career choice in future physicians. Engrami. 2015;37(1):37–48.
27. Youssef FF, Nunes P, Sa B, Williams S. An exploration of cognitive and emotional empathy changes among medical students in the Caribbean. Int J Med Educ. 2014 Sep 24;5:185–92.
28. Hasan S, Al-Sharqawi N, Dashti F, AbdulAziz M, Abdullah A, Shukkur M, et al. Level of empathy among medical students in Kuwait University, Kuwait. Med Princ Pract. 2013;22(4):385–9.

Vascular dementia - A Narrative Review

Nasir Alzbeidi [1], Hamed Alsinawi [2], Hem Phaterpekar [3]

(1) Geriatric Psychiatrist, Cognitive Neurology & Neuropsychiatry Fellow, Mcgill University, Canada.
(2) Senior Consultant Old Age Psychiatrist, Sultan Qaboos University, Oman.
(3) Division lead & Geriatric Psychiatrist, Fraserhealth, BC, Canada.

Corresponding author:
Dr. Nasir Alzbeidi
Email: nasiralzbeidi@gmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Nasir Alzbeidi, Hamed Alsinawi, Hem Phaterphaker. Vascular dementia - A Narrative Review. World Family Medicine. 2022; 20(11): 181-192. DOI: 10.5742/MEWFM.2022.95251395

Abstract

Vascular dementia is the second commonest dementia occurring in the elderly above 65 years. The vascular changes within the brain are suggested to be the main etiologic factor for this type of dementia. Clinically, vascular dementia closely resembles Alzheimer's dementia. The present literature review focuses on the clinical features, diagnostic criteria, pathophysiology, risk factors and the management of vascular dementia.

Keywords: Vascular Dementia, Cognitive Impairment, Neuropathology, Biomarkers

Introduction

The incidence and prevalence of dementia amongst the older population have escalated immensely over the past decades around the globe. Dementia is a type of neurodegenerative disorder that leads to cognitive impairment. It is primarily caused by Alzheimer's disease (AD) and vascular eccentricities in the brain, with a prevalence of 60% and 20% of all dementia cases, respectively (Kalaria et al., 2008; Forette & Boller, 1991). Vascular Dementia (VD) is the cognitive disarray of the brain elucidated by vascular changes such as stroke and ischemia, thereby preventing the brain's normal functioning. Along with cognitive impairment, VD is characterized by progressive memory deterioration and gradual decline in performing day-to-day activities.

The clinical signs and symptoms of AD and VD are similar, with considerable overlap in pathophysiology and risk factors. However, a detailed clinical evaluation that reveals ischemic or haemorrhagic brain changes will enable the clinician to confirm the diagnosis. A study in 2007 employed various radiographic aids and brain MRI to investigate the cerebral changes in dementia and suggested that almost 80% of patients with AD showed vascular changes (O'Brien, 2007). After analyzing the theories relative to dementia, the Diagnostic and Statistical Manual (DSM-5) criteria changed vascular dementia to vascular neurocognitive disorder (Plassman et al., 2007; Blackman, 2016). This narrative review will focus on the diagnostic criteria, pathophysiology, epidemiology, risk factors, and a brief note on differential diagnosis and management.

History

The pathophysiology of VD has constantly been evolving over the past century. The narration of cognitive impairment due to vascular disorders within the brain was primarily documented in the early 1600s, and it was referred to as senile dementia until the 1960s. Initially, senile dementia was believed to be exclusively instigated by arterial sclerosis of the cerebral cortex. However, in 1969 Tomlinson, Blessed, and Roth recognized AD as the primary aetiology of dementia that occurs at later stages of human life (Tomlinson, Blessed, & Roth, 1970). The DSM-4 suggested that vascular disease of multiple large infarcts in the cerebral cortex led to dementia (Spitzer, Williams, & Gibbon, 1990). Nevertheless, in due course, it was found that the factor mentioned above is just one among many causes of VD, with subcortical disease essentially accounting for most of the cases of dementia. This warranted a prerequisite for developing new criteria for VD and a criterion for a subgroup of subcortical VD that includes Binswanger's disease (subcortical leukoencephalopathy).

Diagnostic Criteria

1. The original Hachinski Ischemic Scale (Hachinski et al., 1975):
In this scale, a 1- or 2-point value to every medical condition is assigned, and the aggregate of these points gives the final Ischemic Score (Table 1).
2. The criteria proposed by the DSM-III, DSM-III-R, DSM-IV, and DSM-5
Various sets of DSM criteria necessitate the impairment of memory and other cognitive functions to arrive at the diagnosis of VD. The cognitive deficits should be severe enough to trigger the impairment of basic and social functioning. Among these, the criteria proposed in DSM-5 are currently used (Table 2) (Blackman, 2016).
3. Vascular Behavioural and Cognitive Disorders (VASCOG) (Sachdev et al., 2014)
While DSM-5 is a more sensitive diagnostic tool, VASCOG is another tool that is harmonious with DSM-5 and provides better clarity to arrive at a clinical diagnosis (Table 3).
4. The National Institute of Neurological Disorders and Stroke-Association Internationale pour la Recherche et l'Enseignement en Neurosciences (NINDS-AIREN) (Román et al., 1993)
Criteria for diagnosing VD must be consistent, effective, and easily applicable for clinical and research purposes. To satisfy these requisites, NINDS-AIREN summoned an International Workshop and proposed various criteria for diagnosing VD (Table 4).
5. The Vascular Impairment of Cognition Classification Consensus Study (VICCCS) diagnosis guidelines (Table 5) (Bir, Khan, Javalkar, Toledo, & Kelley, 2021)

Pathophysiology

As the age progresses, gradual changes and disruption of the cortical vascular structure predispose to the development of the disease process (Figure 1) (Bir, Khan, Javalkar, Toledo, & Kelley, 2021). This embraces (but is not limited to) the changes in brain size, arterial stiffness, atherosclerosis (chronic hypoperfusion), and disruption in the function of the blood-brain barrier by neuro-inflammatory molecules that are introduced by vascular risk factors. Moreover, incidence of intracerebral haemorrhages and blood vessel leakage due to the rupture of small arteries also contributes to the pathophysiology of VD.

Epidemiology, prevalence and incidence:

Worldwide assessments reveal that every 20 years, the incidence of dementia doubles, conferring a projection of 115 million people to be affected with dementia by the end of 2050 (Prince, Guerchet, & Prina, 2013). VD is the second commonest type of dementia that appears typically after the age of 65 years. The prevalence increases steeply with an increase in age. It shows slightly greater predilection towards the male gender and African-American race. VD might be more prevalent than AD in Japan and other Asian countries (Ferri et al., 2005). Figure 2 depicts the prevalence and frequency of various types of dementia (Knapp et al., 2007)

The occurrence of cerebrovascular disorders such as micro and macro-infarcts, white matter (WM) lesions, micro-haemorrhages, lacunar infarcts, leukoaraiosis, superficial haemosiderosis, posterior intracerebral haemorrhages, and strategic strokes tend to intensify the risk of acquiring dementia that is independent of AD-associated pathology.

Risk factors

The risk factors for VD are broadly categorized as modifiable and non-modifiable factors.

i. Modifiable risk factors:
Systemic diseases like uncontrolled diabetes mellitus, hypertension, cardiovascular diseases such as arrhythmias, carotid artery stenosis, dyslipidemia, homocysteinemia; lifestyle factors such as obesity and metabolic syndrome, stress, smoking, and alcohol abuse are the modifiable risk factors for VD. Proper treatment and control measures will eliminate or reduce the disease severity and thereby decrease the risk of developing VD.
ii. Non-modifiable risk factors:
Old age increases the risk of developing the disease, with the risk doubling every 5.3 years once the individual has crossed 60 years (Blackman, 2016; Prince, 2013). Genetic factors such as the presence of notch 3 genes for CADASIL, HTA1 gene for CARASIL, GLA gene for Fabry, and apolipoprotein E4 allele (ApoE4) increase the probability of acquiring the disease (Khan, Kalaria, Corbett, & Ballard, 2016) Other non-modifiable risk factors include post-menopausal women, lower-socioeconomic status, and previous history of cerebrovascular diseases such as stroke.

Table 1 - Hachinski Ischemic Scale Score (IS-S)

Medical feature	Score
Abrupt onset	2
Stepwise deterioration	1
Fluctuating course	2
Nocturnal confusion	1
Relative preservation of personality	1
Depression	1
Somatic complaints	1
Emotional incontinence	1
History of hypertension	1
History of strokes	2
Evidence of associated atherosclerosis	1
Focal neurological symptoms	2
Focal neurological signs	2
IS-S ≤ 4 recommends a diagnosis of AD IS-S ≥7 (IS-S 4- 10) suggests a diagnosis of multi-infarct VD. An intermediate Hachinski IS-S of 5– 6 implies a diagnosis of mixed dementia.	

Table 2 - DSM-5 for the diagnosis of VD

A. The criteria are met for major or mild neurocognitive disorder. B. The clinicalfeatures are consistent with avascular aetiology, as suggested by either of the following: 1. Onset ofthe cognitive deficits istemporally relatedto one or more cerebrovascular events. 2. Evidence for decline is prominent in complex attention (including processing speed) and frontal-executive function. C. There is evidence of the presence of cerebrovascular disease from history, physical examination, and/or neuroimaging considered sufficient to account for the neurocognitive deficits. D. The symptoms are not better explained by another brain disease or systemic disorder	
Probable vascular neurodegenerative disorder	Possible vascular neurodegenerative disorder
1. Clinical criteria are supported by neuroimaging evidence of significant parenchymal injury attributed to cerebrovascular disease (neuroimaging-supported). 2. The neurocognitive syndrome istemporally related to one or more documented cerebrovascular events. 3. Both clinical and genetic evidence of cerebrovascular disease is present	This diagnosis is made if the clinical criteria are met but neuroimaging is not available and the temporal relationship of the neurocognitive syndrome with one or more cerebrovascular events is not established.

Table 3: Criteria for VASCOG

Mild Cognitive Disorder: A. Acquired deterioration in functioning from the previous level of performance in one or more cognitive domains as evidenced by the following: a. Concerns of a patient, knowledgeable informant or a clinician of mild levels of decline from a previous level of cognitive functioning. b. evidence of modest deficits on objective cognitive assessment based on a validated measure of neurocognitive function. B. The cognitive deficits are not sufficient to interfere with their day-to-day activities, but greater effort, compensatory strategies, or accommodation may be required to maintain normal functioning.
Dementia* or Major Cognitive Disorder: A. Evidence of substantial cognitive decline from a documented or inferred previous level of performance in one or more of the domains outlined above. Evidence for decline is based on: a. Concerns of the patient, a knowledgeable informant, or the clinician, of significant decline in specific abilities; and b. Clear and significant deficits in objective assessment based on a validated objective measure of neurocognitive function in one or more cognitive domains. These typically fall two or more standard deviations below the mean of people of similar age, sex, education, and sociocultural background, when a formal neuropsychological assessment is available, or an equivalent level as judged by the clinician. B. The cognitive deficits are sufficient enough to interfere with independence
Note that the DSM-IV and ICD-10 concept of dementia requires deficits in at least two domains, one of which is memory.

Table 4: NINDS-AIREN criteria for the diagnosis of VD

1. Probable vascular dementia: i. dementia syndrome not due to delirium, psychosis, aphasia or sensorimotor impairment, and ii. cerebrovascular disease defined by the presence of focal neurological signs and evidence of relevant cerebrovascular disease by brain imaging (further specified), and iii. a relationship between 1 and 2, such as dementia occurring within three months of a stroke, or abrupt deterioration, or fluctuating stepwise progression.
2. Features consistent with probable vascular dementia include early gait disturbance, frequent falls, early urinary symptoms, pseudobulbar palsy, personality and mood changes, subcortical deficits such as psychomotor retardation, and abnormal executive function.
3. Features making vascular dementia unlikely include clinical symptoms in the absence of focal neurological signs or cerebrovascular lesions on brain CT or MRI.
4. Possible vascular dementia: Possible vascular dementia may be diagnosed in the absence of brain imaging studies or a clear temporal relationship of dementia to stroke.
5. Definite vascular dementia: This requires clinical criteria for probable vascular dementia and pathological evidence of cerebrovascular disease in the absence of tangles and plaques or other types of dementia pathology.

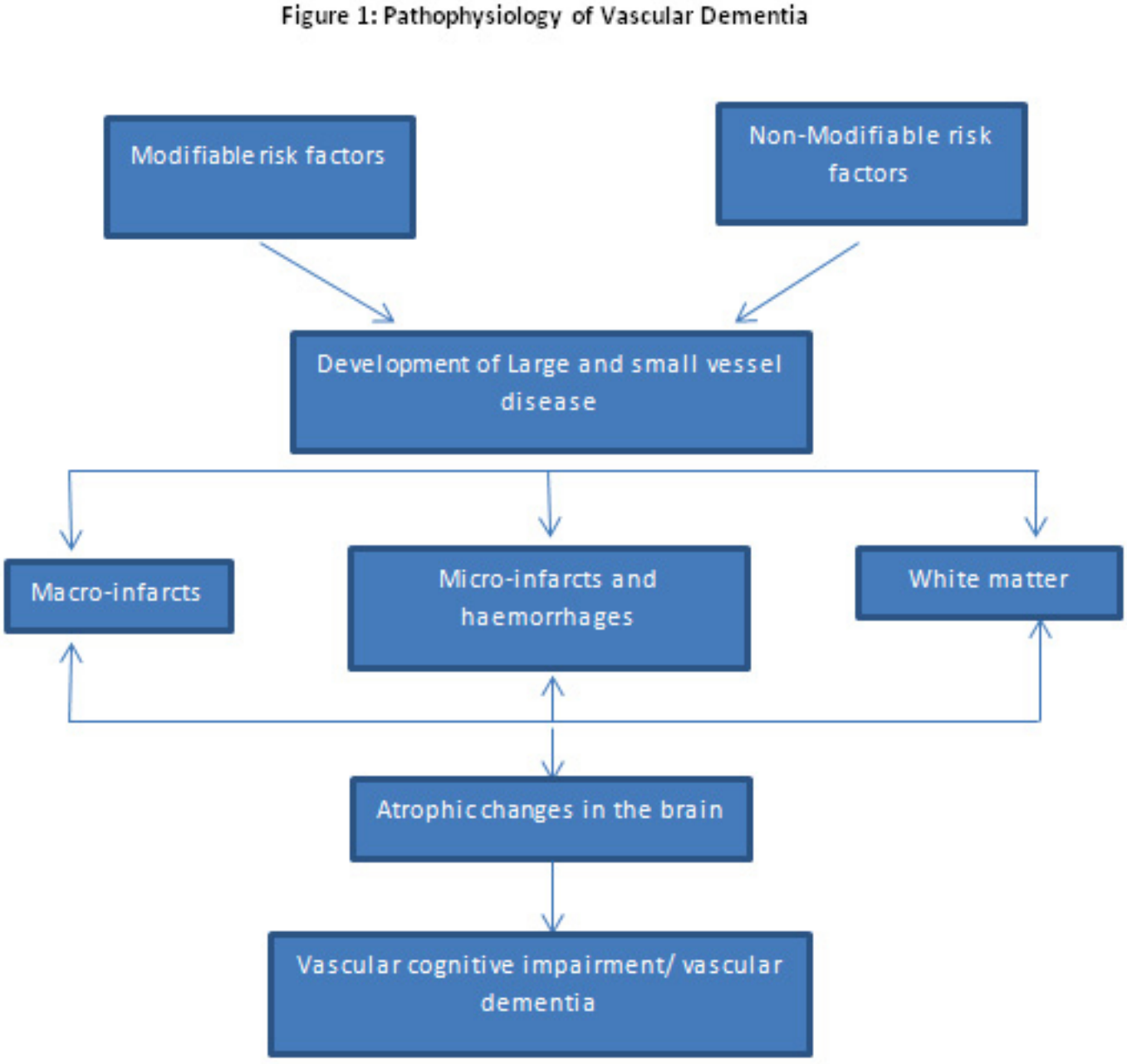
Table 5 - The diagnostic criteria proposed by VICCCS

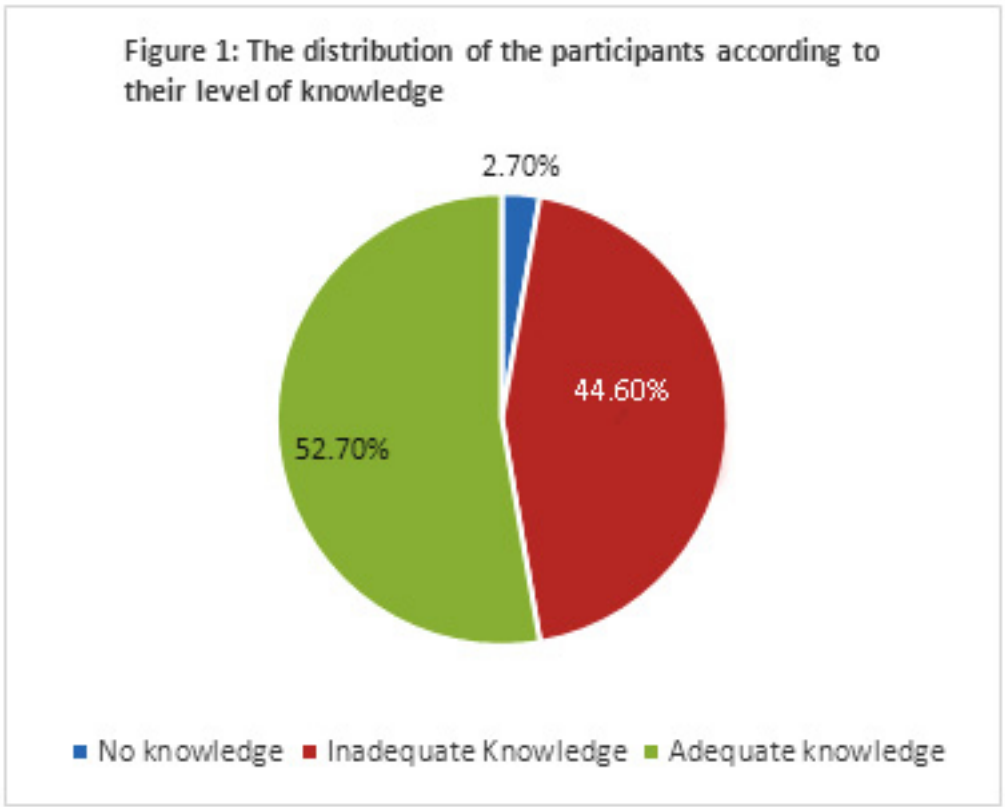
Mild VCI: Impairment in at least one cognitive domain and mild to no impairment in instrumental activities of daily living (IADLs)/activities of daily living (ADLs), respectively.
Major VCI (VD): Clinically significant deficits of sufficient severity in at least one cognitive domain (deficits may be present in multiple domains) and severe disruption to IADLs/ADLs (independent of the motor/sensory sequelae of the vascular event).
Patients given a diagnosis of major VCI (VD) are subcategorized according to the underlying pathology as appropriate. A clear temporal relationship (within six months) between a vascular event and the onset of cognitive deficits is only required for a diagnosis of post-stroke dementia (PSD). Subtypes of major VCI (VD):
i. Post-stroke dementia: A patient described as having PSD may or may not have presented evidence of mild cognitive impairment before stroke.
ii. Mixed dementias: A standalone umbrella subgroup termed "mixed dementias" includes phenotypes representing each combination between vascular and neurodegenerative disease, that is, VCI-AD, VCI–dementia with Lewy bodies, and so forth
iii. Subcortical ischemic VD: Small-vessel disease is the main vascular cause of subcortical ischemic vascular dementia This diagnosis incorporates the overlapping clinical entities of Binswanger's disease and the lacunar state.
iv. Multi-infarct dementia: Multi-infarct dementia is used to indicate the presence of multiple large cortical infarcts and their likely contribution to the dementia. "Probable" and "possible"—terms for the availability of evidence:
Magnetic resonance imaging is a "gold-standard" requirement for a clinical diagnosis of VCI. Probable mild VCI or probable major VCI (VD) is the appropriate diagnostic category if computed tomography imaging is the only means of imaging available.
Those at risk of VCI: It is recommended that greater consideration for diagnosis be given to people who are at risk of VCI if they present with at least six months of sustained impairment (even if very mild), rather than transient impairment, as identified through caregiver reporting and clinical observation. All other potential causes of sustained impairment (e.g., depression or vitamin D deficiency, in addition to the already agreed exclusions from diagnosis) should have been excluded.
Exclusions from diagnosis: Drug/alcohol abuse/dependence within the last three months of first recognition of impairment or delirium.

Table 6 - Subtypes of VCI

Condition	Imaging and pathological changes
Multi-infarct dementia (Cortical VD)	Multiple cortical infarcts
Small vessel dementia (Subcortical VD)	Lacunae, extensive WM lesions; pathological infarcts, demyelination and gliosis
Strategic infarct dementia	Infarct in strategic location (e.g., thalamus)
Hypoperfusion dementia	Watershed infarcts, WM lesions; pathologically incomplete infarcts in white matter
Haemorrhagic dementia	Haemorrhagic changes may be associated with amyloid angiopathy
Hereditary vascular dementia (CADASIL)	Multiple lacunae and WM lesions, temporal lobe WM affected
Alzheimer's disease with cerebrovascular disease (CVD)	Combination of vascular changes and atrophy, especially medial temporal lobe; pathological mixture of vascular and degenerative (plaque and tangle) pathology

Figure 1: Pathophysiology of Vascular Dementia





AD- Alzheimer's disease;
VD- vascular dementia;
DLB- dementia with Lewy bodies;
FTLD- frontotemporal lobar dementia

Protective factors

Higher education and socioeconomic status, multilinguistic individual irrespective of the educational status, healthy lifestyle, non-smoker, and lower level of alcohol consumption have a protective effect as opposed to the development of VD. Statins are the drugs used to counteract dyslipidemia by the HMG-CoA reductase mechanism that reduces the triglycerides and low-density lipoprotein levels in the blood. A systematic review and meta-analysis suggested that the use of statins significantly reduces the risk of developing dementia in the later stages of life (Poly et al., 2020).

Physical activity safeguards neuronal function as well as brain structural integrity. However, cognitive activity bolsters the performance of the neural circuits, thereby promoting the cognitive reserve. The two mechanisms (physical and cognitive activity), when conjoined, reduce the risk of acquiring dementia (Cheng, 2016).

Oestrogen hormone therapy, though initially hypothesized to have protective roles against dementia, is now found to have no significant implication on reducing the risk of dementia. A study by Henderson VW in 2014 highlighted that the use of oestrogen hormone therapy commenced after the age of 65 years may increase the risk of dementia (Henderson, 2014). Likewise, a meta-analysis report in 2005 hinted that the use of NSAIDs did not provide any substantial benefit in reducing the risk of dementia (De Craen, Gussekloo, Vrijsen, & Westendorp, 2005).

Subtypes of Vascular Dementia

Even though the contemporary criteria permitted the recent and novel studies on treatment perspective to be carried out, the validity of the term VD was questioned by many physicians. This prying was fundamental because the definitions of dementia were constructed on the concept of Alzheimer's dementia but did not consider the other types of dementia. Though both types of dementias show cognitive impairment as the key feature; the concept of memory deterioration was not considered while naming VD. Though the term dementia is decidedly apposite for AD, memory loss is inconsistently associated with VD. Therefore, a more inclusive term, vascular cognitive impairment (VCI), was advocated and favoured by physicians and researchers (O'Brien et al., 2003; Hachinski, Iadecola, & Petersen, 2006).

VCI identifies the diverse disposition of the influence of vascular pathology towards the pathophysiology of dementia, as well as classifies the disease into various subtypes (Table 6) (O'Brien & Thomas, 2015).

1. Multi-infarct (cortical):
In this subtype, multiple cortical infarcts with cerebral amyloid angiopathy are noted in most of the cases. Nevertheless, not all infarcts in the diagnosed cases lead to functional cognitive impairment. Among the multiple cortical infarcts, the highest prevalence is seen in the anterior and posterior cerebral artery territory (bilateral presentation), parietal-temporal and temporal-occipital association areas of the dominant hemisphere-including the angular gyrus, the paramedian thalamic region, and inferior medial temporal lobe of the dominant hemisphere (Esiri, Wilcock, & Morris, 1997).

Moreover, the Watershed infarction of the dominant portion of the frontal and parietal lobe in the border zones between tissues that have primary blood supply from the anterior, middle and posterior cerebral arteries is also frequently recounted.

Cerebral amyloid angiopathy (CAA) is the accumulation of β-amyloid plaques within the small and medium-sized blood vessels that predominantly supply the cerebral cortex and the leptomeninges. It is usually diagnosed when numerous micro-haemorrhages are noticed in the brain during an MRI scan (Attems, Jellinger, Thal, & Van Nostrand, 2011). Though CAA is asymptomatic, it might cause cerebral infarction and haemorrhage. As a result of these changes, ischemia of the brain can occur that could lead to the development of dementia and other transient neurologic events. CAA is spotted to be one of the morphologic trademarks of AD. Additionally, it is also identified in the human adult brains without any signs of cognitive disorder.

2. Small vessel dementia (a subcortical ischemic form of VD):
This subtype has an onset above the age of 60 years that shows gradual progression in the disease process. It is frequently linked with hypertension, history of stroke, large vessel diseases, and diseases of the heart valves. Autopsy examination shows destruction of the small blood vessels and nerve fibres of WM, extensive WM lesions, lacunes, infarcts, demyelination, and gliosis. The main clinical features suggestive of this subtype are decelerated processing speed, dysexecutive syndrome, reduction in motor signs, urinary disturbances, and affective disorders. Cognitive deficits or changes seen in this type are short-term memory impairment, altered behaviour, and lack of attention, organization, and decision making (Yamamoto, Craggs, Baumann, Kalimo, & Kalaria, 2011)

This subtype is further classified into Binswanger's disease (i.e., diffuse WM lesions) and multiple lacunar infarcts. In contrary to the features of AD, there are extensive WM lesions, less severe hippocampal atrophy, and absence of Cerebral amyloid angiopathy, which demarcates this subtype of VD from that of AD.

Deep WM vascular changes ensuing subcortical presentation is the widespread type/form. The condition commences rather prematurely in life and is liable to develop a chronic course. The symptoms comprise gait disturbances, Parkinsonism, bradyphrenia, abulia, emotional instability and depression, urinary incontinence, dysphagia, dysarthria, and akinetic mutism. Neuropsychological shortfalls are noted in the aspects of attention, information processing, and set-shifting.

3. Haemorrhagic dementia:
Examination of the brain shows haemorrhagic changes and CAA. The effects depend on the location of the infarct, and various investigations reveal focal neurological findings (Ishikawa, Yanaka, Sugimoto, Ayuzawa, & Nose, 2002).

4. Hereditary vascular dementia (CADASIL):
It is an autosomal dominant type of micro-vasculopathy that is caused by NOTCH 3 mutations of chromosome 19. The age of onset ranges between 20 and 40 years (Peters, Opherk, Danek, Ballard, Herzog, & Dichgans, 2005). The patients usually present with symptoms like depression or migraine with aura. The brain of the affected person shows multiple lacunes and WM lesions (temporal WM) (Charlton, Morris, Nitkunan, & Markus, 2006; Buffon et al., 2006). Nearly 70-80% of the individuals develop mild progressive executive dysfunction much earlier that remains undetected till the fifth decade of life. 60% of the patients have dementia that is possibly diagnosed by the symptoms such as difficulty in walking, personality and mood changes, disturbances in gait and balance, urinary incontinence, and pseudobulbar palsy. Furthermore, recurrent transient ischemic attacks (TIAs), lacunar and subcortical WM ischemic strokes, and strokes in multiple vascular territories are often noted in this subtype. Depression, psychosis, seizures, and other focal neurologic deficits may also occur. In the later years, the patients may develop apathy that is sometimes misinterpreted as depression.

Parenchymal injury, lacunar infarcts, and WM hyperintensities in the frontal and the anterior temporal lobes are significant findings during neuroimaging.

5. Mild Neurocognitive Disorder (MNCD) - AD with CVD:
Here, there is combined vascular change and atrophy of the cerebral cortex, especially the medial temporal lobe. Both vascular pathology and formation of senile plaques and neurofibrillary tangle formation are noticed in this type. The cognitive impairment observed here has multifactorial aetiology. To locate the lesions and identify the aetiology, autopsy examination plays a key role, as the causes coexist.

Vascular disease can coexist with AD and sometimes with Lewy bodies. More often than not, there is going to be mixed pathology. The possible combinations of the pathologies include plaques, tangles with vascular disease, and Lewy bodies. Therefore, it is mandatory to diagnose precisely so that management of the disease is focused on the type of dementia and the specific aetiology.

Differentiating VD from AD:

VD shows the stepwise progression of the disease with less prominent cognitive symptoms. The neurological signs recurrently noted during examination are aphasia or speech difficulties. Frontal symptoms such as apathy, irrational behaviour, verbal fluency problems, and perseveration are apparent if the frontal lobe is involved. Moreover, disturbance in the memory registration phase and impairment in episodic memory, as seen in AD, is absent in VD (Henderson, 2014; De Craen, Gussekloo, Vrijsen, & Westendorp, 2005).

Assessment

One can arrive at a diagnosis as VD after taking a thorough history and performing complete psychiatric & neurologic examination, which includes cognitive testing and brain imaging.

i. History:
Dementia is a clinical diagnosis that ultimately depends upon the clinician's judgement and mandates thorough history taking to identify if the intellectual deterioration has occurred. Clinicians must evaluate the patient's present condition for any debilitating diseases and relevant medication, habits such as smoking, alcohol and sedative use, ADLs and IADLs such as the ability to drive and live and function independently on a daily basis.

ii. Neurologic examination:
It is the most frequently employed as it aids in recognizing the gross focal lesions such as cortical infarcts, and WM damage relating to small vessel disease in the brain (Hachinski, Iadecola, & Petersen, 2006). Estimation of the level of cognitive impairment is a vital part of dementia assessment and is thought to be a feeble connection for the diagnosis of dementia. Neurologic assessment of cognitive and behavioural changes of VCI patients is the same as the assessment of any other patient with alleged cognitive impairment. However, in VCI, the cognitive deficits might encompass any cognitive domain.

The common manifestations of VCI that are revealed during examination are dysexecutive disorder, dysphrenia, impairments in the capability to perform various tasks, and processing and retaining memory (Hachinski, Iadecola, & Petersen, 2006).

iii. Brain imaging:
Brain imaging is an indispensable component for the assessment of patients with impaired cognitive functions and in cases of suspected brain injury due to vascular damage.

MRI is the favoured imaging tool that is exercised to obtain evidence for the signs, location, and extent of any vascular pathology. It is better at spotting lacunar infarcts and micro-haemorrhages. Furthermore, it is helpful in clarifying the diagnosis when confusion exists in identifying the various types of dementias. VICCCS recommends MRI as the gold standard for clinical diagnosis (Bir, Khan, Javalkar, Toledo, & Kelley, 2021)

The clinical implication of WM changes has not been completely explicated. There is a significant association between the CVD risk factors and the incidence of WM changes. Age is considered to be the second strongest

risk factor, only next to hypertension (Schmidt et al., 1992; Breteler et al., 1994). Therefore, WM changes associated with age were referred to as "age-related white matter changes" (ARWMC).

A rating scale proposed by Wahlund LO et al. assessed the severity of white matter changes using ARWMC and compared the results of the images obtained using CT and MRI (Wahlund et al., 2001). The comparison between the two imaging modalities suggested that MRI was a better choice as it detected even the small WM changes.

T2 weighted MRI can envisage various vascular pathologies, including ischaemic lesions, smaller lacunar infarcts, and periventricular leukoaraiosis. Furthermore, it can ascertain the micro-haemorrhages, which is a common finding in the course of CAA.

Additionally, molecular imaging plays a less vital role when compared to its role in detecting the other variants of dementia. However, FDG- PET might be useful in registering certain areas of hypometabolism that can be correlated with the lesions seen on structural imaging.

Clinical features

VD usually presents with a subtle onset of cognitive impairment that shows a gradual stepwise progression of the disease. Initially, memory impairment may show a plateau-like presentation. Complaints relevant to cognition include being responsive to cues and reminders, struggle in forming sentences and language processing, but the patient struggles to form sentences and process languages, experiences attention deficit in terms of difficulty with organization, and solving complex problems. Concentration issues such as decelerated thinking and easy distractibility are also frequently present. The vascular changes are proposed to be the contributors to clinical dementia. Changes in mood or behaviour are also noted, with nearly 25% of the affected individuals suffering from depression. Other symptoms include hallucinations, delusions, motor function deficits such as disturbances in gait, balance, tremors, and generalized weakness.

A study evaluated the effect of depression on the incidence of AD and VD. The results of the evaluation insinuated that depression plays a chief role in developing dementia in later stages of life (Barnes, Yaffe, Byers, McCormick, Schaefer, & Whitmer, 2012). Particularly, depression that was developed during the latter half of life can have a major part in AD prodrome, whereas persistent depression can be clinically related to the increased risk of developing VD.

Taylor WD et al. hinted that age-related CVD leads to a successive influence on mood, behaviour, and cognitive function. The authors also emphasized that "vascular depression" might be the ultimate result due to cognitive impairment, and it should be considered as the prime focus of treatment (Taylor, Schultz, Panaite, & Steffens, 2018).

The vascular changes that occur in patients with VD are hypothesized to be the mechanism for the association between depression and dementia. VD and major depressive disorder (MDD) are each associated with an increased risk of developing each other. Besides, significant depressive symptoms can be more noticed in VD than AD.

Diagnosis

The essential feature of VD that aids in clinical diagnosis is impairment in 2 or more cognitive domains. The striking characteristic difference is noted in the following aspects of brain function:

A. Impaired executive function
B. Visuo-constructional impairment
C. Memory and language are relatively preserved

Another factor that clearly distinguishes VD from the other types of dementia is the CVD associated with other focal signs. These traits must be correlated with the findings of neuroimaging to arrive at the final diagnosis. At this juncture, we would also like to highlight the fact that a temporal relationship between abrupt or stepwise cognitive deterioration and cerebrovascular lesions exists, which assists the clinicians in the diagnosing and planning of the treatment.

Clinical Management

The treatment and clinical management of VD primarily aim at eliminating or reducing the severity of the etiologies, such as reduction of obesity, hypertension, hyperlipidaemia, and glucose intolerance. It should also focus on the promotion of dietary and routine exercise strategies right from the beginning of middle age.

Various medications such as cholinesterase, memantine, and cannabis have been tried to treat the disease. However, the effectiveness of cholinesterase inhibitors is still unclear, and it is not used in VD anymore. But during certain instances, they have been tried in cases of mixed forms of dementia.

A study evaluated the efficacy of memantine in patients diagnosed with VD. The results suggested that 20 mg/dl of memantine proved effective in patients with mild to moderate vascular dementia. It also amended the cognitive function steadily through diverse cognitive scales. The patients did not report any signs of deterioration in overall functioning and behaviour. Moreover, the drug did not cause any adverse reactions (Orgogozo, Rigaud, Stöffler, Möbius, & Forette, 2002). Nonetheless, Cannabis extracts (cannabidiol (CBD) and tetrahydrocannabinol (THC)) do not have any clear evidence to support their use for the management of VD (Peprah & McCormack, 2019). Further long-term studies are required to practice the use of this drug for treating VD.

Depression and anxiety may be effectively treated by antidepressants such as selective serotonin reuptake inhibitor (SSRI) and serotonin and norepinephrine reuptake inhibitor (SNRI) (Whittington, Kendall, Fonagy, Cottrell, Cotgrove, & Boddington, 2004). Finally, the importance of sleep hygiene and sleep apnea must not be overlooked during the treatment planning phase and should be re-evaluated if the patient is non-responsive to treatments.

Future trends in research on VD:

Neuroimaging techniques have been used to identify potential biomarkers of cerebral hemodynamics in people with mild to moderate dementia. Currently, there are several treatments that target vascular risk. However, future research must focus on eliminating the etiologies of dementia rather than treating the disease once it manifests. A study revealed that PEA-OXA, which is a compound known to reduce inflammation and oxidative stress, can be used as a therapy for patients with VD (Impellizzeri et al., 2019). Anti-diabetic drugs like metformin that target the GLP-1 receptor could also be used to treat this condition. Moreover, statins and fibrates are known to have anti-inflammatory and antioxidant effects, and they could benefit patients with VD (Sinha, Sun, Kamari, & Bettermann, 2020).

Future treatment perspectives should focus on gene therapy and stem cell therapy. ApoE4 is the gene that is known to cause this disease in the elderly. Individuals with two or more copies of the ApoE4 allele are prone to having a higher risk of developing dementia. However, the risk of this condition is decreased in individuals with one or fewer alleles, especially the ApoE2 (Biffi et al., 2010).

Certain researchers experimented by delivering virus-mediated ApoE gene into mouse model brains. The studies have shown that this therapy has exhibited positive outcomes. Additionally, contemporary developments in stem-cell therapies predominantly focus on regeneration of the neural cell types instead of aiming to replace the injured cells. Frequently applied stem cells are embryonic stem cells (ESCs), mesenchymal stem cells (MSCs), brain-derived neural stem cells (NSCs), and induced pluripotent stem cells (iPSCs). One of these cell types can be transplanted into the human brain to enable regeneration of the lost neurons (Park et al., 2013). Research on stem cell therapy has shown promising results in terms of reversal of spatial memory and learning deficits in animal models. However, human clinical trials are yet to show improved clinical outcomes in mild to moderate cases of dementia. Another preventive approach is by advising vaccines for individuals prone to develop the condition. Vaccination with ACI-35 rouses the host immune response that in turn clears the abnormal Tau protein (Panza et al., 2016).

Conclusion

Vascular changes of the brain can present themselves in several forms, but it is frequently linked to stroke. These vascular changes lead to impairment of cognitive function and eventually result in dementia. However, pure VD seems to be a rare occurrence as it can occur along with other forms of dementia such as AD. There is compelling evidence suggesting that the vascular changes will deteriorate the cognitive function resulting in neurodegenerative changes. Considering the etiologies of various types of dementia, VD seems to be the only type of dementia that can be prevented if timely diagnosis and intervention are made.

References

Attems, J., Jellinger, K., Thal, D.R., & Van Nostrand, W. (2011). Review: sporadic cerebral amyloid angiopathy. Neuropathology and Applied Neurobiology 2011; 37(1):75-93.

Barnes, D.E., Yaffe, K., Byers, A.L., McCormick, M., Schaefer, C. & Whitmer, R.A. (2012). Midlife vs late-life depressive symptoms and risk of dementia: differential effects for Alzheimer disease and vascular dementia. Archives of general psychiatry, 69(5), 493-498.

Biffi, A., Plourde, A., Shen, Y., Onofrio, R., Smith, E.E., Frosch, M., et al. (2010). Screening for familial APP mutations in sporadic cerebral amyloid angiopathy. PLoS One, 5(11), p.e13949.

Bir, S.C., Khan, M.W., Javalkar, V., Toledo, E.G., & Kelley, R.E. (2021). Emerging Concepts in Vascular Dementia: A Review. Journal of stroke and cerebrovascular diseases, 30(8), 105864.

Blackman, J.S. (2016). Diagnostic and Statistical Manual of Mental Disorders, by American Psychiatric Association. Washington, DC: Author, 20. Psychoanalysis Psychology, 33(4), 651-63.

Breteler, M.M.B., Van Swieten, J.C., Bots, M.L., Grobbee, D.E., Claus, J.J., Van Den Hout, J.H.W., et al. (1994). Cerebral white matter lesions, vascular risk factors, and cognitive function in a population-based study: the Rotterdam Study. Neurology, 44(7), 1246-1246.

Buffon, F., Porcher, R., Hernandez, K., Kurtz, A., Pointeau, S., Vahedi, K., et al. (2006). Cognitive profile in CADASIL. Journal of Neurology, Neurosurgery & Psychiatry, 77(2), 175-180.

Charlton, R.A., Morris, R.G, Nitkunan, A., & Markus, H.S. (2006). The cognitive profiles of CADASIL and sporadic small vessel disease. Neurology, 66(10), 1523-1526.

Cheng, S.T. (2016). Cognitive reserve and the prevention of dementia: the role of physical and cognitive activities. Current Psychiatry Reports, 18(9), 1-2.

De Craen, A.J., Gussekloo, J., Vrijsen, B., & Westendorp, R.G. (2005). Meta-analysis of nonsteroidal anti-inflammatory drug use and risk of dementia. American Journal of Epidemiology, 161(2), 114-20.

Esiri, M.M., Wilcock, G.K., & Morris, J.H. (1997). Neuropathological assessment of the lesions of significance in vascular dementia. Journal of Neurology, Neurosurgery and Psychiatry, 63(6), 749-753

Ferri, C.P., Prince, M., Brayne, C., Brodaty, H., Fratiglioni, L., Ganguli, M., et al. (2005). Global prevalence of dementia: a Delphi consensus study. The Lancet, 366(9503), 2112-2117.
Forette, F., & Boller, F. (1991). Hypertension and the risk of dementia in the elderly. The American Journal of Medicine, 90(3), S14-9.
Hachinski, V.C., Iliff, L.D., Zilhka, E., Du Boulay, G.H., McAllister, V.L., Marshall, J., et al. (1975). Cerebral blood flow in dementia. Archives of Neurology, 32(9), 632-7.
Hachinski, V., Iadecola, C., & Petersen, R.C. (2006). National Institute of Neurological Disorders and Stroke-Canadian Stroke Network vascular cognitive impairment harmonization standards. Stroke, 37, 2220–2241
Henderson, V.W. (2014). Alzheimer's disease: a review of hormone therapy trials and implications for treatment and prevention after menopause. The Journal of Steroid Biochemistry and Molecular Biology, 142, 99-106.
Impellizzeri, D., Siracusa, R., Cordaro, M., Crupi, R., Peritore, A.F., Gugliandolo, E., et al. (2019). N-Palmitoylethanolamine-oxazoline (PEA-OXA): A new therapeutic strategy to reduce neuroinflammation, oxidative stress associated with vascular dementia in an experimental model of repeated bilateral common carotid arteries occlusion. Neurobiology of Disease, 125, 77-91.
Ishikawa, E., Yanaka, K., Sugimoto, K., Ayuzawa, S., & Nose, T. (2002). Reversible dementia in patients with chronic subdural hematomas. Journal of Neurosurgery, 96(4), 680-683.
Kalaria, R. N., Maestre, G.E., Arizaga, R., Friedland, R. P., Galasko, D., Hall, K., et al. (2008). Alzheimer's disease and vascular dementia in developing countries: prevalence, management, and risk factors. The Lancet Neurology, 7(9), 812-826.
Knapp, M., Prince, M., Albanese, E., Banerjee, S., Dhanasiri, S., Fernandez, J.L., et al. (2007). Dementia UK. London: Alzheimer's Society, 7.
Khan, A., Kalaria, R.N., Corbett, A., & Ballard, C. (2016). Update on vascular dementia. Journal of Geriatric Psychiatry and Neurology, 29(5), 281-301.
O'Brien, J.T., Erkinjuntti, T., Reisberg, B., Roman, G., Sawada, T., Pantoni, L., et al. (2003). Vascular cognitive impairment. The Lancet Neurology, 2(2), 89-98.
O'Brien, J.T. (2007). Role of imaging techniques in the diagnosis of dementia. The British Journal of Radiology, 80 (special_issue_2), S71-7.
O'Brien, J.T., & Thomas, A. (2015). Vascular dementia. The Lancet, 386(10004), 1698-1706.
Orgogozo, J.M., Rigaud, A.S., Stoffler, A., Mobius, H.J., & Forette, F. (2002). Efficacy and safety of memantine in patients with mild to moderate vascular dementia: a randomized, placebo-controlled trial (MMM 300). Stroke, 33(7), 1834-1839.
Panza, F., Solfrizzi, V., Seripa, D., Imbimbo, B.P., Lozupone, M., Santamato, A., et al. (2016). Tau-based therapeutics for Alzheimer's disease: active and passive immunotherapy. Immunotherapy, 8(9), 1119-1134.
Park, D., Yang, Y.H., Bae, D.K., Lee, S.H., Yang, G., Kyung, J., et al. (2013). Improvement of cognitive function and physical activity of ageing mice by human neural stem cells over-expressing choline acetyltransferase. Neurobiology of Aging, 34(11), 2639-2646.
Peprah, K., & McCormack, S. (2019). Medical cannabis for the treatment of dementia: a review of clinical effectiveness and guidelines.
Peters, N., Opherk, C., Danek, A., Ballard, C., Herzog, J., & Dichgans, M. (2005). The pattern of cognitive performance in CADASIL: a monogenic condition leading to subcortical ischemic vascular dementia. American Journal of Psychiatry, 162(11), 2078-2085.
Plassman, B.L., Langa, K.M., Fisher, G.G., Heeringa, S.G., Weir, D.R., Ofstedal, M.B., et al. (2007). Prevalence of dementia in the United States: the ageing, demographics, and memory study. Neuroepidemiology, 29(1-2), 125-32.
Poly, T.N., Islam, M.M., Walther, B.A., Yang, H.C., Wu, C.C., Lin, M.C., et al. (2020). Association between use of statin and risk of dementia: a meta-analysis of observational studies. Neuroepidemiology, 54(3), 214-26.
Prince, M., Guerchet, M., & Prina, M. (2013). The global impact of dementia 2013-2050.
Román, G.C., Tatemichi, T.K., Erkinjuntti, T., Cummings, J.L., Masdeu, J.C., Garcia, J.H., et al. (1993). Vascular dementia: diagnostic criteria for research studies: report of the NINDS-AIREN International Workshop. Neurology, 43(2), 250.
Sachdev, P., Kalaria, R., O'Brien, J., Skoog, I., Alladi, S., Black, S.E., et al. (2014). Diagnostic criteria for vascular cognitive disorders: a VASCOG statement. Alzheimer Disease and Associated Disorders, 28(3), 206.
Schmidt, R., Fazekas, F., Kleinert, G., Offenbacher, H., Gindl, K., Payer, F., et al. (1992). Magnetic resonance imaging signal hyperintensities in the deep and subcortical white matter: a comparative study between stroke patients and normal volunteers. Archives of Neurology, 49(8), 825-827.
Sinha, K., Sun, C., Kamari, R, & Bettermann, K. (2020). Current status and future prospects of pathophysiology-based neuroprotective drugs for the treatment of vascular dementia. Drug discovery today, 25(4), 793-799.
Spitzer, R.L., Williams, J.B., & Gibbon, M.B. (1990). First Structured clinical interview for the DSM-3R, patient edition, American Psychiatric Press, Washington DC.
Taylor, W.D., Schultz, S.K., Panaite, V., & Steffens, D.C. (2018). Perspectives on the management of vascular depression. American Journal of Psychiatry, 175(12), 1169-75.
Tomlinson, B.E., Blessed, G., & Roth, M. (1970). Observations on the brains of demented old people. Journal of the Neurological Sciences, 11(3), 205-42.
Wahlund, L.O., Barkhof, F., Fazekas, F., Bronge, L., Augustin, M., Sjogren, M., et al. (2001). A new rating scale for age-related white matter changes applicable to MRI and CT. Stroke, 32(6), 1318-1322.
Whittington, C.J., Kendall, T., Fonagy, P., Cottrell, D., Cotgrove, A, & Boddington, E. (2004). Selective serotonin reuptake inhibitors in childhood depression: systematic review of published versus unpublished data. The Lancet, 363(9418), 1341-1345.
Yamamoto, Y., Craggs, L., Baumann, M., Kalimo, H., & Kalaria, R.N. (2011). Molecular genetics and pathology of hereditary small vessel diseases of the brain. Neuropathology and Applied Neurobiology, 37(1), 94-113.

Role of MR in Evaluating Multiple Sclerosis

Rahaf Saad Mohammed Al Jallal [1], Marwah Saad Mohammed Al Jallal [2]

(1) Medical intern, diagnostic radiology
(2) Medical student

Correspondence:
Shehata Farag Shehata
Lecturer of Biostatistics
High Institute of Public health
Alexandria University
Email: shehatafarag@yahoo.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Rahaf Saad Mohammed Al Jallal, Marwah Saad Mohammed Al Jallal. Role of MR in Evaluating Multiple Sclerosis. World Family Medicine. 2022; 20(11): 193-200. DOI: 10.5742/MEWFM.2022.95251397

Abstract

Introduction: Multiple sclerosis is an inflammatory disease that attacks the central nervous system CNS (brain and spinal cord). Specifically, it attacks the myeline sheath of the neuron cells (1-3). Up to now there is no known pathophysiological cause of the MS disease but it is believed to be autoimmune. Autoimmune means the immunity system attacks normal tissues without obvious cause. It results in progressive neurological deficits leading to accumulating disabilities. The wide distribution of plaques (name of MS lesion) produces a variety of clinical symptoms.

Key words: Multiple sclerosis, evaluation, MRI

Clinical features

Visual disturbance, loss of sensation, muscle weakness, uncontrolled bladder and bowel motion, incoordination and cognitive impairment are some of the clinical features of MS (1,4).

Causes

The aetiology of MS could be genetic or/and environmental. The genetic aspect of the disease is manifested through gender; MS is seen in women more than men by the ratio of 2:1. However, the presence of environmental cause is seen through the deficiency of vitamin D, smoking and obesity during childhood. Surprisingly Vitamin D deficiency has been found in a large number of MS disease patients. The main source of vitamin D is the sun's rays. Therefore, MS is dominantly seen in areas where exposure to the sun rays is short. On the other hand, Multiple sclerosis attacks young people. Usually, it is found between the age of 20 years to the 40s (5,6). In fact, it is considered as the most non-traumatic disabling disease among young people (1,7).

Types

Clinically, multiple sclerosis is divided to four types according to the course of symptoms of the disease; relapse remitting multiple sclerosis (RRMS), secondary progressive multiple sclerosis (SPMS), Primary progressive multiple sclerosis (PPMS) and progressive relapsing multiple sclerosis (PRMS). These types are defined according to disease appearance, disappearance and reappearance (relapse) or speed of worsening (1,8,9).

Multiple sclerosis is clinically diagnosed however, confirmation of the diagnosis or exclusion of conditions that mimic MS requires participation of paraclinical tools such as magnetic Resonance imaging MRI. MRI is known for its sensitivity in diagnosing MS disease. MRI provides several techniques to diagnose MS including but not limited to conventional MR imaging, including Diffusion weighted imaging (DWI), Diffusion tensor imaging DTI, 3D or volume imaging and magnetization transfer imaging MTC. Therefore, MRI is considered to be the best radiology modality in demonstrating neural tissues injury, lesion activity and disease progression. In this literature review we will explore the MRI techniques used to diagnose and demonstrate multiple sclerosis including physics and applications of those techniques (10,11

The Role of MRI in Multiple Sclerosis

First of all, magnet strength plays a role in Multiple sclerosis imaging. It has been agreed by radiologists that 3 tesla MRI is more sensitive than 1.5 tesla in demonstrating MS plaques. The high signal to noise ratio SNR, could be utilized to decrease scan time and/or increase the resolution for more detailed image (12,13).

Diagnosis

Diagnosis of multiple sclerosis is not an easy task for the neurologists. It requires experts who can recognize the central nervous system lesions as MS plaques according to dissemination of lesions in space and time as well as excluding other possibilities which have similar symptoms. There are two pathways to diagnose MS; clinical and paraclinical. There are six clinical criteria set to increase certainty of diagnosis; 1) onset age ranges between 10-50 years 2) objective neurological symptoms 3) symptoms are related to CNS white matter deficits 4) dissemination in space 5) dissemination in time and 6) no better explanation for the symptoms by competent neurologists. Therefore, according to how many points scored from the criteria list, the disease can be classified as definite, probably or possible MS. Value of paraclinical tests is not significant for definite diagnosis as it is for the probable and possible evaluation. In case of definite MS diagnosis, value of paraclinical is to increase the confidence while for probable and possible diagnosis, paraclinical will lead to either positive or negative result. There are two paraclinical tests for diagnosing multiple sclerosis; magnetic resonance imaging (MRI) and laboratory test. MRI is the most sensitive non-invasive investigation. However, laboratory test of cerebrospinal fluid CSF is highly sensitive but rarely done due to being invasive and in fact, other diagnosing tools can lead to true positive or true negative diagnosis. On the other hand, neurologists may encounter difficulties in diagnosing multiple sclerosis for patients presenting with mono symptoms or mono plaque. Optic neuritis, for example, could be focal lesion related to pathology in optic nerve or it could be dissemination in space by MS plaque. Performing MRI scan within 3 months may obscure new tiny plaques disseminated in space. Six months are required to document new MS plaque in space by MRI (1,14,15).

As aforementioned, MS is diagnosed clinically but other related information can be provided by other tools such as Magnetic Resonance Imaging (MRI). When a neurologist suspects the disease as multiple sclerosis, MRI role comes as the next step.

There is no standardized protocol for MR imaging of multiple sclerosis although neurologists and radiologists frequently meet in conventions and discuss this issue. However, all protocols may contain the following sequences ;

Figure 1:

Image weighting	Orientation	Contrast	
T2 FLAIR	Sagittal	Pre-contrast	3D or 2D
T2 FSE	axial	Pre-contrast	3r or 2D
T2 FLAIR	axial	Pre-contrast	
T1 FSE	Axial	Pre-contrast	+/- MTC 3D
DWI	Axial	Pre-contrast	2D
SWI	axial	Pre-contrast	3D
DTI	Axial		3D
A delay period after gadolinium injection			
T1 FSE	Sagittal, axial and coronal	Post contrast	+/- MTC 3D and 2D

Alteration in protocols between MRI centres is expected. These sequences will be explained to clarify the role of these sequences in evaluating MS plaques, how to apply them and a brief physics overview behind these sequences as well as some technical points (16).

-Techniques and applications, physics
-T2 Flair

T2 FLAIR (FLuid Attenuated Inversion Recovery) in sagittal plane is usually the first sequence to be run when MRI is performed for MS patient either diagnosing or follow up. The purpose of applying T2 FLAIR is to increase the conspicuousness of MS plaques. How? The majority of lesions including MS plaques within the brain and spinal cord contain oedema or fluid which appears bright on T2 weighted images. Presence of cerebrospinal fluid CSF around brain and spinal cord decreases the conspicuity of MS plaques. Therefore, FLAIR technique is added to the T2 weighted sequence to suppress the CSF. By suppressing the bright background of the anatomy (CSF), MS plaques appear more prominent on the image and become more feasible for radiological evaluation (17- 19). On the other hand, applying T2 FLAIR in sagittal view would better show if corpus callosum is attacked by the disease or not. Also, sagittal plane demonstrates the orientation of MS plaques to ventricles. MS plaques are generally known as white matter disease which surrounds the ventricles and corpus callosum in the brain. Orientation of MS plaques is perpendicular to ventricles and the best plane to show this feature is sagittal plane (16,12,20).

The T2 FLAIR sagittal should be 3D imaging with isotropic voxel and less than 1.2 mm size. The small isotropic voxel enables reformation of the data to transverse and coronal planes as well as detecting any small plaque (12,21).

IR technique

The suppression of CSF can be achieved by inversion recovery IR technique which is added to the imaging sequence either fast spin echo FSE (as in Figure 2 A and B) or Gradient technique GRE (17,22).

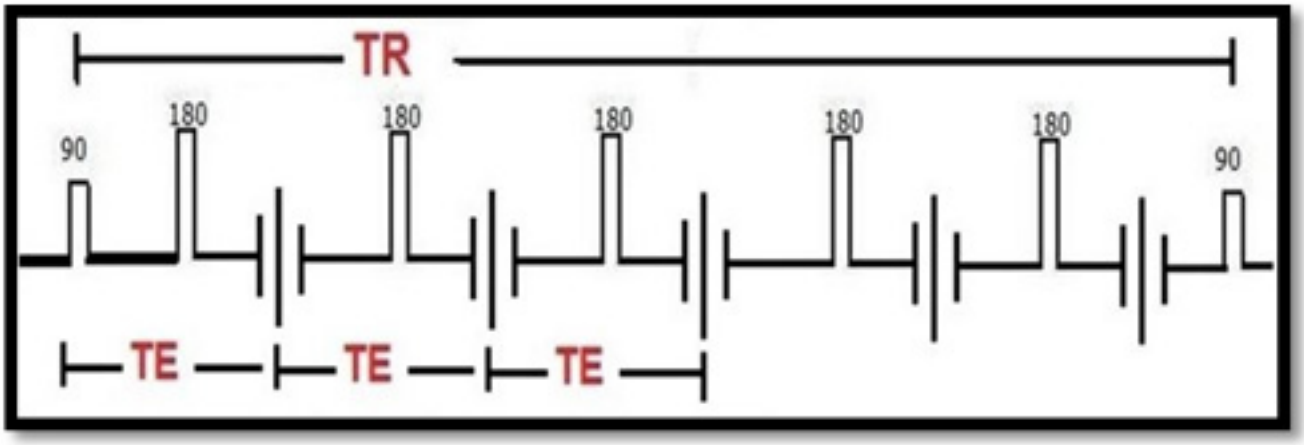


Figure 2A: Fast spin echo technique consists of the 90-excitation pulse followed by multiple 180 refocusing pulses.

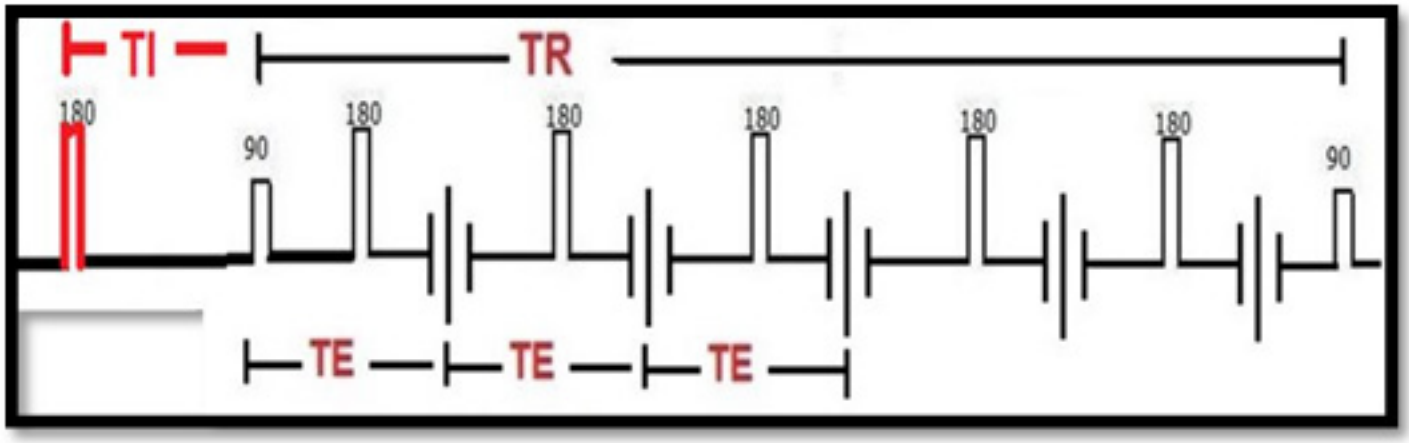


Figure2B: the T2 FLAIR sequence contains two more components than the regular T2 sequence; 1) 180 inversion pulse and 2) time interval between 180 inversion pulse and the 90-excitation pulse.

In fact, all inversion techniques begin with 180 inversion pulse but the difference is usually in time of inversion TI. The time between 180 inversion pulse and 90 excitation is called time of inversion TI and it could be set to target certain tissue. To suppress CSF, the TI should be on the range of 1800-2500ms for 3T MRI system (17,23). T2 FLAIR is applied again but in axial plane because it is more sensitive to plaques on the juxtacortical areas (12,24).

Generally, T2 weighted image is known for its value for pathology evaluation specially in the central nervous system CNS. The T2 weighted images in axial plane is performed for MS evaluation because it is more sensitive for infratentorial MS plaques than the T2 FLAIR (12,25). The T2 contrast is created by setting time of repetition TR and time of echo TE long (17).

T1 weighted

On the other hand, T1 weighted image is known with its anatomical value. However, it is used for pathological purposes when applying post gadolinium injection. Therefore, T1 weighted images must be applied pre contrast to create comparison with the post contrast ones. For MS, T1 imaging is recommended to be 3D for volume measurement which is usually needed for future comparison when atrophy needs to be evaluated (12,26,27). However, T1 2D is more sanative to demonstrate black holes (severe neural axons damage) than the 3D imaging. The majority of T1 2D used in routine MR imaging is carried out with TSE technique but in 3T MR system it is preferable to use T1 GRE which provides better contrast between brain tissues (17,28). In T1 post contrast, only active MS plaques get enhancement while non-active plaque does not (12).

DWI technique

Diffusion weighted imaging (DWI) is a functional sequence depicting motions of the water molecules between intra and extra cellular spaces. DWI is performed with echo planar imaging EPI technique which speed up the sequence (17,29). It is preferable to be less than 5 mm slice thickness and with b values 0 and 1000 for the brain scan. The DWI

is performed for any pathology within the CNS including MS plaques; active MS plaques appear hyperintense in DWI images while non-active appear isointense (16).

SWI technique

Susceptibility weighted imaging (SWI) is sensitive for haemorrhage and calcifications. It is a T2 GRE sequence and depends on long TE, short band width BW and being 3D imaging (17,30). The role of SWI in MS disease evaluation is to provide relationship between the lesion and central vein which is required to draw the picture for nature and progress of the plaque (12,30). Also, it shows the iron deposition around the plaques which give hint with progress of the disease (31,32).

DIR technique

Additionally, there is a new sequence recently introduced to the field of MR imaging called double inversion recovery (DIR) which is applied to improve evaluation of many imaging needs including multiple sclerosis. This sequence uses two inversion radiofrequency RF pulses to suppress CSF and white matter. By doing so, MS plaque within white matter would be further enhanced as well as differentiate between indetermined plaques at juxtacortical; either white or grey matter plaque (33).

DTI technique

Finally, Diffusion Tensor imaging (DTI) is a subdivision of diffusion weighted imaging DWI. However, DTI requires at least six directions to produce accurate images while DWI requires only three directions. The DTI is quite a long sequence but it provides quantification and direction of water diffusion on tissues under imaging. And because MS affects the magnitude and direction of water within white matter for example, DTI could depict these changes on different images. Microscopic changes could not be evaluated with conventional MR imaging like in T1 and T2 images, but DTI fills this gap and provides better sensitivity and specificity for MS plaques diagnosis. Knowing the microscopic profile of MS plaques gives radiologists and neurologists a better management plan for the disease (34,35,36).

Contrast

Decision of Gadolinium injection for MS patients is different from one centre to another but the majority of radiologists are giving it. The five minutes delay after injecting gadolinium is necessary for evaluating MS plaques because the MS plaques get enhanced late. During this period sequences other than T1 can be run because their images will not be affected by the presence of gadolinium. Before giving contrast injection, renal function must be normal otherwise the radiologist has to alter the decision for gadolinium injection (16,37). It is preferable to use macrocyclic contrast agent due to its minor effect to induce nephrogenic systemic fibrosis NSF (12,38).

The post contrast T1 sequences can be improved with magnetization transfer contrast MTC technique. This technique works by transferring magnetization from macromolecule to free water which results in partial saturating of the background and increasead signal of water areas. This technique increases enhancement of small MS plaque which might not be seen without MTC (39,40).

Assessment of the treatment efficacy

Most clinical trials assessment treatment response use MRI results as a secondary measure of outcome and focus on changes in the number and size of hyperintense lesions on T2 and hypointense lesions on T1. A recent meta-analysis of several studies assessed the effect of treatment on injury exposure in treatment studies; that the effects of treatment on MRI lesions for short periods of time (6 to 9 months) may also predict the effects on relapses during longer periods of follow-up (12 to 24 months)(41). Hyperintense lesions on T1 with contrast agent were associated with the number of relapses and the use of MRI, has been suggested as the primary endpoint for treatment studies. Magnetic resonance imaging has been used in several observational studies to identify patients at high risk of treatment failure as measured by clinical disease progression (42-49). In these studies, overall disease activity was lower in interferon-treated patients, but patients who suffer from T2 hyperintense lesions at 1 year follow-up had a much higher risk of poor interferon response disability(44). More specifically, three or more new hyperintense lesions on T2 or one new improved lesion within the first 2 years predicted worse disease progression and the 15 year follow-up confirmed these results (50). With the availability of more effective therapeutic options, emphasis has been placed on achieving multimetric disease stability or “no evidence of disease activity” (NEDA). The definition of NEDA is based on the lack of new activity in magnetic resonance imaging, as well as in the absence of relapse and disability, and was used to assess positive response to treatment in patients with RRMS after 2 years (51). The original criteria are now referred to as NEDA3, as the recently proposed extension to NEDA4, which includes brain atrophy and has been proposed as an improved metric for disease stability (52). It should be noted that NEDA is still under development and there are conflicting studies on the prognostic potential of NEDA3 for long-term stability of the disease (53,54). However, the availability of new treatment modalities offers a more aggressive “treatment to goal” approach and could provide an opportunity to achieve NEDA. The presence of new activity in the MRI is an important marker for the clinical setting, which can be interpreted as suboptimal. Treatment response and treatment changes should be considered on a case-by-case basis. There are no current guidelines as to when imaging should be done for better objective assessment and the following recommendations are based on the literature and protocols used at the MS center. Before starting DMT, an initial MRI (with and without gadolinium) of the entire CNS axis (brain, cervical and thoracic spine) should be performed. Follow-up scans, including imaging of the brain and possibly the spine, are recommended when patients have early active spine disease, 3-6 months after starting treatment to ensure an

early response. Then more MRIs should be done in 6-12 months. Thereafter, if the disease is stable, an annual MRI is required to monitor disease activity and optimal response to contrast agent-free treatment each year, and an MRI of the cervical spine should be considered at least every two years (42,55-59). For patients with diseases of the spine, we recommend doing annual MRIs of the brain and cervical spine. If a patient exhibits new clinical symptoms, an MRI should be done to determine the level of disease activity and based on the imaging result, a change in DMT may be considered. Alternatively, if a patient is clinically stable and new lesions are seen on routine MRI, a more detailed follow-up examination with repeat images, usually taken after 3-6 months, is recommended to ensure disease stability. Routine MRI (or follow-up MRI), a change in DMT can be discussed with the patient. In both of the above cases, MRIs would be done after 6-12 months to ensure treatment response and then returned to annual exams. In RRMS patients receiving DMT with clinically and radiologically stable long-term rest, or in patients with long-term progressive MS, additional images should be adjusted to the individual circumstances. A new MRI may be indicated every 2 to 5 years and more imaging is recommended, especially in younger patients with disease progression. New lesions may appear in patients with progressive MS and treatment adjustments may be considered.

Scan the patients where treatment of CIS is not done every 1 to 3 months for the first 6 months and when recommended stable repeat MRIs every 6 to 12 months unless new clinical symptoms appear. In general, these imaging recommendations allow for close follow-up to assess disease activity and response to treatment to achieve NEDA (60).

Detection of side effects

The role of MRI in drug monitoring in MS is becoming increasingly important as the new generation of immunomodulatory and immunosuppressive drugs become more widespread. In general, MRI has three main tasks in this context: detection of persistent disease activity, comorbidities (neoplastic diseases), and side effects (including opportunistic infections) (61,62). The crucial role of MRI for pharmacovigilance is shown in the case of natalizumab, a recombinant humanized monoclonal antibody against α4integrin (63). Leukencephalopathy (PML), is a life-threatening side effect. The imaging findings of Natalizuma-associated PML are heterogeneous and can therefore be difficult to interpret. However, experienced readers who are informed about the patient's history can reliably detect Natalizuma-associated PML by MRI (64,65,66), even before appear earlier symptoms in the patients (67). Overt Symptoms Detection of progressive multifocal leukoencephalopathy lesions in this symptomatic or presymptomatic stage is associated with better survival and functional outcome (68). To date, there are no strict guidelines as to how and when to perform MRIs for safety monitoring in MS patients treated with natalizumab. Immunosuppressive drugs and the presence (and levels) of antibodies to the JC virus (JCV) have been linked to an increased risk of PML in these patients (69-72). Therefore, the frequency of the MRI examination should be adjusted to the individual risk of PMLv(73). There is substantial evidence that T2FLAIR (Liquid Attenuated Inversion Recovery) is the most sensitive sequence for detecting PML. Diffusion-weighted images are very sensitive in depicting acute demyelination and can also help distinguish acute PML lesions from the chronic and subacute demyelinating lesions of MS (73). Frequent MRI examination with T2FLAIR and diffusion-weighted sequences in combination with conventional T2-weighted images is

therefore recommended for the screening of patients at high risk of PML. Other opportunistic infections that lead to encephalitis may develop in MS patients (e.g., serious paradoxical reactions such as swelling demyelination or overwhelming inflammatory demyelination may occur during treatment with fingolimod). With the growing number of immunosuppressive and immunomodulatory treatments in MS, MRI- based safety monitoring is becoming more complex and valuable. An example of this complexity is when patients treated with natalizumab switch to other drugs such as fingolimod or alemtuzumab. There is increasing evidence that drug-related side effects can occur as soon as an MS treatment is stopped or even several months after the start of a new treatment (so-called "transmitted opportunistic infections") (74- 76). Therefore, patients switching therapy should undergo rigorous pharmacovigilance, including frequent MRI scans, to detect resurgence in MS disease activity and side effects such as opportunistic infections (77).

Benefits

MRI provides a wide spectrum of information about the disease including but not limited to confirmation of the diagnosis, how severe the disease is and monitors the progression over time (1,78). Although MRI provides all of this diagnostic information, it is considered weak in prognostic aspect because the relapse of MS cannot be predicted (10,79).

Needs and recommendations for the future:
-Future research should identify new MRI markers for neuroinflammation and neuroprotection, particularly those related to gray matter pathology (deep gray matter and cortical structures), remyelination, and neuronal repair (77).

- These new markers may require next-generation MRI technology, including newer ones advanced pulse sequences, and improved hardware such as new coils, multi-streaming techniques, and ultra-high- field strengths(77).
- Greater efforts are required to implement and harmonize various advanced MRI techniques and to standardize MRI acquisition and interpretation in MS patients (77).

- Systematic research is required to evaluate the added value of alternative pulse sequences compared to standard pulse sequences, MRI subtraction techniques, and MRI serial scans for disease monitoring and safety (including the most cost-effective monitoring frequency) (77).

Conclusion

Magnetic resonance imaging plays a significant role in detecting and monitoring multiple sclerosis. There are several techniques used to depict the disease and evaluate the progression. These images assist the neurologist to set the treatment plan according to the radiological findings. It is the role of MR technologists not to run only the conventional sequences but to know the new techniques too and apply them in the right way.

References

1. Leary S M, Porter P & Thompson AJ, 2005, Multiple Sclerosis: Diagnosis and The Management of Acute Relapses, postgraduate medical Journal, vol.81, Pp. 302-308
2. Sicotte, N. L., et al. "Regional hippocampal atrophy in multiple sclerosis." Brain 131.4 (2008): 1134-1141.
3. Goldenberg, Marvin M. "Multiple sclerosis review." Pharmacy and Therapeutics 37.3 (2012): 175.
4. Currie, Rhona. "Spasticity: a common symptom of multiple sclerosis." Nursing Standard (through 2013) 15.33 (2001): 47.
5. Dobson R & Giovannoni G, 2019, Multiple Sclerosis – A Review, European Journal of Neurology, vol 26, Pp. 27 – 40.
6. Cantorna, Margherita T. "Vitamin D and multiple sclerosis: an update." Nutrition reviews 66.suppl_2 (2008): S135-S138.
7. Pugliatti, Maura, et al. "The epidemiology of multiple sclerosis in Europe." European journal of Neurology 13.7 (2006): 700-722.
8. Popat, Rita Ashok. Reproductive history and pharmacological agents as risk factors for amyotrophic lateral sclerosis and Parkinson's disease. Stanford University, 2003.
9. Reipert, Birgit. "Multiple sclerosis: a short review of the disease and its differences between men and women." Journal of Men's Health and Gender 1.4 (2004): 334-340.
10. Filippi M & Rocca M A, 2011, MR Imaging of Multiple sclerosis, Radiology, vol. 259, No. 3, Pp. 659 – 675
11. Traboulsee, Anthony L., and D. K. Li. "The role of MRI in the diagnosis of multiple sclerosis." Advances in neurology 98 (2006): 125-146.
12. A Traboulsee, J H Simon, L Stone, E Fisher, D E Jones, A Malhotra, S D Newsome, J Oh, D S Reich, N Richert, K Rammohan, O Khan, E-W Radue, C Ford, J Halper, D Li, 2016, Revised Recommendations of the Consortium of MS Centers Task Force for a Standardized MRI Protocol and Clinical Guidelines for the Diagnosis and Follow-Up of Multiple Sclerosis, American Journal of Neuroradiology, vol. 37, Pp. 394-401
13. Bagnato, Francesca, et al. "Multisequence-imaging protocols to detect cortical lesions of patients with multiple sclerosis: observations from a post-mortem 3 Tesla imaging study." Journal of the neurological sciences 282.1-2 (2009): 80-85.
14. Martinelli, Vittorio, et al. "Disclosing the diagnosis of multiple sclerosis: the Profile Project." Journal of neurology 259.12 (2012): 2605-2610.
15. McDonald, W. Ian, et al. "Recommended diagnostic criteria for multiple sclerosis: guidelines from the International Panel on the diagnosis of multiple sclerosis." Annals of

Neurology: Official Journal of the American Neurological Association and the Child Neurology Society 50.1 (2001): 121-127.
16. Simon, J.H., Li, D., Coyle P.K., Arnold D.L., Barkhof, F., Frank, J.A., Grossman, R., Paty, D.W., Radue, E.W. & Wolinsky, J.S., 2006, Standardized MR Imaging Protocol for Multiple sclerosis: Consortium of MS centres Consensus Guidelines, American Journal of Neuroradiology, vol. 27, Pp. 455-461
17. Westbrook, C. Roth K, & Talbot, J. 2011, MRI in practice, 4th edition, Wiley-Blackwell, Chickster.
18. Souplet, Jean-Christophe, et al. "An automatic segmentation of T2-FLAIR multiple sclerosis lesions." MICCAI-Multiple sclerosis lesion segmentation challenge workshop. 2008.
19. Zhong, Yi, et al. "Automated white matter hyperintensity detection in multiple sclerosis using 3D T2 FLAIR." International journal of biomedical imaging 2014 (2014).
20. Schmidt, Paul, et al. "An automated tool for detection of FLAIR-hyperintense white- matter lesions in multiple sclerosis." Neuroimage 59.4 (2012): 3774-3783.
21. Gramsch, Carolin, et al. "Diagnostic value of 3D fluid attenuated inversion recovery sequence in multiple sclerosis." Acta radiologica 56.5 (2015): 622-627.
22. Redpath, Thomas William, and F. W. Smith. "Use of a double inversion recovery pulse sequence to image selectively grey or white brain matter." The British journal of radiology 67.804 (1994): 1258-1263.
23. Bydder, G. M., J. V. Hajnal, and I. R. Young. "MRI: use of the inversion recovery pulse sequence." Clinical radiology 53.3 (1998): 159-176
24. Hashemi, Ray H., et al. "Suspected multiple sclerosis: MR imaging with a thin-section fast FLAIR pulse sequence." Radiology 196.2 (1995): 505-510.
25. Pretorius, P. M., and G. Quaghebeur. "The role of MRI in the diagnosis of MS." Clinical radiology 58.6 (2003): 434-448.
26. Brex, P. A., et al. "Lesion heterogeneity in multiple sclerosis: a study of the relations between appearances on T1 weighted images, T1 relaxation times, and metabolite concentrations." Journal of Neurology, Neurosurgery & Psychiatry 68.5 (2000): 627-632.
27. Ravid, R., et al. "Histopathologic correlate of hypointense." NEUROLOGY 50 (1998): 1282-1288.

28. Lapucci, Caterina, et al. “Degree of microstructural changes within T1-SE versus T1-GE hypointense lesions in multiple sclerosis: relevance for the definition of “black holes”.” European radiology 30.7 (2020): 3843-3851.
29. Tavazzi, Eleonora, et al. “Quantitative diffusion weighted imaging measures in patients with multiple sclerosis.” Neuroimage 36.3 (2007): 746-754.
30. Maggi, Pietro, et al. “SWI enhances vein detection using gadolinium in multiple sclerosis.” Acta radiologica open 4.3 (2015): 2047981614560938.
31. Filippi, M. Rocca, M.A. Stefano, N.D. Enzinger, C. Fisher, E. Mark A. Horsfield, M.A. Inglese, M. Pelletier, D. Comi, G. 2011, Magnetic Resonance Techniques in Multiple Sclerosis, American Medical Association, vol. 68, Pp. 1514-1520.

Radiological screening for DDH among risky infants in Abha Maternity & Children Hospital from 2019-2021

Mahdi M. Alqarni [1], Khadijah Abdullah Alghanmy [2], Abdulrhman Ali Hassan [3], Abdulrahim Ali Hassan [4], Abduaelah Ali Hassan [4]

(1) Pediatric Orthopedic Consultant, Abha Maternity & Children Hospital, Abha, Kingdom of Saudi Arabia
(2) Orthopedic Consultant, Abha Maternity & Children Hospital, Abha, Kingdom of Saudi Arabia
(3) Orthopedic Resident, Aseer Central Hospital, Abha, Kingdom of Saudi Arabia
(4) Medical Student, College of Medicine, King Khalid University, Abha, Kingdom of Saudi Arabia

Corresponding author:
Dr. Mahdi M. Alqarni
Pediatric Orthopedic Consultant
Abha Maternity & Children Hospital
Abha, Kingdom of Saudi Arabia
Contact #: +966554755828
Email: dralqarnim@gmail.com

Received: September 2022 Accepted: October 2022; Published: November 1, 2022.
Citation: Mahdi M. Alqarni et al.. Radiological screening for DDH among risky infants in Abha Maternity & Children Hospital from 2019-2021. World Family Medicine. 2022; 20(11): 201-207. DOI: 10.5742/MEWFM.2022.95251398

Abstract

Background: Developmental Dysplasia of the Hip (DDH) is the most common musculoskeletal condition diagnosed in neonates. Different timings and approaches to screening for DDH are used in the orthopedic community.

Objectives: To provide evidence that DDH can be screened using sonarograph at the age of 2 months to decrease the risk of misdiagnosed DDH and determine the most common method of treatment regarding the radiological screening the infants underwent.

Methods: This is a retrospective observational study that targeted all infants at risk of DDH who were born between 01-01-2019 to 31-12-2020 at Abha Maternity and Children Hospital (AMCH), Abha, Saudi Arabia. Included in the study were newborns who underwent radiological screening for hip with known risk factors for DDH. Demographic and clinical data were collected from the hospital electronic system. These data included subjects' age and sex, documented ultrasonography screening, documented X-ray diagnosis of DDH, and type of treatment.

Results: A total of 201 infants (101 female, 100 male) aged from one day to six months (mean age 51.46 days, standard deviation 19.21 days) were included in the study. Ultrasonography screening revealed 40 subjects (19.9%) with positive DDH findings. X-rays done at age 4 to 6 months confirmed 26 (12.9%) DDH cases. Ultrasonography correctly detected 24 (11.9%) and excluded 159 (79.1) patients with DDH. However, two cases (1.0%) were not detected by ultrasonography and were later detected by X-ray, and 16 cases (8.0%) were falsely detected as positive DDH.

Twenty-five subjects (12.4%) were treated conservatively, and one subject (0.5%) was treated surgically. Twenty-four cases of DDH showed hip abnormalities on ultrasound, giving a sensitivity rate of 92%. On the other side, 159 subjects who did not have DDH were screened negative with ultrasound (specificity rate 91%).

Conclusions: The present study reveals that early US screening for DDH has high sensitivity and specificity and was associated with a lower rate of invasive intervention. Further research is needed to confirm these findings and examine potential factors influencing the accuracy of US-based screening programs in Saudi Arabia.

Keywords: DDH; Ultrasound; Radiological screening

Introduction

Developmental dysplasia of the hip (DDH) represents a spectrum of hip joint disorders, ranging from hip dysplasia to irreducible hip dislocation, in which some can spontaneously resolve or deteriorate. There is no accepted gold standard in the diagnosis of early DDH [1].

Risk factors for DDH that may prompt targeted screening include breech presentation, female gender, first degree relative with DDH, metatarsus adducts, congenital torticollis, talipes, high birthweight and oligohydramnios, also there are racial differences in the incidence [2].

The potential spontaneous resolution and impreciseness of the diagnosis of DDH makes the assessment of screening in DDH difficult to evaluate accurately. Pathological DDH is more common in females (75%) and on the left side. The rate of unilateral irreducible hip dislocation in the UK is in the order of 0.5-1.00 per 1000 live births. The inheritance of DDH is considered polygenetic and multifactorial. In England and Wales, screening traditionally followed the recommendations of the Standing Medical Advisory Committee (SMAC), originally introduced in 1969 and updated in 1986. This was superseded by the 2008 policy of the NHS Newborn and Infant Physical Examination (NIPE) programmed, in which selective 'at risk' screening was added to the existing universal neonatal and general practitioner clinical hip screening guidelines. The NIPE programme recommends that a strong family history or breech presentation is an important risk factor in the development of DDH. Presently, those with 'true' risk factors of a strong family history of pathological DDH or those born by breech presentation should be screened sonographically [1].

Different timing and approaches to screening for developmental dysplasia of the hip (DDH) are used in the orthopaedic community. Thus, ultrasonographic screening programs and reports based on clinical examinations produced differing incidence rates of DDH. Furthermore, different risk factors and a change of incidence of DDH in the last decades were discussed [3].

Developmental dysplasia of the hip (DDH) is one of the most frequent congenital abnormalities in newborns [4,5]. In the screening of infants for developmental dysplasia of the hip (DDH), clinical examination and hip ultrasonography are the two most frequently used methods. Because clinical evaluations can differ between examiners and because plain radiographs can give inaccurate measurements of the hip joint in the first three months, the use of hip ultrasonography has become widespread in the early diagnosis and treatment of DDH. Advantages of ultrasonography are that it is noninvasive, does not involve radiation and it is easy to use [6].

One of the previous studies shows that the sonographic signs of developmental dysplasia of the hip were found in 0.24 % of the newborns. A significant negative influence of the risk factors birth weight, family history of DDH, and female gender on the α-angle was found. Early or preterm delivery showed a protective potential for DDH [3].

In our study, we tried to provide evidence that DDH can be screened using sonarograph at the age of 2 months to decrease the risk of misdiagnosed DDH; and count the number of at risk infants who are undergoing ultrasound of the hip to determine the most frequent method of radiological screening that the infants underwent.

Materials and Methods

Subjects:
This is a retrospective observational study that targeted all infants at risk of DDH who were born between January 1, 2019 to December 31, 2020 at Abha Maternity and Children Hospital (AMCH), Abha, Saudi Arabia. During this period, a total of 7,573 babies were born in 2019 and 6,931 newborns in 2020. The inclusion criteria applied to 201(1.38%) of total newborns in the study period.

Inclusion and exclusion criteria:
Included in the study were newborns who underwent radiological screening for hip with known risk factors for DDH, i.e., breech presentation, first degree relative with DDH, metatarsus adductus, congenital torticollis, talipes, high birth weight, and oligohydramnios. Newborns who did not meet one or more of these criteria were excluded from the study.

Data collection and management:
Demographic and clinical data were collected from the hospital electronic system. These data included subjects' age and sex, documented ultrasonography screening, documented X-ray diagnosis of DDH, and type of treatment. Graf method ultrasound examination was conducted and reported for all subjects. It is the standard screening technique in the study age group (below 6 months). The radiologists' conclusion of whether a case is positive or negative for DDH was obtained. According to the radiology department protocol in the hospital, ultrasound positivity was noted if α angle was < 55°. X-ray positivity was defined as an acetabular index of >25 associated with Hilgenreiner line, large distance between the neck of the femur and acetabulum, and Perkin line. Positive cases on ultrasound were referred for confirmation by X-rays and fixed abduction brace for confirmed cases. Follow-up every 1.5 months was offered to all confirmed cases. In case of irreducible high dislocation of hip, closed reduction with arthrogram was done according to the hospital protocol. Data were entered using an Excel sheet and then analyzed using the Statistical Package for the Social Sciences (SPSS version 25).

Statistical analysis:
Analyzed data included descriptive (frequency, percentage, mean, and standard deviation) and comparative statistics ($\chi 2$ test). The number of test-positive and test-negative newborns were calculated and used to calculate the accuracy, sensitivity, specificity, positive predictive value, and negative predictive value. P-value <0.01 was set to indicate statistical significance.

Results

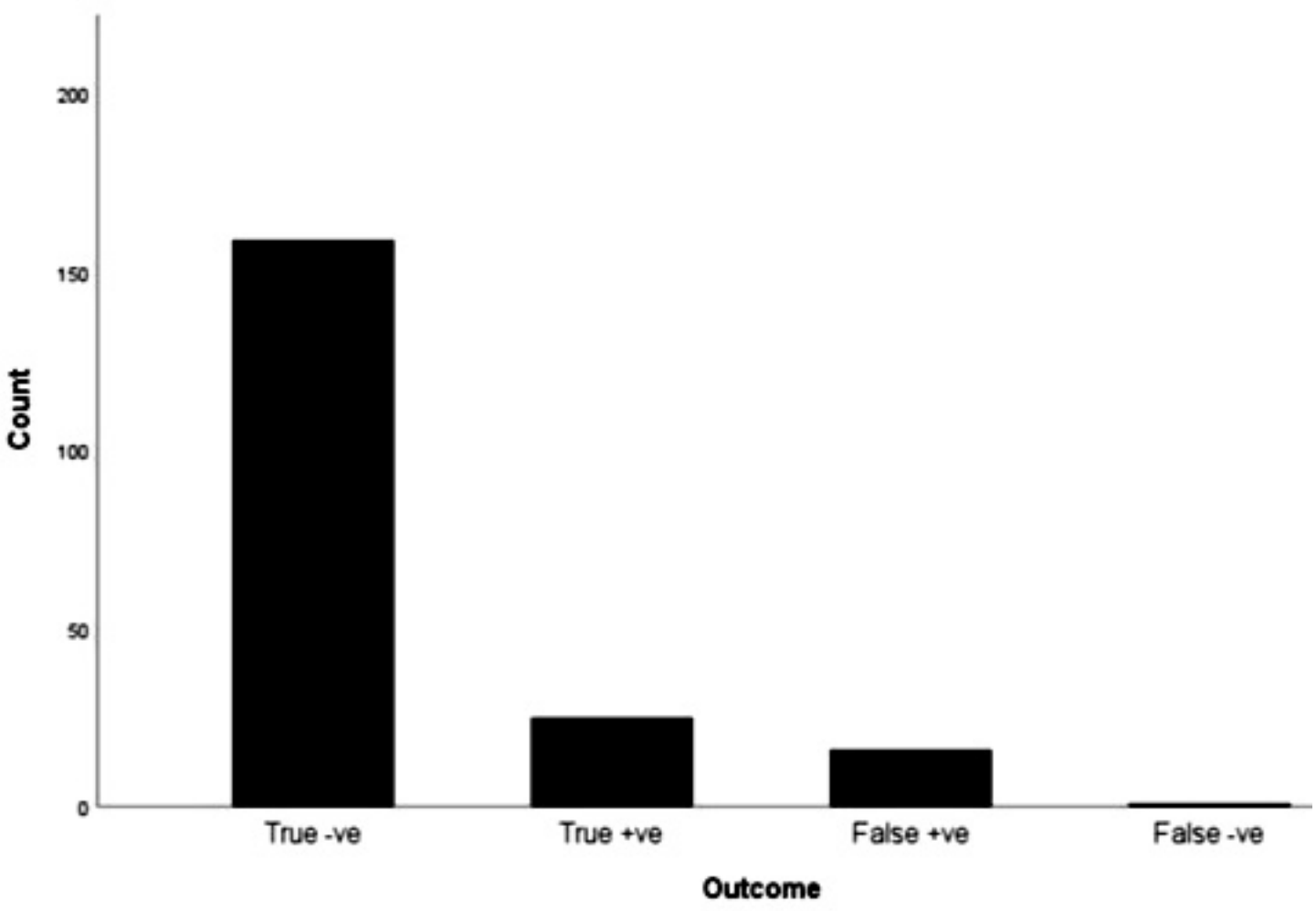
A total of 201 infants (101 female, 100 male) aged from one day to six months (mean age 51.46 days, standard deviation 19.21 days) were included in the study. Ultrasonography screening revealed 40 subjects (19.9%) with positive DDH findings. X-ray done at age 4 to 6 months confirmed 26 (12.9%) DDH cases. Descriptive statistics of the study variables are shown in Table 1.

Table 1. Descriptive statistics of the study variables (n = 201)

Characteristics	Frequency	Percent
Mean age in days, Mean (SD)	51.46 (19.21)	
Sex		
Female	101	50.2
Male	100	49.8
Ultrasonography		
Positive	40	19.9
Negative	161	80.1
X-ray at age 4-6 months		
Positive	26	12.9
Negative	175	87.1
Method of treatment		
None	175	87.1
Brace	25	12.4
Open reduction + pelvic osteotomy + shortening of femur	1	.5
DDH diagnosis		
True negative	159	79.1
False negative	2	1.0
True positive	24	11.9
False positive	16	8.0
SD: Standard deviation; DDH: developmental dysplasia of the hip.		

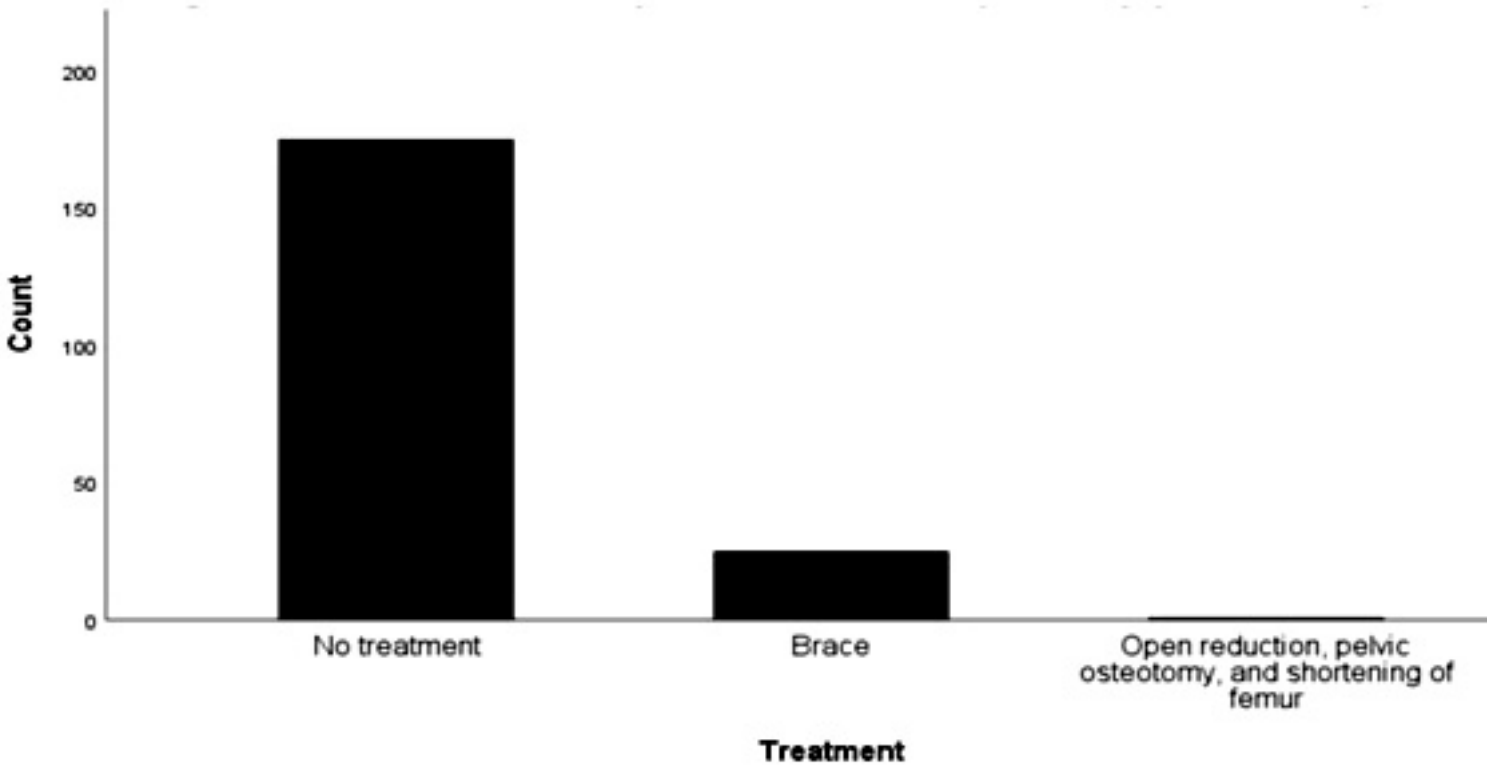
Ultrasonography correctly detected 24 (11.9%) and excluded 159 (79.1) patients with DDH. However, two cases (1.0%) were not detected by ultrasonography and later detected by X-ray, and 16 cases (8.0%) were falsely detected as positive DDH (Figure 1).

Figure 1: Outcome of screening for developmental dysplasia of the hip using ultrasonography and X-ray at age 4 to 6 months



Twenty-five subjects (12.4%) were treated conservatively, and one subject (0.5%) was treated surgically (Figure 2).

Figure 2: Method of treatment of true positive cases of developmental dysplasia of the hip.



Twenty-four cases of DDH showed hip abnormalities with ultrasound, giving a sensitivity rate of 92%. On the other side, 159 subjects who did not have DDH were screened negative on ultrasound (specificity rate 91%). The positive predictive value for hip ultrasonography was 60%, meaning that out of the 100 subjects who were screened positive on ultrasound, 60 of them would eventually receive a diagnosis of DDH. Furthermore, out of 100 subjects who were screened negative on ultrasound, 99 of them did not receive DDH diagnosis. The accuracy of ultrasonography to differentiate the patient and healthy cases correctly was 91% (Table 2).

Table 2. Test characteristics for clinical and ultrasound DDH screening

Characteristics	Ultrasonography		
	Positive	Negative	Total
DDH positive	24 (11.9)	2 (1.2)	26 (12.9)
DDH negative	16 (8.0)	159 (79.1)	175 (87.1)
Total	41 (20.4)	160 (79.6)	201 (100.0)
Sensitivity (TP/TP+FN)	24/26 (.92)		
Specificity (TN/TN+FP)	159/175 (.91)		
Positive predictive value (TP/TP+FP)	24/40 (.60)		
Negative predictive value (TN/TN+FN)	159/161 (.99)		
Accuracy (TP+TN/TP+TN+FP+FN)	183/201 (.91)		
DDH: Developmental dysplasia of the hip; TP: true positive; TN: true negative; FP: false positive; FN: false negative.			

The analysis showed a statistical difference in case treatment according to ultrasonography results ($\chi 2=103.779$, $P<.001$). Among subjects who tested positive for DDH on ultrasound, 60.0% were treated non-invasively, meaning that ultrasonography screening was more likely to detect DDH early and lead to earlier management (Table 3).

Table 3. Sonographic results according to treatment type and rate

Ultrasonography results N (%)	Treatment, N (%)			χ2	P
	None	Non-invasive method	Invasive method		
Positive	16 (40.0)	24 (60.0)	0 (0.0)	103.779	.000
Negative	159 (98.8)	1 (0.6)	1 (0.6)		
Non-invasive: brace; invasive: open reduction + pelvic osteotomy + shortening of femur.					

Discussion

This study evaluated the sonographic characteristics and the role of early ultrasound screening for DDH in a cohort of newborns from one maternity hospital in Saudi Arabia. DDH is a relatively common condition affecting 10/1000 newborns and several screening methods exist to facilitate early detection of abnormal hips and timely clinical management. Although US is the most frequently used screening tool for neonates at risk of DDH, there is controversy regarding the optimal method for DDH screening. As discussed by other authors, the timing of screening programs is strikingly variable with some countries screening as early as the first week (e.g., Austria and Switzerland), two to three weeks (e.g., Netherlands), and other countries screening later at four to five weeks (e.g., Germany) [7]. The current study found that 60.0% of newborns who tested positive on US for DDH were referred early and treated noninvasively. Furthermore, 98.8% of newborns with negative US for DDH received no treatment within a 2-year period. These findings are in line with previous research that confirmed the role of US screening in maximizing clinical outcomes of early nonoperative interventions, as early as the first days of life, and reducing the incidence of operative procedures [8–12].

The analysis showed that US screening for DDH had a perfect sensitivity of 92% and all 25 positive cases were confirmed upon subsequent imaging and treated conservatively. These findings agree with what has been shown in previous studies. For example, Lussier et al. examined a large sample of 1,683 newborns in 2016 and found that US had a sensitivity of 100% in newborns screened before the age of 28 days [13]. Similarly, in our study screening before 28 days of age yielded a sensitivity of 100% (1/1), however, this finding was limited by the small sample size.

A total of 16 (8.0%) who screened positive on US failed to be screened positive by X-ray radiography at age 4 to 6 months (specificity 91%). This figure falls in the range of US specificity across different screening ages as shown by a 15-year prospective longitudinal observational study, where the specificity of US screening for DDH was 99.8%, 90.0%, 97.3% at 28 days, less than 28 days, and 28 days, respectively [14]. Despite early screening for DDH being a prerequisite for preventing invasive surgical correction of dislocated hips discovered at late stages, studies have shown that US screening in the first 6 weeks tends to be highly sensitive and may lead to overdiagnosis [15]. The number of misdiagnosed cases of DDH doubled in cases screened within 4 weeks of life [16]. Hip immaturity is thought to affect the sensitivity and specificity of US screening before 4 weeks owing to interrater variability [16,17].

Clinicians are yet to reach a consensus on the timing of screening for DDH. Early screening has an excellent sensitivity but may increase the cost of frequent follow-up visits, while late diagnosis risks rapid progression of the disease and is considered cost-effective. However, a good body of evidence suggests that early screening is preferable. After 8 to 12 weeks of age, dislocation of the femoral head results in anatomical changes that are likely to consolidate, making it difficult to reduce the femoral head within the acetabular cavity by non-surgical treatment [12]. Furthermore, late treatment is associated with a high risk of adult osteoarthritis due to residual anatomical changes in the acetabulum [18].

In this study, surgery (open reduction, pelvic osteotomy, and shortening of the femur) was done in one case which was screened negative by US at age 2 months and treated late after 6 months. Despite the limitation of the small sample size, these data further support the current practice of early screening of newborns at high risk for DDH (breech, twins, family history). Moreover, even with programs that aim at early screening of at-risk newborns, recent research over the past 10 years shows that selective screening has not significantly reduced late diagnosis and subsequent surgical correction of complicated DDH [12]. Studies conducted in countries that have pioneered "universal" US screening programs, such as Austria, reported a significant reduction in late diagnosis of DDH and a 46% [19] to 52% [20] reduction in surgical correction. Parent adherence to a universal screening program after one month is expected [13].

Strengths and Limitations:

The current study has several strengths as it is among the few studies in Saudi Arabia examining the role of US screening for DDH in infants at risk. The study included all newborns from 2019 to 2020. However, several limitations exist and may reduce the generalizability of our findings.

First, the relatively small sample size should be taken into consideration and conclusions should be made cautiously. Second, the statistical analysis consisted mainly of descriptive tests. Therefore, no inferences could be made from the current data. Third, the retrospective nature of the study, along with relying on electronic files for data collection, hampered the collection of demographic and clinical risk factors for DDH in this sample. Therefore, we could not model the statistical analysis into a regression analysis controlling for confounding factors. The study still has the potential to inspire local future research and a randomized controlled design is necessary to confirm our findings.

Conclusion

The present study reveals that early US screening for DDH has high sensitivity and specificity and was associated with a lower rate of invasive intervention. We believe that DDH screening program should be mandatory, either with ultrasound at the age of 2 months or with X-ray at the age of 4 months, which is the most accurate method, and will diagnose DDH patients early with less cost. Further research is needed to confirm these findings and examine potential factors influencing the accuracy of Early Radiological-based screening programs in Saudi Arabia.

References

1. Talbot CL, Paton RW. Screening of selected risk factors in developmental dysplasia of the hip: an observational study. Arch Dis Child. 2013; 98(9): 692-6.
2. Shorter D, Hong T, Osborn DA. Cochrane Review: Screening programmes for developmental dysplasia of the hip in newborn infants. Evid Based Child Health. 2013; 8(1):11-54.
3. Kolb A, Schweiger N, Mailath-Pokorny M, Kaider A, Hobusch G, Chiari C, Windhager R. Low incidence of early developmental dysplasia of the hip in universal ultrasonographic screening of newborns: analysis and evaluation of risk factors. Int Orthop. 2016 Jan;40(1):123-7.
4. Thaler M, Biedermann R, Lair J, Krismer M, Landauer F (2011) Cost-effectiveness of universal ultrasound screening compared with clinical examination alone in the diagnosis and treatment of neonatal hip dysplasia in Austria. J Bone Joint Surg Br 93:1126–1130.
5. Tschauner C, Fürntrath F, Saba Y, Berghold A, Radl R (2011) Developmental dysplasia of the hip: impact of sonographic newborn hip screening on the outcome of early treated decentered hip joints - a single center retrospective comparative cohort study based on Graf's method of hip ultrasonography. J Child Orthop 5:415–424
6. Dogruel H, Atalar H, Yavuz OY, Sayli U. Clinical examination versus ultrasonography in detecting developmental dysplasia of the hip. Int Orthop. 2008; 32(3):415-9.
7. Geertsema D, Meinardi JE, Kempink DRJ, Fiocco M, van de Sande MAJ. Screening program for neonates at risk for developmental dysplasia of the hip: comparing first radiographic evaluation at five months with the standard twelve week ultrasound. A prospective cross-sectional cohort study. Int Orthop. 2019; 43(8):1933–8.
8. von Kries R, Ihme N, Altenhofen L, Niethard FU, Krauspe R, Rückinger S. General ultrasound screening reduces the rate of first operative procedures for developmental dysplasia of the hip: a case-control study. J Pediatr. 2012; 160(2): 271–5.
9. Price KR, Dove R, Hunter JB. Current screening recommendations for developmental dysplasia of the hip may lead to an increase in open reduction. Bone Joint J. 2013; 95-B(6):846–50.
10. De Pellegrin M, Moharamzadeh D, Fraschini G. Early Diagnosis and Treatment of DDH: A Sonographic Approach. HIP Int. 2007; 17(5_suppl):15–21.
11. Kotlarsky P. Developmental dysplasia of the hip: What has changed in the last 20 years? World J Orthop. 2015; 6(11):886.
12. Agostiniani R, Atti G, Bonforte S, Casini C, Cirillo M, De Pellegrin M, et al. Recommendations for early diagnosis of Developmental Dysplasia of the Hip (DDH): working group intersociety consensus document. Ital J Pediatr. 2020;46(1):150.
13. Lussier EC, Sun Y-T, Chen H-W, Chang T-Y, Chang C-H. Ultrasound screening for developmental dysplasia of the hip after 4 weeks increases exam accuracy and decreases follow-up visits. Pediatr Neonatol. 2019; 60(3):270–7.
14. Mace J, Paton RW. Neonatal clinical screening of the hip in the diagnosis of developmental dysplasia of the hip: a 15-year prospective longitudinal observational study. Bone Joint J. 2015; 97-B(2):265–9.
15. Storer SK, Skaggs DL. Developmental dysplasia of the hip. Am Fam Physician. 2006; 74(8):1310–6.
16. Burnett M, Rawlings EL, Reddan T. An audit of referral time frames for ultrasound screening of developmental hip dysplasia in neonates with a normal antenatal clinical examination. Sonography. 2018; 5(2):61–6.
17. Noordin S, Umer M, Hafeez K, Nawaz H. Developmental dysplasia of the hip. Orthop Rev (Pavia). 2010 Oct 13;2(2):19. http://www.pagepress.org/journals/index.php/or
/article/view/or.2010.e19
18. Staheli L. Developmental hip dysplasia. In: LT S, editor. Fundamentals of pediatric orthopedics. 3rd ed. Lippincott Williams & Wilkins; 2003. p. 82–5.
19. von Kries R, Ihme N, Oberle D, Lorani A, Stark R, Altenhofen L, et al. Effect of ultrasound screening on the rate of first operative procedures for developmental hip dysplasia in Germany. Lancet (London, England). 2003; 362(9399):1883–7.
20. Thallinger C, Pospischill R, Ganger R, Radler C, Krall C, Grill F. Long-term results of a nationwide general ultrasound screening system for developmental disorders of the hip: The Austrian hip screening program. J Child Orthop. 2014; 8(1):3–10.