Diabetic Care Challenges during COVID-19 Pandemic:
Primary Healthcare Physicians' Perspective

Editorial

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This is the first issue this year which is rich with papers that are relevant to primary healthcare. Almalki.et al., followed a cross-sectional study among school teachers in Al-Kharj City, Saudi Arabia, to assess the knowledge and attitude toward epilepsy and seizure first aid among school teachers in Al-Kharj City, Saudi Arabia. In total, 500 school teachers were included in this study. The authors concluded that despite adequate knowledge and attitude demonstrated by the school teachers, nearly half of them showed a lack of understanding about epilepsy and seizure first aid. More education and training are required among school teachers to narrow the gaps in their knowledge about epilepsy and seizure management.

Moussa, et al., did a cross sectional study using A structured questionnaire-based study (DSMQ,) and the hospital electronic medical records system to collect sociodemographic and clinical information. among diabetic patients registered in 3 primary health care clinics in Qatar. With a convenience sample of 400 patients with diabetes. The aim of this study was to explore the status of diabetes self-management (DSM) among patient with diabetes in Qatar and its relationship with glycemic control and other demographic variables. Mean age of participants was 54.36±11.58 years and mean duration of diabetes was 10.53±7.47years. Nearly one third of the patients used insulin and the majority used oral hypoglycemic. The results of this study revealed that good adherence to diabetes self-management was reported among 52.8% of adult diabetic patients while the inadequate cases where around 47.3 % which demonstrated lack of diabetes self-management and subsequently at increased risk of complications. The authors concluded that results indicated that around 47 % of diabetic patients in Qatar do not perform Diabetes self-management (DSM) consistently.

Alotaibi, et al., did an online cross-sectional study of patients with cutaneous hyperpigmentation was conducted in Saudi Arabia. Data were collected by questionnaire-based survey, which was designed by the researcher after a thorough literature review. The aim was to assess the sun protection practices in Saudi Arabia among patients with cutaneous hyperpigmentation. A total of 418 people took part in this study. Approximately 47.0% of sunscreen users reported using sunscreen with a UV protection factor of 21-50. Almost one-third (35.0%) of the patients reported not reapplying sunscreen during the day. The authors concluded that Saudi hyperpigmentation patients use sunscreen inadequately. Males used sunscreen less than females. Healthcare authorities should conduct an educational campaign to inform this group of patients about their condition and the necessity of sunscreen.

Mohialdeen Rahman, et al., looked at the role of MRI CSF flowmetry in the evaluation of patients with suspected hydrocephalus was undertaken by conducting a systematic literature review. The current review was reported as required reporting features for systematic reviews and meta-analysis statements (PRISMA). The authors concluded that the condition of hydrocephalus makes the ventricular size increase and eventually puts pressure on the brain due to excess accumulation of fluid while blocking the CSF flow after it exits ventricles. Currently, many imaging techniques are available for the detection of hydrocephalus that studies the CSF flow dynamics and its related parameters. Among them, the MRI technique is the most reliable, rapid, and most importantly, a non-invasive method for the quantitative measurement of CSF flow rate and intracranial pulsations.

Alsharif , did a retrospective study was done in a hospital on 81 patients randomly selected in a population of over 688,693 were included. Data was collected from patients' ?les, laboratory results data, and echocardiographic results. The aim was to determine trends in rheumatic heart disease in the western region of Saudi Arabia in one decade. The authors concluded that mitral regurgitation (33.3%) and mitral stenosis (33.3%) were echocardiographic fi ndings accounting for more than half of cases. The most common reported signs of rheumatic heart disease were murmur and atrial

fibrillation which goes with international study findings. We recommend to raising the level of public awareness about rheumatic heart disease is required in order to lower the incidence of the disease.

Helvaci MR et al advised that recurrent upper abdominal discomfort may be the cause of nearly half of the applications to the Internal Medicine Clinics, and irritable bowel syndrome (IBS) and chronic gastritis (CG) may be the most commonly diagnosed disorders in such cases. The study included 936 patients with the IBS (592 females) and 346 control cases, totally. They found that FPG and triglycerides are well-known acute phase reactants in the body, IBS and CG may be low-grade inflammatory processes initiated with anxiety, depression, infection, inflammation, trauma, and cancer fear-like stresses of the body, and eventually terminate with smoking, antidepressants use, hemorrhoids, and urolithiasis. Because of the highly significant association of the IBS and CG, they may actually be the two sides of the same paper, and should be called as the irritable gastrointestinal syndrome.

Bin Abdulrahman, et al., did a cross-sectional, and participants completed an online self-administered questionnaire on sleeve gastrectomy in Riyadh to measure the awareness of the indications and complications of sleeve gastrectomy. The total number of respondents assigned is 1700. Among these individuals, women outnumbered males with a percentage of (67.4%) versus (23.6%). The authors concluded that according to their findings, the study population is moderately aware of the indications and complications. However, to ensure that our community has a significant level of knowledge about complications, we must raise social awareness about the indications and complications of sleeve gastrectomy.

Al-Shahrani, et al., conducted a cross-sectional study in primary health centers using a self-report questionnaire from PHC physicians. Challenges in providing health services for type 2 diabetes were assessed.

Two hundred and twenty-two primary care physicians participated in the study. Half of them, 114 (51%), had adequate confidentiality in treating patients with COVID-19. The majority of participating physicians (216; 97.3%) faced challenges in managing diabetic patients during the COVID-19 pandemic (p-value ? 0.05). The authors concluded that most PHC physicians face challenges in managing patients with diabetes mellitus who have COVID-19. Decision makers should increase preparedness for future emergencies to address the significant challenges identified.

Bin Abdulrahman, et al., conducted a cross-sectional study over six months on medical students. Data was collected by using an online self-reported questionnaire. The aim was to assess the prevalence of medical students' syndrome and measure the impact of the syndrome on the GPA among medical students in Riyadh, Saudi Arabia. Four hundred thirteen (413) medical students completed the study questionnaire. According to the Medical students' disease distress scale (MSD-5), 88.9 % of the students had at least one mental disorder. Anxiety was the major mental disorder found in 83.9 % of the medical students, followed by depression (73.6 %). The authors concluded that medical students are more vulnerable to mental conditions like medical students' syndrome, which has negatively impacted their academic achievement. Since students face stress and pressure in their college life, medical students' mental and psychological health should be the top priority to overcome and prevent the occurrence of MSS among students.

Bin Abdulrahman, et al., did a cross-sectional, online survey, looking at the impact of online learning on the psychological state of medical students at Imam Mohammad Ibn Saud Islamic University (IMSIU). Out of 400 participated in the study, 317 (79%) completed the survey; the majority were male (64.7%). The mental state was worsened in 143 (46.5%) students. At the same time, 77 (25%) were psychologically improved. However, 97 (32%) students did not notice any change in their mental health. The results show an effect on the mental state of the medical students during the quarantine of COVID-19.

Alhazmi, et al., did a cross-sectional study of either parent of ASD child aged 1 to 14 years following up at the OPD setting. The aim was to assess the factors influencing the quality of life differences between families caring for a child with Autistic Spectrum disorder diagnosis.

Marital status, housing settings, total household income, current employment, being part of support groups and associated illness in the ASD child were significantly impacting at least one domain of WHOQOL-BREF. The authors concluded that Modifiable factors that have the ability to elevate the quality of life for parents of ASD children; marital status, housing settings, total household income, current employment, being part of support groups overall care of ASD children.

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Changing trends in Rheumatic heart disease: A retrospective tertiary care hospital-based study in the western region of Saudi Arabia

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Abstract

Background: Rheumatic heart disease is a significant public health concern.

Thirty million people are currently thought to be affected by rheumatic heart disease globally. Despite the decreasing trend, there is still a significant disease burden, especially in developing nations.

Objective: To determine trends in rheumatic heart disease in the western region of Saudi Arabia, in one decade. (2010-2020)

Methods: A retrospective study was done in a hospital in Taif region, Saudi Arabia, where 81 patients randomly selected from a population of over 688,693 were included. Data was collected from patients' files, laboratory results data, and echocardiographic results.

Results: The mean age of patients was 47 ± 18 years. The most commonlyreported chronic diseases or surgery were; hypertension 30 (16.4%) and cardiac diseases 24 (13.1%). Almost one-third of the participants presented with a cardiac complication of rheumatic fever in a form of shortness of breath 46 (26.9%). The most common echo finding was mitral valve regurgitation 28 (33.3%).

Conclusion: Mitral regurgitation (33.3%) and mitral stenosis (33.3%) were echocardiographic findings accounting for more than half of cases. The most commonly reported signs of rheumatic heart disease were murmur and atrial fibrillation which goes with international study findings. We recommend raising the level of public awareness about rheumatic heart disease in order to lower the incidence of the disease.

Keywords: Heart, Rheumatic Heart Disease, Tertiary Care Centers, Saudi Arabia.

Introduction

Rheumatic heart disease (RHD) is a preventable yet serious public health problem in low- and middle-income countries and marginalized communities in high-income countries, including indigenous populations [1]. Despite the decreasing trend, RHD is still a significant disease burden, especially in developing nations [2].

Acute rheumatic fever (ARF) and rheumatic heart disease (RHD) are significant public health concerns worldwide [3]. Despite decreasing incidence, there is still a significant disease burden, especially in developing nations [2]. This study will provide a background on the prevalence of RHD in Taif city.

Thirty million people are currently thought to be affected by rheumatic heart disease globally [4]. In 2015, rheumatic heart disease was estimated to be responsible for 305,000 deaths and 11.5 million disability-adjusted life years lost. Of these deaths, 60% occurred prematurely (before the age of 70) [5]. These figures are uncertain due to incomplete data in many countries. Despite the availability of effective prevention and treatment measures, there has been little change in the contribution of rheumatic heart disease to overall global mortality between 2000 and 2015.

A previous Saudi study found 24 cases of rheumatic heart disease for every 10,000 students (6-15 years). Females and rural areas had greater prevalence rates. According to this survey, 34% of participants were beta-hemolytic streptococci carriers [6].

We were motivated to conduct this study because there is a dearth of information from the Taif region that compares evolving patterns in RHD. This hospital-based study aimed to determine trends in rheumatic heart disease in the western region of Saudi Arabia in one decade (2010–2020) at a hospital in Taif region.

Materials and Methods

Study design, setting and time: A retrospective study was conducted in a tertiary hospital in Taif region, Saudi Arabia, from 2010 to June 2020. Taif city has a 2020 estimated population of 688,693 people, making it the 6th most populous city in the kingdom.

Study participants: medical records of three hundred (300) patients who attended the study setting and had a confirmed diagnosis with rheumatic heart disease through echocardiographic imaging were reviewed. Of them only 81 patients with complete medical information were included.

Data collection: A checklist was prepared to collect data by the research ethics committee of Directorate of Health Affairs in Taif city (ethical approval No.:449) about patients' demographics, past medical history (previous diseases), most common clinical presentation, most common examination, investigation findings and echocardiographic findings, and most common valvular abnormalities.

Data analysis: The SPSS program version 26 was used for analysis. Analytic statistics using percentage, mean, standard deviation, and chi-square test were used. A p-value of less than 0.05 was considered as statistically significant.

Results

Final data of 81 patients were enrolled in data entry and analysis with a mean age of 47 ± SD 18. More than two-thirds were females 57 (70.4%); 40 (49.4%) were of the middle socio-economic class (Table 1).

The most commonly reported chronic diseases or surgery in order were; hypertension 30 (16.4%), cardiac diseases 24 (13.1%), diabetes mellitus 19 (10.4%), post valve replacement 11 (6%) and others. The most frequently reported diseases and surgeries were post CABG, valve repair, SLE and APD with a frequency of 1 (0.5%) (Table 2).

Almost one-third were presented with a cardiac complication of rheumatic fever in a form of shortness of breath 46 (26.9%). Other presenting complaints were chest pain 27 (15.8%), previous history of RF 20 (11.7%), palpitation 14 (8.2%). Only 1 patient (0.6%) was asymptomatic or presenting with cyanosis or syncope (Table 3).

As for cardiovascular complications, 29 (22.5%) had a murmur, 17 (13.2) have atrial fibrillation. Of them, 19 (14.7%) had negative findings. Only one (0.8%) had pleural effusion, S4, atrial flutter and dilated right atrium, dilated right ventricle, and pulmonary edema. Dilated left atrium and dilated left ventricle were found in 4 (3.1%) and 11 (8.5%) had other examination findings (Table 4).

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Regarding investigations results, 24 (30.8%) were anemic, 14 (17.9%) were normal, 13 (16.7%) had leukocytosis, 12 (15.4%) have low albumin level and only one (1.3%) has an erythrocyte sedimentation rate more than 50. In 14 (17.9%) investigations were not found (Table 6).

The most common echo findings were; 28 (23%) MR, 28 (23%) MS, 13 (10.7%) AR, 12 (9.8%) TR, 8 (6.6%) cardiomyopathy, 4 (3.3%) valve abnormality and 1 (0.8%) had TS or mitral valve click. Of patients, 5 (4.1%) had normal echo and in 19 (15.6%) no abnormality was found (Table 7). The most common valvular abnormalities were MR and MS (33.3%), AR (15.5%), TR 12 (14.3%), and AS, TS, or mitral valve click (1.2%) (Table 7).

Most cases were recruited in 2017 13 (16%), 11 (13.6%) were in 2020, 9 (11.1%) of cases in 2015 and a similar number in 2018. Seven cases were in 2012 and seven also in 2019 (Table 8).

Table 1: Distribution of patients according to their demographic data

Variable		N	%
Age (Mean ± SD)	47 ± 18		
Gender	Male	24	29.6%
	Female	57	70.4%
Socioeconomic status	Low Socioeconomic status	5	6.2%
	Middle Socioeconomic status	40	49.4%
	Not mentioned	36	44.4%

N.B.: SD = Standard Deviation

Table 2: Distribution of patients according to their past medical history (previous diseases)

Variable	N	%
DM	19	10.4%
HTN	30	16.4%
IHD	9	4.9%
History of Cardiac surgery	10	5.5%
Cardiac disease	24	13.1%
DVR (double valve replacement)	2	1.1%
Post CABG	1	0.5%
Valve Repair	1	0.5%
Post valve replacement	11	6.0%
TIA	5	2.7%
CVA	8	4.4%
Asthma	3	1.6%
Renal diseases	3	1.6%
Renal stones	3	1.6%
Renal failure	2	1.1%
ESRD	2	1.1%
Liver disease	3	1.6%
Gastritis or gastroenteritis	3	1.6%
Epilepsy	2	1.1%
Hypothyroidism	7	3.8%
Autoimmune diseases	4	2.2%
SLE	1	0.5%
APD	1	0.5%
MVD	8	4.4%
Other	11	6.0%
Medically Free	10	5.5%

N.B.: DM= diabetes mellitus, HTN= hypertension, IHD = ischemic heart disease, DVR= double valve replacement, Post CABG= coronary artery bypass graft, TIA, CVA= cerebrovascular accident, ESRD= End-Stage Renal Disease, SLE=systemic lupus erythematous, APD=action potential duration, MVD=Coronary Microvascular Disease.

Table 3: Distribution of patients according to their most common clinical presentation

Variable	N	%
Fatigue	13	7.6%
SOB	46	26.9%
Chest pain	27	15.8%
Chest discomfort	11	6.4%
Palpitation	14	8.2%
Dizziness	11	6.4%
Syncope	1	0.6%
Heart failure	4	2.3%
Cyanosis	1	0.6%
History of Autoimmune disease	3	1.8%
Asymptotic	1	0.6%
Previous history of RF	20	11.7%
Other	16	9.4%
None	3	1.8%

N.B.: SOB=shortness of breath

Table 4: Distribution of patients according to their most common examination findings

Variable	N	%
Tachypnea	3	2.3%
Tachycardia	6	4.7%
Looks Stressed	4	3.1%
Pulmonary edema	1	0.8%
Crepitation	5	3.9%
Basal crackles	2	1.6%
Pulmonary Hypertension	3	2.3%
Plural effusion	1	0.8%
Lower limb edema	6	4.7%
Ascites	2	1.6%
S4	1	0.8%
Decreased air entry	5	3.9%
Murmur	29	22.5%
Arrhythmia	3	2.3%
A. fib	17	13.2%
Atrial flutter	1	0.8%
Dilated RA	1	0.8%
Dilated RV	1	0.8%
Dilated LA	4	3.1%
Dilated LV	4	3.1%
Other	11	8.5%
None	19	14.7%

N.B.: RA= right atrium, RV= right ventricle, LA= left atrium, LV= left ventricle

Table 5: Distribution of patients according to their most common investigation findings

Variable	N	%
Normal	14	17.9%
ESR >50	1	1.3%
Anemia	24	30.8%
Leukocytosis	13	16.7%
Low albumin	12	15.4%
Not found	14	17.9%

N.B.: ESR= erythrocyte sedimentation rate

Table 6: Distribution of patients according to their most common echocardiographic findings

Variable	N	%
Normal echo	5	4.1%
Cardiomegaly	2	1.6%
AR	13	10.7%
AS	1	0.8%
MR	28	23.0%
MS	28	23.0%
TR	12	9.8%
TS	1	0.8%
Cardiomyopathy	8	6.6%
Mitral valve click	1	0.8%
Valves abnormality	4	3.3%
Not found	19	15.6%

N.B.: AR= aortic regurgitation, AS= aortic stenosis, MR=Mitral regurgitation, MS= mitral stenosis, TR= tricuspid regurgitation, TS= tricuspid stenosis

Table 7: Distribution of patients according to their most common valvular abnormalities

Variable	N	%
AR	13	15.5%
AS	1	1.2%
MR	28	33.3%
MS	28	33.3%
TR	12	14.3%
TS	1	1.2%
Mitral valve click	1	1.2%

N.B.: AR= aortic regurgitation, AS= aortic stenosis, MR=Mitral regurgitation, MS= mitral stenosis, TR= tricuspid regurgitation, TS= tricuspid stenosis

Table 8: Distribution of patients according to year of recruitment

Variable	N	%
2010	5	5.8
2011	6	7.4
2012	7	8.6
2013	3	3.7
2014	5	6.2
2015	9	11.1
2016	6	7.4
2017	13	16.0
2018	9	11.1
2019	7	8.6
2020	11	13.6

Discussion

This study found that 16% were reported as having surgery on their heart. A cardiac consequence of rheumatic fever showed up in almost one-third of the individuals as shortness of breath 46 (26.9%). Mitral valve regurgitation was the most typical echo result, with 28 (33.3%). Understanding Rheumatic Heart Diseases (RHD) by studying its wide range of pathological effects is an important measure to overcome its serious complications [7]. These complications can cause significant morbidity and mortality and burden by affecting the young age group [8]. It can range from simple asymptomatic valvular lesions to more serious complications such as arrhythmias, stroke and heart failure [9].

The main purpose of this study was to determine trends in rheumatic heart disease in the western region of Saudi Arabia in one decade (2010–2020). In this study, more than two-thirds of patients were females and slightly less than one-third were males. Half of them were of the middle socio-economic class. This gender difference was also observed in previous studies [10]. Other epidemiological studies of RF and RHD reported no gender predilection for the incidence of RF; however, RHD is more prevalent in females [11,12].

The high prevalence of rheumatic heart disease in low- and middle-income countries was supported by many studies [2, 3,13]. In low- and middle-income nations, the prevalence of rheumatic heart disease was shown to range from 2.7 cases per 1000 people (for "clinically evident" disease) to 21.1 cases per 1000 people (for "clinically quiet" disease), according to a recent meta-analysis [14]. More than two-thirds of cases were recruited in the period between 2015 and 2020. This reflects more progression and evolution in patient diagnosis and more development of the health sector which is one of the goals of Saudi vision 2030. So the only reported cases were the very late presenting and complicated cases and could also be due to reduced patient awareness of RHD and its complications resulting in decreased treatment-seeking behavior [15,16].

The past medical or surgical history of the patients were reported. The most commonly reported chronic diseases or surgery in order were; hypertension which was diagnosed by sixteen percent followed by cardiac diseases in thirteen percent, diabetes mellitus post valve replacement, and others. This result could be attributed to the fact that most hypertensive patients are asymptomatic and are found with the appearance of the symptoms of RHD and subsequent routine blood pressure measuring, so, they accidentally discover that they are hypertensive. The relation here is not a casual relation but a coincidental finding. But causation relation was reported in another study conducted in Nigeria, where the relation was through elevation of blood pressure in the pulmonary circulation which is pulmonary hypertension [17].

Shortness of breath was the most common presenting complaint in about one-third of the participants who presented with a cardiac complication of rheumatic fever followed by chest pain. This is a very serious issue here as dyspnea in patients with RHD always indicates some degree of heart failure and so further evaluation and more attention should be given to prevent the progression of the disease [2].

Concerning the signs of RHD, about one-fifth of patients had murmur and thirteen percent had atrial fibrillation. Relatively rare or late presenting signs are effusion, S4, atrial flutter and dilated right atrium, dilated right ventricle, and pulmonary edema. The most serious of these late presenting complications was atrial fibrillation which may lead to stagnation of blood, thrombus formation and then shooting embolus to the different organs in the body and results in stroke or renal infarction [18].

About one-third of the patients were anemic, and less than twenty percent were normal. The same percentage had leukocytosis and fifteen percent had low albumin levels. These are considered constitutional laboratory findings for many of the chronic diseases and are not specific for RHD but with the other findings, all will guide to the diagnosis.

Mitral regurgitation (MR) and mitral stenosis (MS) were the most reported echocardiographic findings. In addition, about half of the patients had MR or MS and only ten percent of the patients had AR. The right heart valves were the least valves affected. In this study, MS and MR had the same prevalence in contradiction to another study conducted in Brazil which found that the most reported was mitral regurgitation [19].

Limitation
A limitation of the present study was being a single center study that could prevent the generalization of the study results. Other limitations were the small sample size, being a retrospective study and lack of the ASO titre.

Conclusion

In the present study, shortness of breath was the highest presenting complaint followed by chest pain, previous history of renal failure, and palpitations, respectively. The most common reported signs of RHD are murmur and atrial fibrillation; rare or late presenting signs are effusion, S4, atrial flutter, and dilated right atrium, and dilated right ventricle. The most common comorbidities with RHD are hypertension, cardiac diseases, and diabetes mellitus. We recommend more public awareness about RHD in order to lower the incidence of the disease. In addition, improvement in diagnostic techniques through updating the health system through continuous and advanced training of health care professionals is needed.

Ethical approval: The design of the work has been approved by directorate of health affairs – research and studies department – Taif and it conforms to standards currently applied in the country of origin by Number of (449) dated 1 November 2020. The patient's written informed consent was obtained and any information should be as anonymized as much as possible.

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Awareness of the Indications and Complications of Sleeve Gastrectomy in Riyadh, Saudi Arabia

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Abstract

Background: Obesity significantly affects daily activities and contributes to countless diseases and co-morbidities that can drastically alter an individual's life. This study aims to measure the awareness of the indications and complications of sleeve gastrectomy in Riyadh, Saudi Arabia.

Methods: This study was cross-sectional, and participants completed an online self-administered questionnaire on sleeve gastrectomy in Riyadh through Google Forms. Data were entered into Microsoft Excel 2013 and statistically analyzed using SPSS software.

Results: The total number of respondents assigned is 1,700. Among these individuals, women outnumbered males with a percentage of (67.4%) versus (23.6%). The majority of respondents held a bachelor's degree (64.0%). The majority of participants are familiar with the complications associated with sleeve gastrectomy (43.9%). However, 33.1% of the participants are unaware of the complications related to sleeve gastrectomy surgery. As a result, the study has a favorable attitude among the target populations, as the majority are well aware of the surgery.

Conclusion: According to our findings, the study population is moderately aware of the indications and complications. However, to ensure that our community has a significant level of knowledge about complications, we must raise social awareness about the indications and complications of sleeve gastrectomy.

Keywords: Sleeve surgery, obesity, gastrectomy, complications, Saudi Arabia.

Introduction

Obesity is one of the leading causes of many major health problems worldwide (1–5). Its prevalence has increased in the Kingdom of Saudi Arabia (6–8). Obesity significantly affects daily activities and contributes to countless diseases and comorbidities that can drastically alter an individual's life (9,10). The World Health Organization (WHO) defines it as abnormal or excessive fat accumulation with a body mass index (BMI) greater than 30 kg/m, which increases the risk of mortality and morbidity in an individual (2,11). As a result, weight loss is the ideal treatment to reduce the common risk factors associated with obesity (12,13). Sleeve gastrectomy is the only known treatment for morbid obesity (14–17).

Furthermore, its effectiveness is the most commonly performed gastrointestinal surgical procedure (18–21). Sleeve gastrectomy, also known as vertical sleeve gastrectomy, is a restrictive procedure that removes the outer margin to restrict food intake. As a result of this reduction in stomach size, the patient will be able to feel full after eating less, consuming fewer calories, and removing the stomach part that secretes a hormone responsible for the sensation of hunger (22–24). Despite the effectiveness of sleeve gastroenterology surgery, the prevalence of postoperative complications, such as surgical site infections, nutritional deficiencies, vein thrombosis, hemorrhages, and anastomotic leaks, is unfortunately considered high (25–27). As a result, educating patients about the complications and indications of sleeve gastrectomy surgery is critical before referring them to surgery (28–30).

Furthermore, as a first step, educating and raising awareness throughout society is critical (31). The study aims to assess public awareness of sleeve gastrectomy surgery and its indications and complications in Riyadh, Saudi Arabia. Awareness in this study covers a wide range of topics, including the procedure itself and postoperative complications.

Materials and Methods

Study design
A self-administered cross-sectional survey study was conducted in Riyadh City, Saudi Arabia, from October 1 to November 30, 2020.

Study subjects
The study population consists of Riyadh residents aged 18 to 65 years. Participants under 18 years of age and older than 65 who are not residents of Riyadh were excluded. Purposive sampling was performed according to the subject's eligibility criteria. The questionnaire had 14 questions, and participants needed an average of 2 –3 minutes to answer them. Participation was voluntary, and no incentives were used.

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, resulting in a sample size of 724 volunteer adults.

Study questionnaire and its validation process
The authors designed the self-administered online questionnaire. The questionnaire underwent the validation process, starting with face validity, followed by the pilot testing by 25 volunteers. The data set cleaning, principal component analysis, Cronbach's Alpha, and final revision were carried out to make sure it was ready for distribution. Two thousand two hundred fifty (2250) targeted participants were emailed and reminded to participate. The pretest was conducted to assess the reliability of the questionnaire for the sample; some questions were modified accordingly. 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 asked to complete the study questionnaire. The questionnaire included 14 multiple choice questions, 5 of which were dichotomous (yes/no), one (male/female), and one residential place.

Furthermore, there were eight multiple-choice questions about postoperative complications, patient age and complications, and background knowledge about the surgical procedure. The significance of sleeve gastrectomy was used to evaluate all the questions. In addition, tests are preferred to be performed after a sleeve gastrectomy.

Data Analysis
Continuously measured variables were described using mean and standard deviation, while categorically measured factors were described using frequencies and percentages.

Kolmogorov-Smirnov statistical normality and histograms were used to assess the normality assumption for metric variables. The multiple-response dichotomies analysis described the variables measured with more than one option. The chi-squared association test was used to determine the relationship between the years and their future medical specialty. The chi-square test was also used to determine differences in perceptions of future career prospects between male and female medical students. A continuity-adjusted chi-square association test was used for the two × two contingency tables that showed statistical count violations within the contingency table cells (i.e., when one or more cells had counts of 5 or less than the expected count). The relationship between predictors and their odds of being highly aware of sleeve gastrectomy complications was expressed as an odds ratio (OR) with a 95% confidence interval. The SPSS IBM V21 program was used for statistical data analysis. The alpha significance level was considered statistically significant at the 0.050 level.

Results

Of the 2,250 emailed participants, 1,700 (75.5%) responded. The respondent's results were divided into four categories. The first shows sociodemographic characteristics: women outnumbered men by 67.4%. The prevalent age group was 18 to 29 years (52.6%). The second category shows the health status by displaying their BMI and health conditions. While 84.9% of the participants did not suffer from chronic diseases, 15.1% did. The third category discusses the background knowledge of sleeve gastrectomy. For example, 71.1% of participants were aware a history of sleeve gastrectomy surgery, either personally or through friends or family. Finally, the last category shows the participant's awareness of sleeve gastrectomy complications since approximately half (43.9%) participants were familiar with sleeve gastrectomy. However, 33.1% of the participants do not know about the complications of sleeve gastrectomy surgery.

Table 1 presents the sociodemographic characteristics of the respondents. The vast majority of the respondents (83.6%) live in Riyadh. Approximately two-thirds (64.0%) have a bachelor's degree, 26.0% have a high school diploma or less, and 9.0% have a Master's or Ph.D. Regarding occupation, nearly 80.6% worked in fields other than healthcare.

Table 1: Descriptive analysis of sociodemographic and health-related characteristics

	Frequency	Percentage
Sex		
Male	402	23.6
Female	1298	76.4
Age group		
18-29 years	894	52.6
30-40 years	315	18.5
41-50 years	284	16.7
51-65 years	207	12.2
Educational Level		
High school Level or less	459	27
University Degree	1089	64.1
Higher studies	152	8.9
Residence city		
Outside Riyadh	278	16.4
Inside Riyadh	1422	83.6
Body Mass Index		
I don't know/ unsure	454	26.7
Less than 18 (Underweight)	57	3.4
18-25 (Normal)	383	22.5
25-30 (Overweight)	274	16.1
30-40 (Obese)	298	17.5
>40 (Pathological obesity)	234	13.8
Working field / occupation		
Other professional work	1370	80.6
Healthcare worker	330	19.4
Comorbid		
No	1443	84.9
Yes	257	15.1
Comorbidity type, n=257 patients.		
Diabetes mellitus	128	49.8
Hypertension	110	42.8
Heart disease	19	7.4

Table.2: Descriptive analysis of perceptions and indicators of awareness of gastric sleeve surgery

	Frequency	Percentage
Have you or family members or friends had sleeve gastrectomy surgery?		
No	491	28.9
Yes	1209	71.1
How familiar are you with the medical complications associated with sleeve gastrectomy surgery?		
I don't know much	562	33.1
I have a great familiarity with the complications	747	43.9
I think there might be slight complications, and it cannot be more than a surgical site infection	344	20.2
There are no complications with gastric sleeve surgery at all, to my best of knowledge	47	2.8
What are the post-surgical complications of sleeve gastrectomy?		
Vitamin and minerals deficiencies	1215	86.7
Infection	679	48.5
Adverse reactions to anesthesia,	517	36.9
Bleeding from the surgical site	607	43.3
What follow-up tests must be followed postoperatively for a sleeve gastrectomy operation?		
Kidney Function test	644	53.9
Liver Function test	647	54.2
Serum Iron content	669	56
Serum Vitamin D Level	643	53.9
Serum Ferritin Level	642	53.8
Complete Blood Count (CBC)	994	83.2
Serum Zinc Level	541	45.3
Vitamin B12. Level	732	61.3
Do you have a reliable background on the surgical procedure in sleeve gastrectomy operation, such as (the duration, type of anesthetics, etc.)		
No	845	49.7
To some point/degree	525	30.9
Yes	330	19.4
Do you think the patient's age is related to the surgical complications of sleeve gastrectomy?		
No	250	14.7
To some point/degree	542	31.9
Yes	908	53.4
Do you think that sleeve gastrectomy postoperative complications are curable or can be reduced?		
No	154	9.1
To some point/degree	729	42.9
Yes	817	48.1
General gastric sleeve surgery complication awareness score (0-14 points), mean (SD)	6.78 (4.1)	
General awareness of sleeve gastronomy complications level		
Awareness score <=6 points	894	52.6
Awareness score >6 points	806	47.4

Table 2 summarizes the general knowledge of complications from bariatric surgery. Among those surveyed, 454 (26.7%) did not know their body mass index (BMI), while 383 (22.5%) had a BMI in the normal range of 18.5 to 25. On the other hand, 298 (17.5%) were obese. The remaining 274 (16.1%) participants were overweight. Additionally, 57 (3.4%) people were underweight. 234 (13.8%) were classified as extremely obese. Regarding health conditions, 1,443 (84.9%) participants did not have any chronic disease, 128 (7.5%) had diabetes, 110 (6.5%) had hypertension, and the remaining 19 (1.1%) had chronic heart diseases.

More than 200 participants (71.1%) had knowledge of sleeve gastrectomy surgery as participants, or through their friends, or family members. About a fifth of participants said they have had surgery. Table 3 shows the background knowledge of sleeve gastronomy surgery.

More than half, 53.4%, believed that the patient's age was related to the incidence of complications. Approximately 48.0% believe that the postoperative complications of sleeve gastrectomy could be curable or reduced.

Table 4 shows the participant's awareness of sleeve gastrectomy complications. About a third (33.1%) were unaware of the complications of the surgery. Furthermore, (19.4%) of the participants did not know of any postoperative complications of surgery. Furthermore, 31.6% were unaware of any postoperative blood tests.

Multivariate logistic binary regression analysis was used to verify the findings from the bivariate analysis. The analysis model, Table 4, showed that people over 40 years of age were found to be significant, $p < 0.001$, less predicted (41.7% times less or ((1-0.583) X 100)) to have a high awareness of sleeve gastronomy surgery compared to those aged <=40 years on average, considering the other predictors in the analysis as accounted for; however, note Figure 1. Furthermore, the analysis model showed that it was significantly more predicted that women would be highly wary of sleeve gastronomy surgery (2.096 times more) than men on average, $p < 0.001$. Furthermore, the multivariate analysis model showed that people living within the capital city were significantly more predicted (1.325 times more) to be highly aware of sleeve gastronomy surgery than those outside the capital city, $p = 0.049$, which accounts for everything else in the model. Not only that, but the analysis model indicated that people who were unaware of their body mass status were significantly less (37% less) predicted to be highly aware of sleeve gastronomy surgery compared to people who perceived themselves as having high body mass indexes, $p = 0.001$, but people with normal and high body mass index perceptions may not necessarily differ significantly in their awareness of sleeve gastronomy surgery, $p = 0.091$, see Figure 2. The level did not converge particularly with their odds of having a high awareness of sleeve gastronomy, $p = 0.544$. Also, people's work converged significantly with their odds of having a heightened awareness of sleeve gastronomy. Healthcare workers were significantly more predicted, 2.088, to have

a high awareness of sleeve gastronomy surgery compared to those who are not healthcare workers, $p < 0.001$. Unsurprisingly, the analysis model showed that people previously exposed to sleeve gastronomy surgery were significantly more predicted to have a high awareness of sleeve gastronomy surgery (1.456 times more) compared to people not previously exposed /experienced with sleeve gastronomy surgery, on average, $p = 0.002$. But also, the analysis model indicated that people without reliable sources of information on sleeve gastronomy surgery were significantly less predicted (53.7% times less) to be highly aware of sleeve gastronomy surgery and required medical follow-up compared to those who had some or a great extent of information sources on sleeve gastronomy surgery, $p < 0.001$. People's comorbidities (diabetes and hypertension) did not converge significantly on their odds of being highly aware of the aspects of sleeve gastronomy surgery. Still, people who believed that sleeve gastronomy had no complications at all were significantly less predicted (78.8% times less) to be highly aware of the complications of sleeve gastronomy surgery and desired post-surgical follow-up compared to those who believed sleeve gastronomy had some complications or those fully aware of the complications of the sleeve gastronomy surgery or even those who advised that they lacked information at all, on average, $p < 0.001$ according to the multivariate analysis model.

Table 3: Descriptive bivariate analysis of people's awareness of gastric sleeve surgery complications and postoperative precautionary measures

| | Awareness of Gastric Sleeve Surgery Complications | | | |
	Low (n=894)	High (n=806)	test statistic	p-value
Sex				
Male	262 (29.3)	140 (17.4)	$\chi 2$ (1)=33.50	<0.001
Female	632 (70.7)	666 (82.6)		
Age group				
18-29 years	410 (45.9)	484 (60)	$\chi 2$ (3)=51.28	<0.001
30-40 years	161 (18)	154 (19.1)		
41-50 years	183 (20.5)	101 (12.5)		
51-65 years	140 (15.7)	67 (8.3)		
Educational Level				
High school Level or less	244 (27.3)	215 (26.7)	$\chi 2$ (2)=2.73	0.255
University Degree	561 (62.8)	528 (65.5)		
Higher studies	89 (10)	63 (7.8)		
Residence city				
Outside Riyadh	162 (18.1)	116 (14.4)	$\chi 2$ (1)=4.31	0.038
Inside Riyadh	732 (81.2)	690 (85.6)		
Body Mass Index				
I don't know/unsure	299 (33.4)	155 (19.2)	$\chi 2$ (2)=46.32	<0.001
Normal/Underweight	327 (36.6)	387 (48)		
Overweight/Obese	268 (30)	264 (32.8)		
Working field/ occupation				
Other professional work	782 (87.5)	588 (73)	$\chi 2$ (1)=57.12	<0.001
Healthcare worker	112 (12.5)	218 (27)		
Comorbid				
No	735 (82.2)	708 (87.8)	$\chi 2$ (1)=10.50	0.001
Yes	159 (17.8)	98 (12.2)		
Comorbidity type				
Diabetes mellitus	78 (8.7)	50 (6.2)	$\chi 2$ (1)=3.90	0.049
Hypertension	69 (7.7)	41 (5.1)	$\chi 2$ (1)=4.85	0.028
Heart disease	12 (1.3)	7 (0.9)	$\chi 2$ (1)=0.86	0.353
Have you or family members or friends had sleeve gastrectomy surgery?				
No	297 (33.2)	194 (24.1)	$\chi 2$ (1)=17.30	<0.001
Yes	597 (66.8)	612 (75.9)		

Table 3: Descriptive bivariate analysis of people's awareness of gastric sleeve surgery complications and postoperative precautionary measures (continued)

How familiar are you with the medical complications associated with sleeve gastrectomy surgery?			χ2	
I don't know much	440 (49.2)	122 (15.1)	(3)=297.3	<0.001
I have a great familiarity with the complications	234 (26.2)	513 (63.6)		
I think there might be slight complications, and it cannot be more than a surgical site infection	183 (20.5)	161 (20)		
There are no complications with gastric sleeve surgery at all, to the best of my knowledge	37 (4.1)	10 (1.2)		
Do you have a reliable background on the surgical procedure in sleeve gastrectomy operation, such as (the duration, type of anesthetic, etc.)			χ2	
No	533 (59.6)	312 (38.7)	(1)=92.34	<0.001
To some extent	252 (28.2)	372 (33.9)		
To a great extent	109 (12.2)	221 (27.4)		

Table 4: Multivariate logistic binary regression analysis of people's odds of being well aware of gastric sleeve surgery complications. N=1700

	Multivariate adjusted Odds Ratio (OR)	95% C.I. for OR		p value
		Lower	Upper	
Age >40 years	.583	.452	.752	<0.001
Sex= Female	2.096	1.633	2.692	<0.001
Residence=City-Riyadh	1.325	1.001	1.752	.049
Did not have an UpToDate BMI reading/don't know	.630	.475	.836	.049
Underweight/Normal weighted	1.250	.965	1.619	.091
Educational Level	.946	.790	1.133	.544
Work field - Health worker	2.088	1.584	2.752	<0.001
Had previous sleeve gastronomy surgery/ A relative had sleeve gastronomy.	1.456	1.143	1.855	.002
Lack of a reliable source of information on gastric sleeve surgery	.463	.374	.574	<0.001
Comorbidity - Diabetes	.826	.548	1.246	.363
Comorbidity - Hypertension	.764	.489	1.193	.236
Comorbidity - Heart Disease	.541	.198	1.476	.230
Believes that sleeve gastronomy surgery has no complications	.212	.101	.449	<0.001
Constant	.556			.036

Dependent outcome variable = Has a sleeve gastronomy awareness score greater than average (median = 6 points): No/ Yes. Overall statistical significance χ2 (13) =250.6.

Figure 1: People's awareness of the complications of sleeve gastrectomy surgery
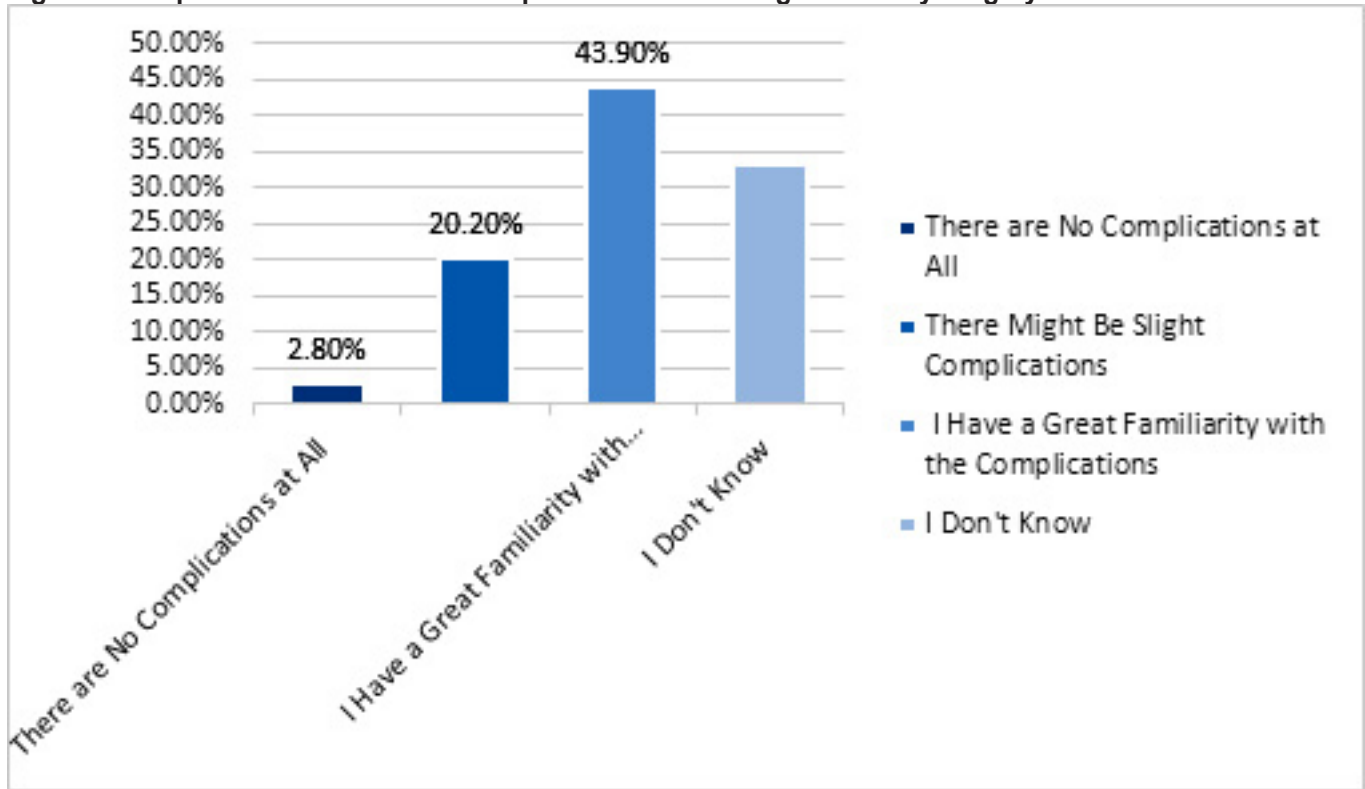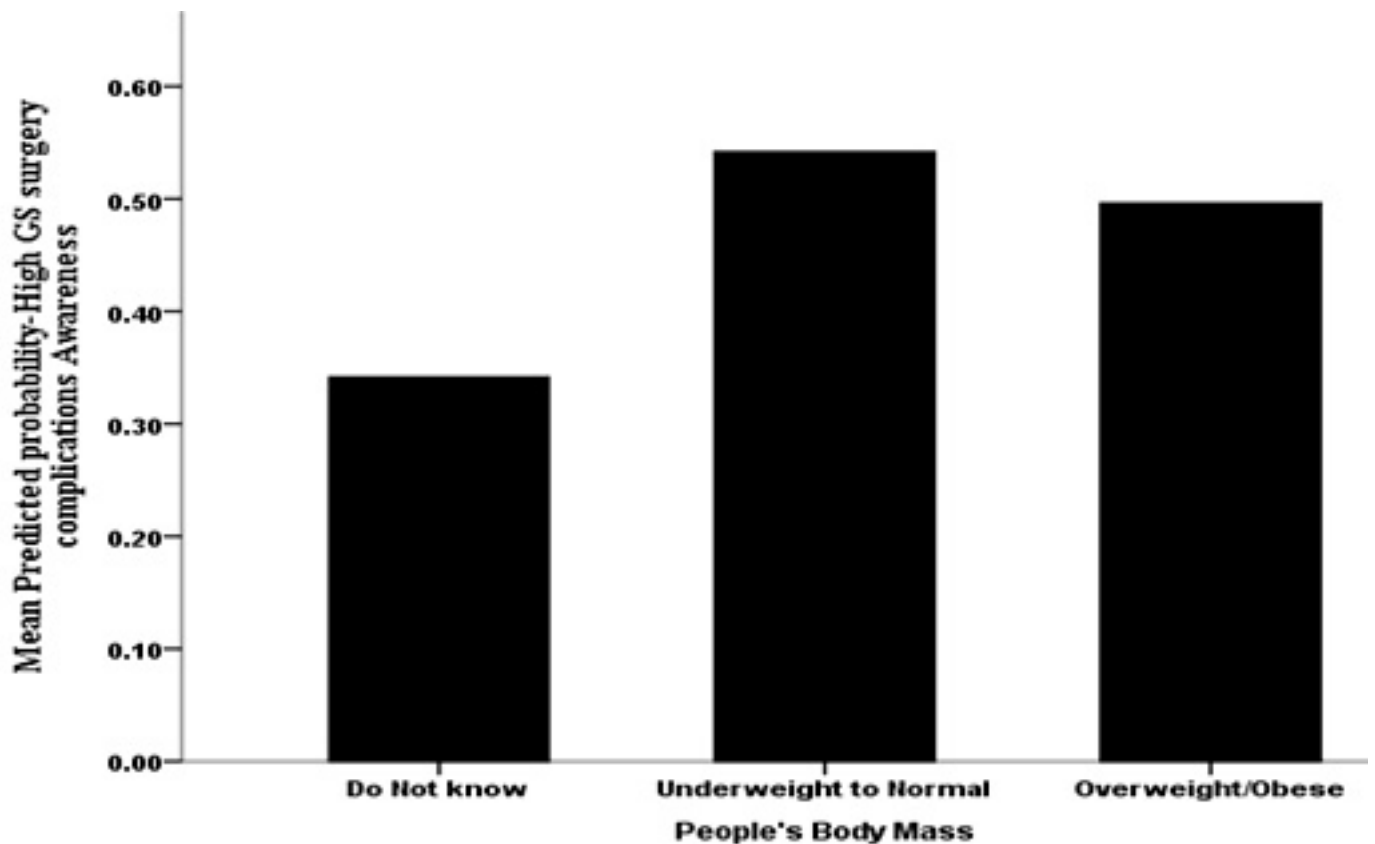

Figure 2: The association between people's perceived body mass with their multivariate adjusted probability of being highly aware of sleeve gastrectomy surgery complications

Discussion

A good public awareness of sleeve gastrectomy complications is essential to ensure that those affected seek medical advice for weight loss. Many factors can influence people's awareness, including education level, personal experience, lifestyle modification after surgery, and individual experience.

The findings of the current study revealed a moderate level of knowledge, particularly among those aged 18 to 29 years. Most of the participants have some knowledge about sleeve gastrectomy complications because most of the participants indicated that bleeding, infections, and vitamin deficiency could occur as complications after surgery. Female participants demonstrated a higher level of knowledge than males. Most of the participants did not know their BMI.

To spread more knowledge about complications, it is imperative to improve society's educational activities in our community and ensure that all health data are based on scientific evidence. The result showed that 58% were aware of the correct postoperative sleeve gastrectomy blood test.

Sleeve gastrectomy induces weight loss by restricting food intake, making it difficult for the individual to consume daily food intake, resulting in spontaneous weight loss (32,33). In addition to its effective contribution to controlling heavy weight with the least effort possible, some people experience postoperative complications that can lead to undesirable health conditions (34). In addition, the patient's symptoms can worsen over time (35). To avoid harmful complications, patients willing to undergo surgery must have a clear understanding and awareness of the surgical procedure and preoperative and postoperative complications (36,37). A good background in bariatric surgery is undoubtedly one of the primary responsibilities (38–40). Unfortunately, few studies have been conducted on this topic in Saudi Arabia, and most reveal a lack of awareness (28,29,41–44). A study was conducted at King Khalid Hospital to assess awareness of sleeve gastrectomy complications and indications of sleeve gastrectomy. The study found that 59.0% of the participants were unaware of the indications for sleeve gastrectomy (41). However, another study has examined whether these patients have a better quality of life and self-reported functional status than obese adults who do not have bariatric surgery. According to the findings, significant weight loss after bariatric surgery, the search for depression treatment, and the absence of medical comorbidities appear to predict better quality of life and self-reported functional status (45). Despite its effectiveness, bariatric surgery has been associated with several serious complications. A study on patients' awareness of the potential risks of weight loss surgery found that acute complications occurred in 0.3 to 8% of operations. According to the survey, two-thirds of the general population knew the possible acute complications associated with bariatric surgery (42). Another study investigated the public perception of morbid obesity and bariatric surgery in Saudi Arabia. According to the survey, the public perception of obesity and bariatric surgery in Saudi Arabia is limited; approximately 50% were unaware of the correct indications for bariatric surgery (46). Patients should be aware of bariatric surgery's safety, effectiveness, and consequences to avoid or deal with complications. A study in Jeddah city revealed that 74% have inadequate opinions about bariatric surgery, and 50.8% have good knowledge about the prevention behavior of obesity (47).

In addition, a survey of Saudi adults was conducted to assess their knowledge and attitudes toward bariatric surgery. According to the study, understanding obesity is generally good in Saudi Arabia. Most Saudis prefer to avoid surgery by following a healthy diet, with most falling into the normal range (BMI 18.5–25) (43).

Conclusion

According to our findings, the study population is moderately aware of the indications and complications. However, to ensure that our community has a significant level of knowledge about complications, we must raise social awareness about the indications and complications of sleeve gastrectomy.

Limitations
This study may have limitations. The sensitive nature of sharing personal information, such as a respondent's weight and BMI, may contribute to low compliance or incorrect responses. The method used in this study is cross-sectional; the timing of the collected data cannot be guaranteed to be representative.

Authors' Contributions:
All authors participated in the concept, design, analysis, interpretation of data, the writing, and manuscript review. They have seen and approved the final version of the manuscript.

Conflict of interest
The authors declare that there is no conflict of interest concerning the publication of this article.

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Ethical Consideration
The study was approved by the IMSIU Research Ethics Committee (project number 119-2020; approval date, 08 December 2020). All writing is done in accordance with the ethical principles of the Declaration of Helsinki. The survey link included a brief description of the study and a more detailed explanation on the survey's front page. Participants were told that completion of the study constituted consent. All participant consent and data were collected in complete confidence throughout the study.

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Awareness and Perception of Seasonal Influenza (Flu) among Medical and Non-Medical Students at Umm Al-Qura University in Makkah, Saudi Arabia: A Cross-Sectional Study

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Abstract

Background: Increasing vaccination rates and reducing the spread of influenza are both greatly improved by raising public knowledge about seasonal influenza. To promote acceptance and create awareness it is necessary to identify any potential barriers to vaccination. This study aimed to assess seasonal influenza awareness, knowledge, vaccination uptake, and barriers.

Methods: A cross-sectional study was conducted as an online survey of 355 medical and non-medical students of Umm Al-Qura University.

Results: Out of the total 355 participants, 175(49.3%) were medical students and 180 (50.7) were non-medical students. There was an almost equal distribution of males (178 (50.1%) and females 177 (49.9%) in both groups. Most of the students 208 (58.6%) were aged 21-24 and most of them were single 346 (97.5%). Awareness of seasonal influenza was 172 (98.3%) among medical students and 157 (87.2%) among non-medical students. The mean knowledge score was 7.75 ± 2.9, with a statistical difference between the two groups (P < 0.001). Vaccination uptake was low in both groups 29 (16.6%) vs 46 (25.6%) in medical and non-

medical respectively. The most prominent barriers to vaccination were the negative perceptions of the vaccine's efficacy (53%) followed by accessibility (20%) and vaccine safety concerns (17%). More than one-third (37.7%) of the medical students and (8.9%) of non-medical students had good knowledge levels of seasonal influenza. Surprisingly, 145 (40.8%) had a poor knowledge level of seasonal influenza with a significant difference between the medical and non-medical groups (p < 0.001).

Conclusions: Despite the high level of awareness, the knowledge level and vaccine uptake were unsatisfactory. Negative perceptions of the vaccine's efficacy, and accessibility were the most significant barriers to vaccination. Campaigns and health education programmes should be considered to encourage others to get vaccinated to reduce the burden of seasonal influenza.

Keywords: Awareness, seasonal influenza, vaccine uptake, knowledge

Introduction

Influenza is a highly infectious human respiratory viral infection that is spread by droplets from coughing and sneezing (1). Around 5 million people worldwide are infected with influenza which kills about 300,000 people yearly. In 2019, influenza A infected 15850 individuals, and about 124 persons died in Saudi Arabia. It mostly occurs in the winter and early spring (2).

 The influenza infection is usually caused by four types of viruses, A, B, C, and D. Influenza A and B viruses cause seasonal epidemics, types C and D do not affect humans. Type A influenza is the most common, spreading quickly and accounting for the majority of the epidemics or pandemics, and includes subtypes H1N1 and H3N2. It is associated with high mortality and morbidity. H3N2 affects older adults and causes more death among the same group compared to H1N1. This effect is primarily due to a weak immune response and antibody production acquired during adulthood (3).

Influenza can affect people of any age group with different prognoses, which can be self-limited in some cases, and fatal in other cases. It can exacerbate patients' underlying chronic diseases such as asthma, chronic obstructive pulmonary disease, diabetes, and renal disorders and can cause an indirect effect on the heart (4).

The best way to prevent infection is the seasonal flu vaccine (5). The annual influenza vaccine contains influenza type A (H1N1 and H3N2) and type B as inactivated or live-attenuated formulations. The flu vaccine timing and the type of flu vaccine are crucial to achieving immunity (6). Influenza vaccination significantly minimizes the risk of contracting the disease and its symptoms (7).

Despite the guidelines' recommendations, the vaccine coverage rates remain low in various regions worldwide. For example only 10.2% of students, 19.1% of patients, and 35.6% of healthcare workers were vaccinated regularly in the United States (8), In Turkey, only 8.1% of people received regular annual vaccinations (9), and the uptake of the influenza vaccine was 15.3% in Saudi Arabia (2).

Many factors influence influenza vaccination uptake, including a lack of awareness about the vaccine's efficacy and convenient access to the vaccine itself (10). Other significant barriers to vaccine uptake were found to be negative perceptions of the flu vaccine and a lack of physician recommendations (11).

Regarding the awareness of influenza, a study conducted in Pakistan on medical and non-medical students found that health awareness about seasonal influenza was low among university students, especially non-medical students (12). In Saudi Arabia, knowledge about seasonal influenza was also unsatisfactory (13)

The data about the level of knowledge among medical and non-medical students regarding seasonal influenza are scant. Hence, this study aims to assess awareness of seasonal influenza among medical and non-medical students of Umm Al-Qura University the vaccine uptake rate and to identify barriers to vaccination. The results might highlight the role of the level of knowledge among university students.

Material and Methods

During the 2022 flu season, an online based survey was conducted on Umm Al-Qura students in Makkah, Saudi Arabia. Medical and non-medical students from all UQU faculties were eligible to participate in the study, with students under the age of 18 excluded. A convenient sampling method was used to include all participants who met the inclusion criteria until the sample size was reached. The calculated sample size was 355 with a 5% alpha error, an 80% power, and a 95% confidence interval. n = [Z2 α/2P (1-P)]/d2 (14), where the Z = value corresponded to the confidence level (Z = 1.96 for 95% CI), P = the frequency of outcome in similar study (P = 0.3 (11), and d = precision (d = 0.05), with 10% dropout. The study used a self-administered, online-based questionnaire in Arabic. Student representatives from each faculty uploaded the survey and the link was then given to the students by email, social media, or by publishing on the websites of the respective faculties. The students had the right to refuse to participate in the survey. The survey was open for four months, from January 2021 to April 2022.

The tool of the study, had three parts. The first part was to assess socio-demographic characteristics such as (age, gender, marital status and specialty). The second part included questions to assess the awareness and knowledge of influenza such as the causes, symptoms, mode of transmission, prevention, vaccinations, and treatment. The third part assessed vaccine uptake and its barriers.

There were 13 questions to assess the level of knowledge about influenza and there were three possible responses for each question: (0 score for a wrong answer or I don't know response and 1 score for a correct answer) the highest score was 13.

The knowledge score was estimated as follows, Low knowledge level would be a score between 0 and 6. Scores between 6 and 9 would be categorized as moderate knowledge. Scores between 10 and 13 are classified as a high level of influenza knowledge.

Statistical Analysis Plan:
Descriptive and analytical analysis were performed using SPSS software, version 25. Depending on the kind of distribution for each variable, quantitative data was shown as mean, SD, or median and range. Percentages were displayed for categorical data. Independent t-tests for continuous variables and the Chi-square test for categorical data were used to compare the groups.

Ethical part & confidentiality:
The research was approved by the Institutional Review Board (IRB) of Umm Al-Qura University-College of Medicine (No. HAPO-02-K-012-2021-10-8O5). The students were included in the study after signing an informed consent form. Students' information remains confidential.

Results

Out of the total 355 participants, 175(49.3%) were medical students and 180 (50.7) were non-medical students. There was an almost equal distribution of males (178 (50.1%) and females 177 (49.9%) in both groups. Most of the students 208 (58.6%) were aged (21-24) and most of them were single 346 (97.5%). Most participants, (172 (98.3%) of medical students and 157 (87.2%) of non-medical students were aware of seasonal influenza, (P value < 0.001).

Regarding the vaccination rate among study participants, only 29 (16.6%) of medical students versus 46 (25.6%) of non-medical students received regular an annual vaccination with a significant difference in the flu vaccine uptake between the two groups, (P value 0.038). Socio-demographic characteristics of participants, awareness, and vaccination rate in both groups are described in Table1

Barriers to influenza vaccine uptake
There were many barriers to the flu vaccine uptake. The most prominent variable was the negative perceptions of the vaccine's efficacy which was reported by 53% of participants. Accessibility was the second most prevalent barrier (20%). Vaccine safety issues and side effects were highlighted by 17% of the students. Affordability and lack of awareness were other contributing factors that prevent the students from being vaccinated. Barriers to the influenza vaccine are shown in Figure 1.

Knowledge of seasonal influenza
One-third (37.7%) of the medical students and (8.9%) of non-medical students had good knowledge levels of seasonal influenza. Surprisingly, more than one-third of the participants had poor knowledge levels of seasonal influenza 145 (40.8%). with a significant difference between the medical and non-medical groups (p < 0.001).

Item-wise analysis showed that most of the participants 326 (91.8%) recognized influenza as a viral infection. 311 (87.6%) recognized the symptoms of influenza correctly.

Only one-third of the students (39.2%) knew that influenza can be fatal. More than two-thirds of the participants, 277 (78.0%) were familiar with the presence of an effective influenza vaccine. In addition, 240 (67.6 %) of participants were aware of preventive measures for influenza. The full details of participants' knowledge about influenza are described in Table 2

Table 1: Socio-demographic characteristics of participants, awareness, and vaccination rates

Socio-demographic Characteristics	Medical students	Non-Medical students	Total	X^2	P value
Gender					
Female	86 (49.1%)	91 (50.6%)	177 (49.9%)	0.071	0.790
Male	89 (50.9%)	89 (49.8%)	178 (50.1%)		
Age					
18-20	75 (42.9%)	72 (40.0%)	147 (41.4%)	0.299	0.585
21-24	100(57.1%)	108 (60.0%)	208 (58.6%)		
Marital status					
Single	171 (97.7%)	175 (97.2%)	346 (97.5%)	1.643	0.650
Married	2 (1.1%)	4 (2.2%)	6 (1.7%)		
Divorced	1(0.6%)	1 (0.6%)	2 (0.6 %)		
Widowed	1 (0.6%)	0 (0.0%)	1 (0.3%)		
Seasonal influenza awareness					
Aware	172 (98.3%)	157 (87.2%)	329 (92.7%)	16.001	< 0.001
Not aware	3 (1.7%)	23 (12.8%)	26 (7.3%)		
Influenza vaccine uptake					
Vaccinated	29 (16.6%)	46 (25.6%)	75 (21.1%)	4.298	0.038
Not Vaccinated	146 (83.4%)	134 (74.4%)	280 (78.9%)		

Figure 1, Barriers to influenza vaccine uptake

Barriers to influenza vaccine uptake

5.9
15.5
40.6
1.1
13.2

- Negative perceptions
- Vaccine unsafety
- Affordability
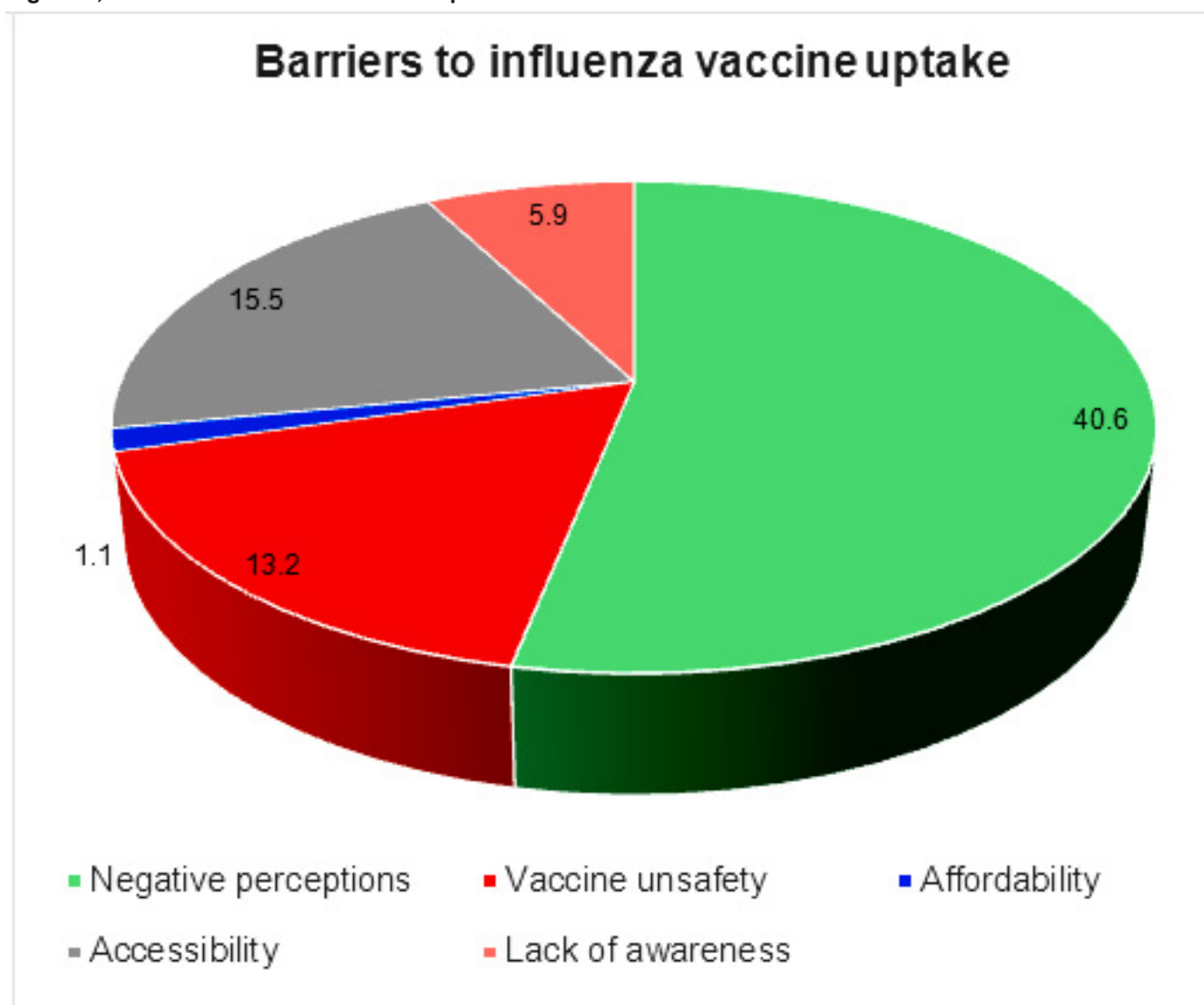- Accessibility
- Lack of awareness

Table 2: Knowledge of seasonal influenza among medical and non-medical students

Knowledge items	Medical students	Non-Medical students	Total	X²	P value
	Correct response N (%)	Correct response N (%)	Correct response N (%)		
Influenza is a viral infection	170 (97.1%)	156 (86.7%)	326 (91.8%)	12.982	< 0.001
Influenza usually occurs in winter	146 (83.4%)	134 (74.4%)	280 (78.9%)	4.298	0.038
Influenza may have serious complications	154 (88.0%)	146 (81.1%)	300 (84.5%)	3.219	0.073
Most infected persons have mild symptoms	107 (61.1%)	99 (55.0%)	206 (58.0%)	5.174	0.075
Influenza may cause death	80 (45.7%)	59 (32.8%)	139 (39.2%)	6.358	0.042
Symptoms of influenza	164 (93.7%)	147 (81.7%)	311 (87.6%)	11.861	0.001
Mode of transmission of influenza	123 (70.3%)	92 (51.1%)	215 (60.6%)	13.659	< 0.001
Preventive measures for influenza	129 (73.7%)	111 (61.7%)	240 (67.6 %)	5.881	0.015
There are investigations to diagnose influenza	80 (45.7%)	106 (58.9%)	186 (52.4%)	6.178	0.046
Severe infection requires seeing your physician	85 (48.6%)	77 (42.8%)	162 (45.6%)	1.201	0.273
Treatment of influenza is supportive	65 (37.1%)	33 (18.3%)	98 (27.6%)	16.969	< 0.001
Influenza has an effective vaccine	156 (89.1%)	121 (67.2%)	277 (78.0%)	27.834	< 0.001
Infected persons and immunocompromised can't take the vaccine	58 (33.1%)	41 (22.8%)	99 (27.9%)	8.977	0.0011
Knowledge level					
Poor	43 (24.6%)	102(56.7%)	145 (40.8%)	54.560	< 0.001
Average	66 (37.7%)	62 (34.4%)	128 (36.1%)		
Good	66 (37.7%)	16 (8.9%)	82 (23.1%)		
Knowledge score (Mean ± SD)	7.75 ± 2.9	5.71 ±2.8	6.71 ± 3.00	6.799*	< 0.001

Discussion

The present study aimed to assess the awareness of medical and other non-medical university students towards seasonal influenza in Makkah city. The findings showed that 98.3% of medical students and 87.2% of non-medical students were aware of influenza infection. Another study revealed a similar level of awareness, most of the respondents (85.5%) were aware of seasonal influenza and its preventive methods (1). Awareness assessment is considered the initial step in preventing and controlling infectious diseases.

Despite the evidence-based recommendations for an annual influenza vaccination, vaccine coverage and uptake are still very low, especially among medical students who had comparatively greater health awareness than other students. It was revealed that only (16.6%) of medical students versus (25.6%) of non-medical students received regular an annual vaccination with a significant difference in vaccination levels

between the two groups. The findings were in line with those of another study, which found that college students were vaccinated at a very low (28%) rate (15). Benjamin reported similar findings, stating that only 20.6% of college students had received the flu shot (16). In Italy, much lower estimates were seen in students than in Health Care Workers (12.5% vs 15% for the flu shots (17), while in the USA, only 10.2% of students, 19.1% of patients, and 35.6% of healthcare workers were vaccinated regularly (8). From the previous studies, it was obvious that influenza vaccine uptake was low worldwide which could be due to different barriers to vaccination.

Negative perceptions of the vaccine's efficacy, which were stated by 53% of participants, emerged as the study's most significant barrier. The second most frequent barrier (20%) was accessibility. 17% of the students were worried about the safety of the vaccine as it might lead to infection or complications. Other factors preventing students to be vaccinated included affordability and lack of knowledge.

Similarly, in the USA, low vaccine uptake was primarily explained by unawareness (31%), worries about vaccine safety (29%), and negative perceptions (23%) (8). In Turkey, only 8.1% of people regularly received an annual influenza vaccination which was affected by people's sensitivity, lack of awareness, and unfavourable attitudes against the influenza vaccine (9). Another study revealed that the two main barriers are vaccine unsafety (41.6%) followed by a lack of awareness (39.6%) while the cost or access to the vaccine were not considered obstacles (16). Conversely, vaccine ineffectiveness and lack of convenient access to the vaccination were the main barriers to flu vaccine uptake in the UK (10). Vaccine uptake barriers varied by population, age group, education level, financial status, level of vaccine hesitancy, health insurance, and health awareness (11, 18). Awareness campaigns and health education programmes should be considered to encourage university students to behave as role models by maintaining appropriate health practises and encouraging others to get vaccinated regularly to reduce the frequency and adverse effects of seasonal influenza. Awareness programmes should be directed to address the negative perceptions, unfavourable attitudes, and unwillingness of students to be vaccinated. Awareness of the students will directly influence the willingness of the general population to get vaccinated.

Regarding the knowledge of influenza which may have a considerable effect on vaccine uptake, the present study found that the mean and standard deviation for knowledge score was 7.75 ± 2.9; better in medical students than non-medical students, with a significant difference in the level of knowledge among both groups. One third (37.7%) of the medical students and (8.9%) of non-medical had appropriate knowledge of influenza. Unexpectedly, more than one-third of the respondents (40.8%) had a poor knowledge level of seasonal influenza with statistical significance between the two groups. Close estimates were observed in Mallhi's study which reported, the mean knowledge score was 7.81 ± 1.96, where 20.4%, 67.6%, and 12% of the study population had good, moderate, and poor knowledge levels about seasonal influenza (11). In Al-Madinah, Saudi Arabia, there was a significantly lower level of understanding, with (53.5%) of the community having poor knowledge and attitudes toward influenza vaccination (19).

Limitation of the current study:
No causal inferences could be made using the cross-sectional study design, but the conclusion was limited to the association relationship between the current study variables. As the convenient sampling technique was used as a nonprobability sample, generalisability of the results was not possible. In addition, the self-reporting of students about their awareness, vaccination uptake, and potential barriers might give biased results about these items.

Conclusions

Despite the great awareness, the knowledge level and vaccine uptake were unsatisfactory among university students. Negative perceptions of the vaccine's efficacy, and accessibility were the most significant barriers. Campaigns and health education programmes should be considered to encourage university students to be role models and encourage others to get vaccinated according to the recommendations to reduce the burden of seasonal influenza.

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Interfering Barriers to Postpartum Depression Screening among women in Saudi Arabia: A Phenomenological Study

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Abstract

Background: During the postpartum period women are at critical risk for postpartum depression. However, with the continuous development of maternal health services this maternal mental health issue remains underdiagnosed.

Aim: This study aimed to explore the barriers interfering with postpartum depression screening among postpartum women in the context of Saudi Arabia. Method: An interpretive phenomenological qualitative approach was conducted in a tertiary hospital in Saudi Arabia. A convenience sample of 10 nurses who work in postpartum units were interviewed face-to-face. Semi-structured interviews were employed, recorded and transcribed.

Findings: Two main themes and sub-themes were derived from the data analysis of the interviews: personal barriers and fragmented care.

Conclusion: The findings may aid in improving maternity health services in Saudi Arabia by establishing a postpartum depression screening programme and enhancing awareness among postpartum women so they can maintain their mental health.

Keywords: Postpartum, depression, barriers, women, nurse

Introduction

The postpartum period is associated with mental health problems, such as postpartum depression (PPD); it was reported that depression can occur anywhere between a few days and a few weeks after childbirth (Rai et al., 2015). According to Rezaie-Keikhaie et al. (2020), the prevalence of what is known as the baby blues ranges from 13.7% to 76.0%.

Unfortunately, the mental health of postpartum women has traditionally been neglected in women and child healthcare programmes, particularly in low- and middle-income nations (Atif et al., 2015). Consequently, the World Health Organization (2019) launched a unique initiative concerning mental health (to run from 2019–2023) as an aspect of universal health coverage, with the aim of achieving the highest standards of mental health and well-being. Moreover, PPD remains underdiagnosed because women may not show any signs of depression or they may fail to initiate a discussion about their mood with their healthcare providers (Falana et al., 2019).

Maternity research in the Middle East has tended to focus on maternal and perinatal mortality and morbidity as well as prevalent birthing techniques, which is in line with the medicalisation of birth and the desire to enhance the quality of maternity services in these countries (Jahlan et al., 2016). Relatedly, a number of studies conducted in Saudi Arabia have reported the prevalence of PPD, its risk factors and its predictors (Al asoom & Koura, 2014; Al marzouki et al., 2014; Al Nasser et al., 2020; Al sayed et al., 2021).

In terms of maternal health in Saudi Arabia, the services typically provided to women include premarital screening, which aims to identify any hereditary or infectious diseases; periodic maternal screening for breast cancer; and the creation of a mother and child passport system, which is used as a record of the woman's health status and her child's health status (Ministry of Health, 2021).

Maternity care is also provided in Saudi Arabia. Women with straightforward pregnancies are offered at least eight consultations starting in their first trimester, although low attendance of these consultations represents a serious problem (Alanazy & Brown, 2016). Moreover, initiatives designed to promote breastfeeding have been introduced, including mother–child passports and baby-friendly hospitals (Ministry of Health, 2021). Other initiatives have been introduced in an attempt to improve the health of mothers and children by tracking the mother's health throughout pregnancy and the child's health until the age of five (Ministry of Health, 2019). However, the effectiveness of these initiatives still needs to be evaluated (Raheel & Tharkar, 2018).

While the continuous improvement in the healthcare services provided to women during their perinatal period has been a priority, the clinical pathway for addressing maternal mental health problems, including PPD, remains unclear (Saleh et al., 2020). There is a lack of studies about the challenges that interfere with screening for postpartum depression among women in Saudi Arabia in order to provide maternal mental healthcare. Thus, the present study aimed to explore postpartum nurses' perceptions about the barriers to screening for depression among postpartum women in the context of Saudi Arabia.

Theoretical considerations

Kristen Swanson (1991) developed the theory of caring, which has subsequently been validated for utilisation in research, education and clinical practice. The theory of caring involves five steps: knowing, being with, acting for, enabling and maintaining belief. When used in nursing practice, each of these five steps enhances the caregiver's attitude and promotes the patient's total well-being (Lillykutty et al., 2018). Nurses who work in the maternity field come into direct contact with women during the pregnancy, labour and postpartum periods; thus, they can assess, educate and provide suitable interventions for women who are at risk of, or have, developed mental health problems, such as PPD (Segre et al., 2010). If PPD is identified, nurses must conduct an immediate assessment to detect any risk for the mother and/or baby and provide appropriate management (Mughal et al., 2021). Furthermore, nurses should look to facilitate and encourage the involvement of peer support, partners and families in the provision of care for depressed postpartum women (Bolton, 2005; Lowdermilk et al., 2016).

Methodology

Research Design
This study is an interpretive phenomenological qualitative inquiry. Interpretive phenomenology is dedicated to understanding and uncovering the experiences of individuals in constant relation with others (Frechette et al., 2020). In the study discussed in this paper, we attempted to understand the factors that inhibit nurses from screening for postpartum depression based on the interpretation of their experience in caring for postpartum women (Neubauer et al., 2019).

Participants
In interpretative phenomenology, an average of 10 phenomenon-rich participants is appropriate (Frechette et al., 2020). A convenience sample of 10 nurses who worked in the postpartum department in a tertiary maternal hospital participated in this study. All the participants were female. Their ages ranged from 27 to 52 years; their professional experience ranged from 3 to 19 years. To develop a thorough understanding of the phenomenon of interest, a study must be credible, which requires interviewing a sufficient number of people to gain a good understanding of the subject (Ellis, 2016). Unlike a statistical study, phenomenological studies strive to illuminate the lived experience in depth, as much as possible, rather than generalising it.

Data Collection

An interview protocol enables the interviewer to take notes on the interviewees' responses. Additionally, it assists researchers in organising their thoughts on the topics, such as headings, how to begin the interview, concluding ideas, how to conclude the interview and thanking the interviewees (Cresswell & Poth, 2016). In this study, Bevan's (2014) phenomenological interview structure was applied. The interview structure provides researchers with an explicit approach because it enables the use of phenomenology as a comprehensive method of research that contributes to the clarity of the overall study (Bevan, 2014). The data required for this study were collected through individual face-to-face interviews that were conducted over the course of two days. Six participants were interviewed on the first day and four were interviewed on the second day. The durations of the interviews ranged from 30 to 45 minutes. Data saturation was recognised by the absence of the emergence of new data, thus indicating suitability of the termination of the session.

Data tabulation and analysis

The interviews were recorded, transcribed and stored until they were analysed. Colaizzi's (1978) data analysis method was used as a straightforward and logical procedure for delving into the meanings of the nurses' experience (Wirihana et al., 2018). Additionally, the findings were sent to the participants via a link for the purpose of validation (Polit & Beck, 2017).

Rigor

Credibility was attained by intensive listening during the interviews. Careful probing to obtain rich and comprehensive data, audio-recording the interviews for the purpose of transcription and monitoring the transcription accuracy are all strategies for enhancing the quality of data (Polit & Beck, 2017). Moreover, dependability was ensured by introducing the data to the participants after the analysis to determine the truthfulness of the results. Confirmability was demonstrated by an audit trail through the digital recording, and field notes assisted with confirmability. Transferability was presented by detailed information to allow for judgements concerning the setting, the participants and their experience.

Ethical issues

The participants were informed about the study, asked to participate on a voluntary basis and were reminded of their right to withdraw from the study at any time. Prior to the interview, the interviewer informed the participants that their participation was voluntary, anonymous and would not affect their employment status. This study was approved by the review board of King Saud University with log No.KSU-HE-21-617.

Results

Two main themes were derived from the data analysis of the interviews: personal barriers and fragmented care. Communication barriers, cultural issues, lack of education and stigma were sub-themes for the personal barriers theme. Missed care, resources and workload were sub-themes for the fragmented care theme.

Theme 1: Personal Barriers
Sub-theme 1: Communication Barriers.
Participants highlighted language barriers as a major difficulty within the hospital due to the resultant limitations on their ability to express what they want to say to postpartum women in Arabic. As one participant noted: *"Here, the barrier is the language and understanding of the postpartum women."*

The participants also explained that most nurses who work at the hospital are expatriates who are prevented from understanding postpartum women due to language: *Language is an issue because most of the staff are Indian and Filipino, so that is the thing, the postpartum woman can't express their feelings and the staff can't express how they will educate them and extract those emotions of the women in order to understand postpartum women.*

The nurses also reflected on how communication barriers negatively affect postpartum women's care because they cannot verbalise their feelings, which limits the nurses' ability to understand what the women are going through after delivery and provide the care they need. Here, the nurses stated they were unsure about how to ask postpartum women to express their feelings. One of the participants said: *"First for most is the language barrier, because I am not an expert in Arabic, and if a postpartum woman can't express herself, I can't help."*

Sub-theme 2: Cultural Issues.
Cultural differences can result in miscommunication between nurses and postpartum women, which can negatively impact care. For instance, the participants mentioned that when attempting to educate postpartum women to do something, some will refuse because the relevant practice is not allowed in their culture. For example, one of the participants said: *"When we ask postpartum women to do something, they will say it is prohibited, like that."*

The nurses also believed that, due to cultural differences, they feared breaching the postpartum women's privacy by asking them about their mental health status, as mental health issues are not discussed in several cultures. One participant said: *"We have some reservations or hesitations if we feel like we're invading their privacy or culture. Although it is confidential between you and the patient, I hesitate in asking."*

Sub-theme 3: Lack of Education.

The nurses reported that health education programmes are provided to postpartum women to enable them to care for themselves and their newborn. However, such maternal education tends to focus on the women's physical needs, such as exercise, diet and breastfeeding. They felt that postpartum women also need to be educated about PPD so that they can recognise the signs of depression and seek help when required. According to one participant: *"Other barriers would be education. They need to educate the postpartum women; they should have something to educate them."*

The nurses clarified that PPD is not covered in the education provided to postpartum women. As one of the nurses noted, they typically refer these issues to other healthcare providers, such as social workers: *"Education about postpartum depression not covered, but if she needs support, we will make referrals."*

Sub-theme 4: Stigma.

In this context, stigma refers to a negative attitude toward persons with mental health problems. The nurses explained that cultural stigmatisation prevents some postpartum women from reporting their depression and seeking proper treatment. Indeed, the participants stated that postpartum women often fear reporting what they feel because doing so is prohibited in their culture. One of the participants said: *"Postpartum women are afraid to verbalise what they think is a taboo, especially for their cultures."*

The nurses reflected on the fact that depression might occur after a woman is discharged from the hospital, and she might not have someone to trust to whom she can report her depression. As one of the participants noted: *"Sometimes postpartum depression occurs late, and they don't like to tell it to somebody unless trusted."*

The nurses suggested that because postpartum women with depression often feel guilty, awareness is needed to overcome this misconception. One participant said: "Some feel guilty because '*I am like this, so they feel bad about it. That is the main thing I felt personally."*

Theme 2: Fragmented Care
Sub-theme 1: Missed Care.

The nurses sadly acknowledged that care is sometimes omitted, delayed or not completed. In particular, they reflected on how and why PPD is not detected or managed. After delivery, a woman who delivered normally or via Caesarean section spends a short amount of time in hospital, and depression may not occur within that time. Once postpartum women are discharged home, they may start to experience depression without being aware of the condition. The nurses highlighted the possibility of depression not manifesting until a postpartum woman returns home. One participant said: "*Actually, postpartum depression may happen at their home; in 24 hours, we can't identify postpartum depression."* Another participant added: "Here, postnatal cases we can assess for 24 hours and caesarean cases we have only 72 hours, maybe after that *it will happen. Within one week, maybe after two to three days, postpartum depression can develop suddenly."*

The nurses noted that data should be collected during admission to help identify the risk of depression, although this is not always done, suggesting that more effort should be dedicated to detecting PPD. A participant said:

On admission, we have to collect data from postpartum women so we can find out [about PPD], but this is not always done. Sometimes it is missed, so we have to inform nurses to do more about screening postpartum women's mental status, especially in terms of postpartum depression.

The nurses suggested that mental health assessments are not always performed for postpartum women because mental health is not a focus of the maternity services provided to postpartum women. Another participant said: *"In our maternity hospital, we don't do this assessment to determine who will develop this depression. It is not the focus; it is not routinely done."*

The nurses revealed that the priority with maternity care services is to ensure a healthy mother and baby, although maternity mental well-being is not part of the provided care services from the beginning. Another participant said: "*The active problem for us is to help them give birth and deliver a healthy baby. Postpartum woman's depression is not part of our admission assessment."*

The nurses added that the main focus of maternity services is conducting maternal programmes, such as breastfeeding promotion, and there is no available program for PPD. According to one participant: *"We are focusing more on breastfeeding, but for postpartum depression, I am not aware if there is a programme."*

Sub-theme 2: Resource Barriers.

The participants elucidated their perceptions of how resources within maternity health services impact the care for postpartum women. Here, most of the nurses mentioned that there are no specific assessment guidelines for PPD. They suggested that increasing the availability of screening tools for PPD would help nurses promptly identify postpartum women who are at risk of depression and refer them to a social worker. One of the participants said: *"If there were depression screening papers, we could easily do the referral to a social worker."*

The nurses indicated that postpartum women are not usually assessed for PPD because there are no screening tools available for depression in maternity health services. Another participant said: *"We don't have a screening tool, and it is not routinely done. I think this is the only thing we need."*

The nurses stated that if they knew a postpartum woman to have depression, they inquired about how to confirm a diagnosis of PPD. They mentioned that the signs of depression were generally confirmed without the use of

assessment tools, such as those used for pressure injury and fall risk assessment. One of the participants said: "*How will I know if she has signs of depression when we don't have assessment and screening tools in this hospital? This screening focuses more on pressure injury and fall risk assessment than on postpartum depression.*"

Moreover, the nurses noted that they depend on the postpartum women's history to determine if they are at risk of PPD. One participant said: "*There is no tool for assessing postpartum depression, but we take a history.*"

The availability of policies and procedures to guide nurses in how to handle a postpartum woman with depression was identified as another issue. The nurses linked their role in detecting and managing PPD to the availability of policies and clinical pathways to guide them in doing so. They mentioned that policies could guide them in caring for postpartum women. One participant said: "*If there is a policy for depressed postpartum women, it would be easy for us to follow it.*"

Unfortunately, PPD is not covered in any of the hospital's current policies. Moreover, the participants noted that clinical pathways explaining the process of detection and recommending intervention measures are not available. According to one of the participants: "*We don't have a clinical pathway when it comes to postpartum depression. We are not detecting it. This is a big issue or problem because there is no clinical pathway for PPD.*"

Sub-theme 3: Workload.

Most of the nurses mentioned that caring for postpartum women takes a lot of time and effort. However, the pressure associated with a heavy workload may affect nurses' concentration during the provision of care. A heavy workload may also result in delays in assisting postpartum women. The signs of depression could be missed or ignored due to workload issues, as nurses are typically assigned to more than four postpartum women and their newborn.

The participants explained that postpartum women have to be assisted in attending to their daily needs, for example, ambulation following a Caesarean section. According to one participant:

Sometimes we are handling more than four postpartum women with four babies, or five postpartum women with four babies. Sometimes it is difficult to be with the postpartum women. Due to our workload, we may not notice that a postpartum woman has depression. Even if a postpartum woman is expressing concerns about depression, things are sometimes ignored.

Spending sufficient time with postpartum women so as to detect the signs of depression is difficult for nurses because their heavy work load means that they typically have to focus on physical rather than psychological aspects. As one participant noted: "*We need to spend more time, but maybe because of some other work, we tend to neglect*

that part; we are more focused on medical nursing care, but as a whole in mental issues not so much."

The participants explained that the high admission rate of postpartum women results in nurses only having a limited amount of time to spend with individual postpartum women, although they would have a better chance of determining the women's psychological status if they had fewer patients. According to one of the participants:

We can't control the census of the hospital. If the census is high and we are taking more than our allowed number of postpartum women, it will be a barrier. We usually handle three to four postpartum women; usually, there is time then.

Discussion

The main aim of this study was to explore nurses' experience regarding the barriers to screening for postpartum depression among women. The findings from the data analysis of the interviews revealed two main themes: personal barriers and fragmented care. Communication barriers, cultural issues, lack of education and stigma were sub-themes for the personal barriers theme. Missed care, resources and workload were sub-themes for the fragmented care theme.

In general, Sofronas et al. (2011) identified the following barriers to caring for postpartum women: a lack of time, training and language, as well as patient and family beliefs. Among the organisational factors considered to be important barriers are a lack of maternal mental health services, lack of care pathways, heavy workload, lack of time, lack of privacy and inability to see women frequently enough to develop relationships with them (Higgins et al., 2018).

Smith et al. (2019) described the barriers that affected relevant actors, such as the barriers related to a woman's knowledge, attitudes and individual characteristics, her family's knowledge, attitudes and individual characteristics and her healthcare providers' knowledge, attitudes and individual characteristics; organisational characteristics, such as service access and resource inadequacy; sociocultural barriers, such as family support, wider social support networks and cultural attitudes; and structural barriers, such as undefined policy.

The communication barrier sub-theme was indicated by the nurses in this study when they reported that language differences make it difficult to understand postpartum women's feelings, limit postpartum women's ability to be open with nurses and prevent nurses from providing psychological care for mothers. Language barriers have been frequently reported as a limitation in caring for postpartum women (Loudon et al., 2016; Sofronas et al., 2011; Teng et al., 2007). Thus, investing in language support, whether in the form of a broad linguistic team or interpreters, is critical to effectively offering PPD services to women (Ganann et al., 2019).

In this study, the cultural issues sub-theme was raised by the nurses when they related their fear about saying something that may breach a woman's privacy or providing care that is prohibited in a woman's culture. Saleh et al. (2020) stated that most international midwives and nurses are unfamiliar with the Kingdom of Saudi Arabia's culture and needs and cannot communicate in Arabic, which complicates efforts to improve maternal healthcare.

In this regard, the common obstacles are related to the influence of women's partners, friends and family members rather than the healthcare system. This is a notable finding, because if a woman's relatives or friends have incorrectly normalised her symptoms, she may choose not to share them with healthcare professionals (Kingston et al., 2015).

In this study, the lack of education sub-theme was found to relate to both nurses and postpartum women. The nurses reported the existence of educational programmes for postpartum women within maternity services, although such programmes mainly focused on the physical needs of postpartum women and their new-borns, such as nutrition, breastfeeding and exercise. Education regarding mental health issues was absent.

A review study revealed that women and their families lacked basic knowledge of maternal mental health, which highlighted the importance of a broader approach to increasing knowledge (Smith, 2019). Moreover, Kingston et al. (2015) emphasised the need to educate women's friends and family members about the importance of maternal mental health education. Women are not always confident about determining if their emotional status is clinically relevant, which validates the significance of the perspectives of their family or friends.

The nurses who participated in this study highlighted the stigma sub-theme as one of the barriers to the detection of PPD. Here, stigma involves a negative attitude toward mental health problems and impacts the mother by preventing her from seeking help. The mother may fear reporting PPD and seeking help from a psychologist due to the dominant views in her society. In fact, postpartum women may not report their symptoms of depression for a variety of reasons, including a desire to avoid questioning or experiencing the shame or stigma connected with their feelings; a lack of understanding of depression as a serious issue; and a lack of symptoms within the period in which professional interactions occurred (Place et al., 2015).

In terms of the fear of social stigma, a woman's spouse may discourage her from seeking care or exposing her symptoms, even to her relatives. There may also be concerns about confidentiality and whether other people will be aware that the mother is receiving mental health treatment. Negative attitudes toward the diagnosis and treatment of psychological health issues can result in women avoiding getting help and reinforce their feelings of stigma and guilt (Smith et al., 2019).

Ordan et al. (2018) reported that nurses who care for postpartum woman with mental illness and their new-borns might provide fewer conventional postpartum interventions due to professional stigma and negative views. Professional stigma can also impact the therapeutic relationship with postpartum women who are experiencing psychological issues (Ordan et al., 2018).

With regard to the missed or delayed care sub-theme, this study found that psychological problems may be missed or a diagnosis may be delayed due to a postpartum woman's short length of stay in the hospital, the means of collecting data about mental health status during admission or the lack of focus on maternal health services. Smith et al. (2019) reported that a lack of awareness of psychological issues, such as PPD, among healthcare providers, women and their families could result in delayed diagnosis, delayed referrals and confusion about the healthcare provider's role.

The timing and methods of any PPD screening may also impede the identification of women at risk of or with PPD. For example, evaluations conducted prior to hospital discharge following the birth, or even at the six-week postpartum check-up, may miss many women who develop symptoms later in the postpartum period (Smith et al., 2019). Moreover, due to the sensitivity associated with the perinatal period, the waiting periods for mental healthcare were considered a major concern, as women may become discouraged from seeking treatment if they are faced with long wait times or have the impression that the professionals are unwilling to assist them (Ganann et al., 2019).

In the present study, the identified barriers related to resources include a lack of policies, guidelines and screening tools, in addition to a shortage of healthcare providers. According to Saleh et al. (2020), no standardised techniques for screening for PPD have been developed, and there are no clinical guidelines for assessing and managing PPD in most healthcare settings in the Kingdom of Saudi Arabia. Furthermore, there are no job descriptions or standards governing the roles of nurses and midwives in assessing and managing PPD. Smith et al. (2019) reported that structural barriers, such as weak policy implementation, interfere with providing access to healthcare for postpartum women with mental illness.

The nurses in the present study reported adhering to clinical practice guidelines, although they noted that there are none available for PPD. Indeed, PPD screening is not widespread, which may contribute to the low prevalence estimates (Goldsmith, 2007). Physicians, nurses and social workers have reported being unable to use screening tools due to a lack of official hospital guidelines on PPD, which gives rise to a sense of powerlessness (Place et al., 2017). It must also be acknowledged that existing validated PPD instruments lack cultural sensitivity and terminology and do not resonate with cross-cultural manifestations of PPD (Ganann et al., 2019).

Place et al. (2016) presented three significant findings regarding whether and how postnatal depression is addressed in healthcare policies: 46% of policies address postnatal depression in ways that may improve the quality of the care for women experiencing, or at risk of developing postnatal depression through statements of intent or actions; 15% of policies acknowledge postnatal depression but do not address it in a way that might impact postnatal depression care and management and 38% of policies do not address postnatal depression at all.

In the present study, the workload sub-theme was highlighted by the participants as another factor that limits the amount of time a nurse has to provide care for postpartum women. According to Place et al. (2017), the failure of health personnel to detect and care for women with PPD symptoms represents a failure to care for the patient in an integrated or holistic manner. This failure was largely attributed to overly heavy work schedules and "practices" in healthcare settings, which do not allow for adequate patient interaction time (Place et al., 2017). Kebede et al. (2021) reported that healthcare providers may be unable to correctly follow the standards due to their workload or they may choose to ignore them entirely. In this regard, the availability of enough sufficiently skilled birth attendants in the maternity unit would enable providers to comply with recommendations, reduce their task overload and promote teamwork, thereby facilitating the early detection and treatment of PPD.

Conclusions and Recommendations

The study's findings indicate that maternal mental health is challenging in both Saudi Arabia and worldwide due to several barriers. The current regulations regarding maternal healthcare services should also be evaluated to help maintain the mental health of postpartum women. Screening for PPD needs to be added to the package of services provided to women in Saudi Arabia, as the ongoing development of the healthcare system is part of the Saudi Vision 2030.

Limitations
Since this study used qualitative research methods, it has some limitations. Because only 10 participants were interviewed from one maternity hospital, the study was not entirely representative of all postpartum nurses in Saudi Arabia. However, since the study participants varied in age and length of work experience, the results are applicable to a wider audience.

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Screening the risk of eating disorders among adolescents in primary care centres in Makkah, Saudi Arabia

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Abstract

Background: Adolescence is a period of transition in which adolescents are preoccupied with their body shape and image. Eating disorders among adolescents have become a mental health issue globally because they can cause deficient ingestion and/or overeating, even resulting in death. The prognosis of the illness is improved by early screening and treatment, however, we have insufficiently assessed adolescents in primary care services for the risk of eating disorders.

Aim of the study: To screen whether adolescents who visited primary healthcare centres with their parents were at high risk of eating disorders in Makkah, Saudi Arabia.

Methods: The participants completed a self-report screening questionnaire (the SCOFF screening tool).

Results: Of the 428 participants, 237 (55.4%) had a SCOFF score of ≥2. Being overweight (22.9% vs 10.0%) and obese (19.4% vs 5.0%, p<0.001), having been diagnosed with eating disorders previously (21.9% vs 8.6%, p<0.001), using laxatives for weight loss (8.3% vs 0.0%, p<0.001), having the feeling of being fat (85.1% vs 38.6%, p<0.001), being on a diet (24.0% vs 9.3%, p<0.001), and overeating during periods of stress (50.7% vs 22.1%, p<0.001) were found to increase the risk of suffering eating disorders.

Conclusions: Preventive programmes in primary care are needed to avoid the negative consequences of eating disorders.

Keywords
Primary care; mental health; screening tool; adolescents

Introduction

Adolescence is a transitional period in which adolescents are preoccupied with their body shape and image. A mix of mental, physical, and social problems characterise eating disorders (EDs), which affect people worldwide and may cause sufferers to have low self-esteem (1, 2). The negative consequences and costs of EDs have been examined in depth, as they can cause deficient ingestion and/or overeating, even resulting in death.

EDs are also known as comorbid psychopathologies (3-6), thereby placing affected individuals at risk of suffering critical complications, including stunted growth, salivary gland hypertrophy, dental erosion, cheilosis, hypovolemia, electrolyte imbalance, periodontitis, and weight gain. In addition, EDs affect individuals' social lives and relationships. Moreover, the suicidal ideation rate is higher among those affected, along with increased chances of abortion among young women (7, 8).

EDs are ranked as the third most frequently observed mental illness (9). Bulimia nervosa, binge eating disorder, and anorexia nervosa are the three EDs that have the highest death rates of all mental illnesses (2). First, because anorexics fear gaining weight, they stay very thin. Second, a cycle of binge eating followed by efforts to burn off the extra calories is the feature of bulimia. Third, a large unmanageable quantity of food is often consumed during binges by people with binge eating disorder.

People of any age, sex, race, or ethnicity are at risk of suffering EDs (10). While bulimia nervosa and anorexia nervosa most frequently manifest during adolescence, binge eating disorder typically first appears in patients in their mid-twenties (11). Although the reasons underlying EDs are unclear, a combination of factors is thought to contribute to their development, such as sociocultural factors, family dynamics, interpersonal experiences (e.g., stress), and a past record of childhood abuse or personality disorders (12-16). All these risk factors have been strongly suggested to be linked with EDs.

The prevalence rate of EDs has increased in both western and non-western nations (17). The prevalence rate among western women has been found to be up to 5.7% and anorexia nervosa is thought to affect women more than men. The prevalence rates of bulimia nervosa reach 7.3% among western women and 2.1% among western men. By contrast, Bulimia nervosa prevalence rate among female patients in non-western nations is reported to be 3.2% (18-21). In the Middle East, the prevalence rates are 33.1–49.1% in Emirati men and 24% in women (22-24) and 38.2% in Palestinian women (25). Recent studies in Saudi Arabia have focused on assessing the risk of EDs among adolescents using the SCOFF questionnaire. A study published in 2021 (26) found that around 46% of adolescents in secondary schools have the possibility of developing EDs.

While EDs are thought to be a mental illness, they may also trigger other severe physical health issues. Hence, the earlier these illnesses are identified and evaluated, the greater is the likelihood of effective therapy and a faster recovery. Therefore, the purpose of this research is to identify adolescents at risk for eating disorders who visited primary healthcare centres (PHCCs) with their parents in Makkah, Saudi Arabia.

Materials and Methods

Study design
This analytical cross-sectional research screened adolescents who attended PHCCs with their parents for the risk of EDs. The study included 428 participants, who were approached while visiting these clinics, by distributing the online questionnaire using a QR code.

Study setting
The setting of this research was Makkah, which is considered to be the holiest city in Islam as well as a significant city in Saudi Arabia's western area. The holy mosque is situated in the city's centre. Millions of pilgrims travel to Makkah every year to perform Islamic rites. As a result, the social, cultural, and educational backgrounds of the population vary greatly. Its around two million residents are spread over 60 districts. Residential neighbourhoods determine the location of these PHCCs.

The health authorities divide Makkah city into four sectors (north, east, west, and south). Sampling and randomisation were performed based on the distribution of the PHCCs. From each sector, two PHCCs were chosen. Hence, eight PHCCs in total were first chosen randomly from the list of the PHCCs in the area. Next, individuals who visit the clinics for any reason were chosen using simple random sampling. To obtain approval to conduct the survey, the researcher contacted the PHCC management team and explained the nature and procedure of the study.

The second phase involved approaching each participant and their parents and providing them with a cover letter and an online self-report survey via a QR code. The act of completing the questionnaire implied consent to participate. To ensure anonymity, a signed informed consent waiver was acquired. The researcher visited the clinics throughout the recruiting period (April to October 2022) to find participants for the study.

Sample size
The sample size was determined using a previously published prevalence [26], a type-I error rate of 5%, and a type-II error rate of 20%. The required sample was 383 participants; however, 472 respondents who went to the clinics with their parents during the recruiting period were asked to take part in the study. Forty-six of these respondents were omitted because of missing primary outcomes in the SCOFF survey and 12 respondents were removed from the research sample because they were over the age of 24. Therefore, 428 respondents were included in this study.

Ethical review
The Faculty of Medicine at Umm Al-Qura University's local research and ethics committee approved the study (HAPO-02-K-012-2022-11-1263).

Data collection
All the participants of the research completed a self-report screening questionnaire, namely, the SCOFF questionnaire. Demographic data were collected (age, sex, education level, height, weight, previous history/family history of mental illnesses, previous bariatric surgeries, diet history, and use of laxatives). All participants and their parents voluntarily provided their informed consent. Using self-reported height and weight, the body mass index was calculated.

The SCOFF survey is a very accurate self-administered questionnaire commonly used as an ED screening tool. It contains five yes/no questions scored 1 for yes and 0 for no. Scores of 2 or over were set as the cut-off point for maximum sensitivity to detect anorexia and bulimia nervosa (27). The sensitivity of the SCOFF survey in the primary care setting is 84.6% and its specificity is 89.6% (28). Arabic versions of the scale have been validated, with a sensitivity of 80.0%, a specificity of 72.7%, and an area under the curve of 80.0% at two affirmative answers (29).

Statistical analysis
Using RStudio (R version 4.1.1), the data were analysed. Categorical data were represented by frequencies and percentages, whilst continuous variables were characterized by the median and interquartile range (IQR). Factors associated with the risk of EDs were assessed using the Wilcoxon rank sum test for the numerical data and a Pearson's Chi-squared test for the categorical data. Independent risk factors for having EDs were explored by constructing a binary logistic regression model using the dichotomous SCOFF variable (SCOFF score <2 vs ≥2) as the dependent variable. The significantly associated variables from the univariate analysis were used as the independent variable in the regression model. The results were displayed as odds ratios (ORs) and their respective 95% confidence intervals (95% CIs). A 0.05 p value signified statistical significance.

Results

Demographic characteristics
The data on the 428 participating adolescents were analysed. The median (IQR) age of the participants was 20.0 (19.0, 22.0) with a range of 15 to 24 years. The majority of the respondents were women (72.2%). Approximately half had a healthy weight, whereas overweight and obese participants represented 18.7% and 14.7% of the sample, respectively. A history of an eating disorder was apparent among 17.5%, while 14.3% of the respondents had a family member with an ED (Table 1).

History of mental illnesses
Altogether, 109 participants (25.5%) declared that they had a history of a mental illness. Of these, the most common illnesses included depression (31.2%) and anxiety (17.4%, Figure 1A). Furthermore, a previous family history of mental illnesses was reported among 89 participants (20.8%); depression (51.7%) and anxiety (24.7%) were again the most frequent illnesses (Figure 1B).

Surgical history and nutritional and behavioural characteristics
In total, 72 participants had a history of surgery; of these, 6.9% had undergone both minor and major surgeries. Although 69.9% of the participants had the feeling of being fat, only 19.2% were on a diet. Additionally, 5.6% of the respondents were using laxatives to lose weight. Frequently adopted behaviours while stressed were sleeping (48.8%), overeating (41.4%), and avoiding eating (33.9%, Table 2).

Results of the SCOFF questionnaire
Of the 428 participants, 237 (55.4%) had a SCOFF score of ≥2. Approximately half of the respondents agreed that they worry about losing control of the amount of food they consume (50.2%) and 40.4% stated that food dominates their lives. Conversely, the majority disagreed that they have recently lost one stone in a three-month period (83.6%) and have made themselves sick because of feeling uncomfortably full (73.4%, Figure 2).

Factors linked to the risk of EDs
The possibility of EDs (SCOFF ≥2) was significantly higher among overweight (22.9% vs 10.0%) and obese adolescents (19.4% vs 5.0%, p<0.001) as well as those having a history of EDs (21.9% vs 8.6%, p<0.001), using laxatives for weight loss (8.3% vs 0.0%, p<0.001), having the feeling of being fat (85.1% vs 38.6%, p<0.001), being on a diet (24.0% vs 9.3%, p<0.001), and overeating during stressful periods (50.7% vs 22.1%, p<0.001). By contrast, the possibility of EDs was significantly lower among adolescents who perform other activities during periods of stress (5.9% vs 15.7%, p<0.001, Table 3).

Independent risk factors for EDs
The following independent risk factors were found based on the multivariate regression analysis: having a history of EDs (OR=2.76, 95% CI, 1.30 to 6.32, p=0.011), having the feeling of being fat (OR=5.10, 95% CI, 2.88 to 9.22, p<0.001), and overeating during periods of stress (OR=2.50, 95% CI, 1.47 to 4.30, p<0.001). However, carrying out other activities during stressful periods was less likely to be associated with EDs (OR=0.36, 95% CI, 0.17 to 0.76, p=0.008, Table 4).

Table 1: Demographic characteristics of the participants (n-428).

Parameter	Category	N (%)
Age*	Years	20.0 (19.0, 22.0)
Gender	Male	119 (27.8%)
	Female	309 (72.2%)
Weight*	Kg	60.0 (48.0, 70.0)
Height*	cm	160.0 (155.0, 167.2)
BMI*	Kg/m²	22.6 (19.6, 26.5)
BMI	Underweight	72 (16.8%)
	Healthy	213 (49.8%)
	Overweight	80 (18.7%)
	Obese	63 (14.7%)
History of eating disorders	Yes	75 (17.5%)
Family history of eating disorders	Yes	61 (14.3%)

Data is expressed as median (interquartile range); otherwise, data is presented as frequency and percentage.

Figure 1: the percentages of psychological diseases among patients with a personal history (A) and a family history (B) of psychiatric illnesses. The numbers of included participants were 109 and 89 in panel A and B, respectively.
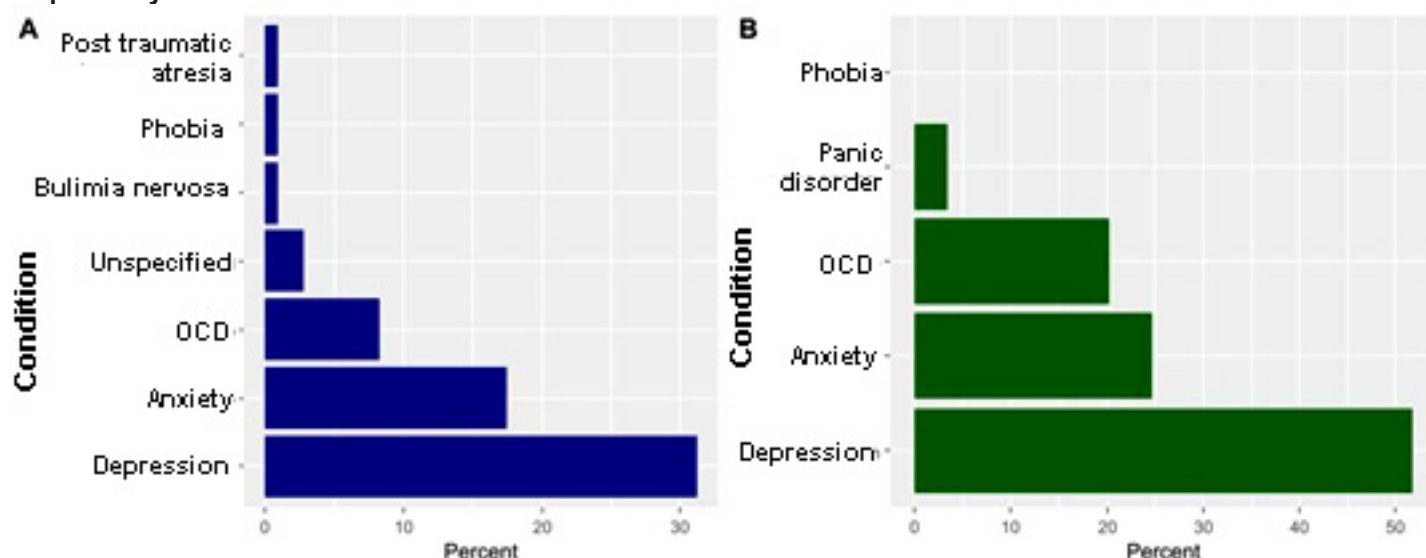
Table 2: Surgical history and selected nutritional and behavioral characteristics.

Parameter	Category	N (%)
History of surgery	Yes	72 (16.8%)
Type of surgery	Major surgery	10 (2.3%)
	Minor surgery	65 (15.2%)
	Both major and minor	5 (6.9%)
	Unknown	2 (2.8%)
Use laxative to lose weight	Yes	24 (5.6%)
Have the feeling of being fat	Yes	299 (69.9%)
Currently on a diet	Yes	82 (19.2%)
Having regular period (females)*	Yes	215 (69.6%)
Behaviour during stress	Eat a lot	177 (41.4%)
	Avoid eating	145 (33.9%)
	Sleep	209 (48.8%)
	Do sport	73 (17.1%)
	Do other activities	39 (9.1%)

* descriptive data are presented based on 309 females

Table 3: Factors associated with the risk of eating disorders among adolescents.

Parameter	Category	SCOFF		
		<2, N = 140	≥2, N = 288	p-value
Age		21.0 (19.0, 23.0)	20.0 (19.0, 22.0)	0.182
Gender	Male	45 (32.1%)	74 (25.7%)	0.162
	Female	95 (67.9%)	214 (74.3%)	
BMI	Underweight	47 (33.6%)	25 (8.7%)	<0.001
	Healthy	72 (51.4%)	141 (49.0%)	
	Overweight	14 (10.0%)	66 (22.9%)	
	Obese	7 (5.0%)	56 (19.4%)	
History of eating disorders	Yes	12 (8.6%)	63 (21.9%)	<0.001
Family history of eating disorders	Yes	17 (12.1%)	44 (15.3%)	0.384
History of psychiatric diseases	Yes	37 (26.4%)	72 (25.0%)	0.750
Family history of psychiatric diseases	Yes	27 (19.3%)	62 (21.5%)	0.592
History of surgery	Yes	21 (15.0%)	51 (17.7%)	0.482
Use laxative to lose weight	Yes	0 (0.0%)	24 (8.3%)	<0.001
Have the feeling of being fat	Yes	54 (38.6%)	245 (85.1%)	<0.001
Currently on a diet	Yes	13 (9.3%)	69 (24.0%)	<0.001
Having regular period (females)*	No	30 (31.6%)	64 (29.9%)	0.790
	Yes	65 (68.4%)	150 (70.1%)	
Behaviour during stress	Eat a lot	31 (22.1%)	146 (50.7%)	<0.001
	Avoid eating	56 (40.0%)	89 (30.9%)	0.062
	Sleep	63 (45.0%)	146 (50.7%)	0.269
	Do sport	29 (20.7%)	44 (15.3%)	0.161
	Other	22 (15.7%)	17 (5.9%)	<0.001

*data are presented based on 309 females

Table 4: Risk factors for having a SCOFF score ≥2.

Parameter	Category	OR	95% CI	p-value
BMI	Underweight	—	—	
	Healthy	1.17	0.58, 2.35	0.651
	Overweight	1.78	0.70, 4.62	0.229
	Obese	2.46	0.83, 7.91	0.114
History of eating disorders	No	—	—	
	Yes	2.76	1.30, 6.32	0.011
Use laxative to lose weight	No	—	—	
	Yes	NA	NA	0.983
Have the feeling of being fat	No	—	—	
	Yes	5.10	2.88, 9.22	<0.001
Currently on a diet	No	—	—	
	Yes	2.07	1.00, 4.55	0.057
Eat a lot	No	—	—	
	Yes	2.50	1.47, 4.30	<0.001
Other	No	—	—	
	Yes	0.36	0.17, 0.76	0.008

NA: non-available due to zero frequencies; OR: odds ratio; CI: confidence interval

Discussion

The purpose of the current research was to assess the risk of adolescents who visit PHCCs in Makkah, Saudi Arabia developing EDs. The average age of the respondents was 20.0 years with a range of 15 to 24 years and more than half were women. Approximately half of the participants had a healthy weight, whereas 17% had a history of an eating disorder and 14.3% had a family member with an eating disorder. This result supports that of Ziobrowski's study (30) finding that 28.3% of young females reported symptoms fitting the criteria for an eating disorder and 12.4% of these girls reported receiving treatment over a one-year period. Girls whose mothers had a history of EDs had an increased likelihood of both experiencing eating disorder symptoms and seeking treatment. Hence, screening girls and their mothers for current or previous eating disorders may be essential for the prevention and diagnosis of eating disorder symptoms.

Female adolescents and young adults are more prone to developing EDs, anxiety disorders, and depression. In the current study, over one-quarter (25.5%) of the participants reported a history of a mental illness. Of these, the most common illnesses were depression and anxiety (31.2% and 17.4%, respectively). Moreover, 20.8% of the participants reported a family history of mental illnesses; depression (51.7%) and anxiety (24.7%) were again the most frequent illnesses. The study conducted by Sander (9) explored the inter-individual variations in the relationships among anxiety, depression, and eating disorder-related disability among 320 girls aged 12 to 25. A high level of anxiety/depression impairment was found to be related to more

severe eating disorder symptoms. Another study (31) examined the incidence of co-occurring eating and anxiety disorders among women seeking inpatient and outpatient treatment for an eating disorder and women seeking outpatient treatment for an anxiety condition. Among those women seeking treatment for an eating disorder, 65% fulfilled the criteria for at least one comorbid anxiety disorder and 69% of these women claimed that their anxiety condition began before the eating disorder. Social phobia was the most often diagnosed anxiety disorder, followed by post-traumatic stress disorder, generalised anxiety disorder, obsessive–compulsive disorder, panic/agoraphobia, and specific phobia. In addition, 13.5% of the women seeking treatment for anxiety matched the criteria for a concurrent eating problem, while 71% claimed that their anxiety condition appeared before the eating issue. As eating disorder symptoms link more significantly with anxiety and depression symptoms and other mental illnesses in early adolescence than in other life stages, preventive measures must consider screening all mental comorbidities.

In this study, based on the answers to the SCOFF questionnaire, the risk of adolescents who visit PHCCs suffering anorexia and bulimia nervosa was 55.4%. This finding is similar to that of previous studies that have used the same SCOFF screening tool. For example, one study conducted in Makkah reported that 46% of school-aged adolescents are at risk of EDs (26). Another study in Samarinda (32) reported that 57.4% of its participants aged 14 to 17 years and over were at risk of EDs. Therefore, the SCOFF is an easy-to-administer screening device that primary care professionals can use to identify EDs.

The present study found that different underlying causes are linked to an increased risk of suffering an eating disorder (SCOFF ≥2). In particular, being overweight (22.9% vs 10.0%) and obese (19.4% vs 5.0%, p<0.001) was a risk factor. Teenagers with obesity are susceptible to EDs. Teens often present with atypical or subthreshold criteria owing to excessive body weight or concerns about the prevalence of a distorted body image. The recognition and treatment of EDs may be delayed in patients with premorbid overweight or obesity and subsequent weight reduction (33, 34). Moreover, this study found an association between patients who had a history of EDs (21.9% vs 8.6%, p<0.001), using laxatives for weight loss (8.3% vs 0.0%, p<0.001), having the feeling of being fat (85.1% vs 38.6%, p<0.001), and being on a diet (24.0% vs 9.3%, p<0.001) and the possibility of having EDs. These results are consistent with those of earlier research in Italy (35) and England (36).

Stress as a risk factor has been found to be positively associated with developing EDs. This study reported that overeating during stressful periods (50.7% vs 22.1%, p<0.001) was statistically significantly associated with the risk of EDs. The study participants were asked to identify their behaviours when they felt stressed. Most reported that sleeping (48.8%) and overeating (41.4%) were commonly deployed responses. The results of the multivariate analysis showed that overeating during stressful periods (OR=2.50, 95% CI, 1.47 to 4.30, p<0.001) was strongly associated with being at risk of EDs. Hence, patients with EDs could be especially vulnerable to stress and its effects (37). Chronic stress and mental illness are highly linked to the development of EDs. The relationship between stress and EDs is partially mediated by psychological comorbidity (38). Hence, family physicians may play a significant role in identifying these diseases and coordinating a multidisciplinary team of psychiatrists, dietitians, and other experts to treat eating disorder patients effectively.

Conclusions

This study screened the risk of EDs among adolescents who visit PHCCs in Makkah. It found that 55.4% of adolescents are at risk of developing anorexia and bulimia nervosa. Being overweight and obese, having a history of EDs, using laxatives for weight loss, having the feeling of being fat, being on a diet, and overeating during stressful periods are factors associated with an increased risk of suffering EDs. The Ministry of Education and Ministry of Health must work together to undertake awareness and educational programs in schools and universities as well as implement preventive programmes in primary healthcare settings to avoid the negative consequences of EDs.

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A three-year audit of the effectiveness of family physician reminders on cervical screening uptake amongst non-responders in a UK family medicine setting

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Abstract

Background: Cervical cancer screening is offered to all women in the United Kingdom (UK) between the ages of 24.5 and 64 years of age. The majority of screening is performed in primary care settings and the coverage rate remains stubbornly below 80%, despite an automated national invitation system.

Objective: To audit the effectiveness of physician reminders during patient-booked telephone or face-to-face family medicine appointments upon non-responders to automated invitations.

Methods: One physician in a primary healthcare centre opportunistically administered a three-step verbal invitation to all individuals identified as non-responders during their appointments with him. Patients seen face-to-face were also given a fourth invitation, a written slip to give to the receptionist to help them book an appointment. A code was entered into the patient's notes to indicate that this patient had received the invitation. The invitation was continued for three years. The rate of screening uptake in the invitation arm was then compared to the rest of the non-responder population who received other non-structured reminders.

Results: 122 patients in the invitation arm and 602 in the control arm met the inclusion criteria. Cervical screening uptake was 11.1% greater in the invitation arm than the control arm (p < 0.0001; RR 1.188: CI 1.04 to 1.36). Patients receiving the fourth invitation in face-to-face appointments booked screening appointments 60 days earlier (mean = 110.8 days, n = 66) than those who received the verbal invitation only (mean = 170.4 days, n = 19, p = 0.08).

Conclusion: There is evidence to support the use of both a verbal invitation followed by a written invitation by physicians in a family medicine setting in the UK for patients who are non-responders to cervical screening to increase uptake. The cost per extra cervical screening accepted in this non-responder population is £14.35. Both of these factors support the use of physician invitations to increase screening rates.

Keywords
cervical cancer screening, primary health care, non-responder, increasing uptake, invitations

Introduction

General Practitioners (GPs) are primary care family medicine consultant physicians in the United Kingdom (UK). The majority work within the National Health Service (NHS) and have to prioritise healthcare messages to maximise patient wellbeing in a limited amount of time; normally 10 to 15 minutes. The list of their responsibilities to each patient include acute healthcare needs, chronic disease monitoring, medication concordance, physical, mental and emotional wellbeing, health promotion, screening tests, vaccinations, safeguarding, addictions and social concerns. Following a consultation, GPs then have to prescribe treatments, arrange referrals, organise tests, arrange follow-up, manage results and reports, respond to queries and contemporaneously document patient encounters. Maintaining cervical screening uptake above 80% is an Essential Service in their General Medical Services (GMS) contract with NHS Primary Care. An ineffective reminder system for non-responders to screening is a contractual failure, and would result in a "needs improvement" rating by the Care Quality Commission, the government regulator, and the risk of further monitoring and interventions.

The cervical screening test is offered to all women between the ages of 24.5 and 64 registered with a GP practice in the UK by a national automated system. Open Exeter is the web-based application that forms the data-management backbone of the NHS Cervical Screening Programme. It is a secure, online record of the full national cervical screening history of a patient, and integrates with the cytology laboratory, the sample taker and the patient's healthcare provider organisation (either specialist or primary care). Open Exeter relies upon searches of the General Practice medical records. Invitations to patients eligible for cervical screening are automatically generated by Open Exeter. A second "overdue" notice is sent when the lab has not received a result for the individual 126 days (18 weeks) beyond the date they should have had the cervical screening. When patients fail to book an appointment after these two reminders by Open Exeter, they are classed as "non-responders". A weekly upload from Open Exeter by the practice administrators results in a reminder letter being sent by the practice to all non-responders and a non-responder code is added to the patient's medical record. A second warning system is in place on the primary care patient management system. This alerts any member of staff who accesses an individual patient's record if they are overdue their follow-up cervical screen based on their age and the last coded screening test.

According to Cancer Research UK, cervical cancer is the 19th most common cause of female deaths from cancer with 860 deaths in 2018 (1). The screening test involves a small sample of cells taken from the cervix and tested for the human papilloma virus (HPV). If positive for HPV, samples are sent for further analysis to look for abnormal changes to the collected cells. Rates of cervical cancer have been decreasing since the roll out of the programme. Around 70 – 73% of eligible women attend their GP for a screening test; one of the highest uptakes for all screening programmes in the UK. Approximately 24% of cervical cancer cases are detected by this route and data shows that a 3-year survival rate for these patients is significantly higher than for those diagnosed by other methods. Positive cases are then monitored and treated accordingly. 83.9% of women referred with high-grade abnormalities had histological outcomes of CIN 2, 3 or adenocarcinoma in-situ leading to prompt referrals and treatment, of whom a large number are asymptomatic (2). It is estimated that between 800 and 2,000 deaths a year are now prevented due to the effectiveness of this programme and mortality rates have dropped by over 75% since the 1970s. These statistics corroborate the importance of the screening programme in reducing mortality from cervical cancer.

Diligent clinicians, proactive managers and effective recall systems are needed to ensure compliance with the contractual obligations that are designed to maximise screening coverage. There are some newly recognised groups who may not receive screening reminders. Some biological females recoded as being male, transgender or non-binary, may be missed from Open Exeter searches (3). There have also been widely-publicised cases of some women with sub-total hysterectomies being incorrectly coded as having total hysterectomies who have been excluded from screening. This error has been compounded by patients not knowing their cervical status, and declining screening on the incorrect assumption that they don't have a cervix (4). Women with a history of HIV are invited for annual screening, the performance of which is the responsibility of their HIV specialist team, but should not be overlooked by their GP.

Currently, an ad hoc system is in place in most primary healthcare settings, where patients who are non-responders may or may not receive verbal invitations when they consult their GP, practice nurse or other healthcare worker. This is often because the patient's agenda is addressed first, leaving little time for invitations and human error causes healthcare workers to overlook alerts. As many practices have automated systems that send reminder letters to non-responders, some clinicians consider their responsibility complete if they see that the reminder letter has been sent. When invitations are made by some clinicians, these are often unstructured. The national screening uptake highlights the flaws of this ad hoc system.

A Cochrane Review (5) (Everett et al., 2014) noted that the cervical screening rate in the UK remains stubbornly below 80% and interventions are needed to attract the 20% who are missing out on screening. This meta-analysis reviewed the different subgroups of interventions, namely: invitations, reminders, education, message framing, counselling, risk factor assessment, economic incentives and procedure access. They found one trial comparing face-to-face invitations versus control in an Australian Aboriginal urban population (Hunt, 1998), in which only 4 out of 121 individuals receiving the intervention attended for screening. There were no other high-quality studies reported which looked at a physician intervention in routine practice.

We therefore report the results of a three-year prospective audit to determine whether there is clinical equipoise for the following questions: What, if any, impact does a physician giving structured reminders during standard care have on the uptake of cervical screening amongst non-responders? Is it therefore, an effective invitation during time-critical consultations?

Methods

This audit was designed as a physician invitation in a standard healthcare environment, providing care to a heterogeneous patient population and a typical treatment environment to yield replicable real-world results. Undertaking a prospective observational audit was considered the most ethically appropriate way to investigate physician invitations. It would be harmful to patients and negligent of clinicians to withhold effective invitations from individuals (who would have otherwise been assigned to a control group of a randomised controlled trial) who are overdue their cervical screening or at high risk of cervical cancer due to lifestyle markers with clear causality to cervical cancer (e.g., a history of HPV infection, active HIV infection or smoking).

Statistically significant appropriate outcomes would either promote, make no change to or restrain GPs performing the invitations amongst this population. If the outcome invited no change or restrained GPs from making the invitations, researchers would need to develop more effective interventions. If the outcome promoted the invitations, GPs may be accused of negligence if patients subsequently developed cervical cancer and the invitations had not been documented during consultations. Results are statistically analysed using the data analysis package on Microsoft Excel. The report was prepared using Microsoft Word.

As per the Cochrane review (Everett et al., 2014) comparisons made to the control group of usual care with routine invitations is deemed appropriate. Bias is reduced by allocation concealment by centralised allocation – patients are free to book with a clinician of their choice when booking a routine appointment and when booking an emergency appointment, with the clinician on-call for that day. Selective reporting is avoided by the practice office manager running the search and the principal investigator adding the raw data into the Excel spreadsheet. All patient data of the invitation group will be analysed to reduce reporting bias. The principal investigator, who is also the audit clinician, will be analysing this data. This potential bias is minimised as the search data is available on EMIS Web (with a search date) and can be cross-referenced by patient number in the Excel spreadsheet. The data can be viewed and cross-referenced by the practice team and will be available for review to researchers for up to 10 years from the publication date. Randomisation and blinding will not reduce clinical or patient bias in this population – patients are free to book appointments with any GP, for any problem and those requesting review in an emergency clinic don't have a choice of clinician. Pure randomisation will lead to patients not being able to book appointments

with a preferred GP for routine care, therefore creating barriers to routine care. Undertaking a questionnaire of patient attitudes to the invitation was considered and rejected as the invitation is standard patient care and measurement of the invitation would be judged by the outcome – booking of a cervical screening appointment.

A data cleansing pre-audit was performed and reported by the practice nurse to the clinical team in February, 2017. This was to identify anyone who may have been excluded from screening in error. A search was performed on the EMIS Web to find any biological female exempted from screening, followed by a review of their medical notes by nurses and doctors. Two patients were found with incorrect codes. Both of these women were now older than the screening age and had had negative results previously. One patient reported that she had had a hysterectomy overseas, but an ultrasound scan had revealed her to have a uterus in-situ. A specific search code indicating the presence of a cervix was added to her notes and also to the notes of those who had had gender-reassignment procedures and retained their cervices. In line with PHE guidance, an annual reminder code was added to those women who were HIV positive to ensure that these patients were being recalled. All other women were correctly coded as "absence of cervix" and removed from recall on Open Exeter.

A second analysis was undertaken to determine the numbers needed to achieve adequate power. From the Cochrane review (2014), there were no similar designs that could be used as a baseline to predict a percentage difference between an audit and control group. The nearest similar study of face-to-face interventions (Hunt, 1998) declared a relative risk of 9.15 (95% CI: 0.50 to 166.30), which was deemed unrealistic and with too broad a confidence interval. The trial of Robson (1989) comparing a health-promotion nurse versus control gives a relative risk of 1.18 (95% CI: 1.10 to 1.26). A meta-analysis of counselling versus control based on Rimer (1999) and Ward (1991) shows a significantly higher uptake of screening in those given counselling than those given no prompts with a relative risk of 1.23 (95% CI: 1.04 to 1.45). A meta-analysis of four studies (Binstock 1997; McDowell 1989; Stein 2005; Vogt 2003) assessing women who received a telephone invitation versus control found a significant improvement in uptake in the study groups with a relative risk of 2.16 (95% CI: 1.70 to 2.74). As this audit involves a physician giving an intervention including health promotion and prompting, face-to-face and via telephone, an increase in uptake of cervical screening compared to the control group in the range of between 18% and 216% is considered. Following discussion with the audit team, a 25% difference between the invitation and control groups was agreed to be a fair estimate. A calculation was completed to give a minimum number of subjects for 80% power and an alpha of 0.05: this gave a sample size of 134 patients. To determine the audit period, an approximation was made. As there were 367 non-responders out of 1,568 patients eligible for cervical screening on the 1st of December, 2016, and assuming

that each of the 6 clinicians will see one sixth of these patients at some point annually, this gave a figure of 61 patients per annum that the principal investigator might see. Therefore, an audit period of three years would yield an invitation group of approximately 180 patients. With a 10% exclusion rate and a 10% human error rate (where the clinician forgets to perform or document the invitation), this gave a predicted yield of 150 patients who could be recruited to the audit arm and 790 patients to the control arm.

The protocol for the audit was as follows: The principal investigator reviewed the medical notes of all individuals they consulted to check for the patient's cervical screening status. If they were coded as being non-responders (i.e., they have not booked an appointment following two Open Exeter reminders), they received a three-step verbal invitation:

1. "Your cervical cancer screening is now overdue."
2. "The test is easy to perform and saves thousands of lives from cervical cancer every year."
3. "Should we book an appointment for cervical screening now so that you make sure you have it done?"

Those who were seen face-to-face received a fourth invitation:

4. An appointment slip was given to the patient to hand to the receptionist. This included the patient's name and the comment, "Book an appointment with practice nurse for cervical screening".

The benefit of the fourth step was to save the patient from having to remember the name of the test and to minimise embarrassment from others overhearing them requesting the test at reception. As appointment booking requires the patient to confirm if they can attend at a particular time and date, it is considered a better use of time for the receptionist to book the appointment rather than the physician.

The invitation was planned to be brief, such that it can be completed in any practice setting. The primary outcome measure was to compare the response rate between the invitation group and the control group. The hypothesis was that there would be a 25% statistically insignificant improvement following the invitation. A secondary outcome measure was to determine if there was a difference between the type of appointment in which the invitation is given and the time taken to book an appointment. The second hypothesis was that face-to-face routine appointments would result in shorter times to book due to the fourth invitation.

A monthly reminder to the practice team of the audit and the importance of forwarding any patient concerns was agreed.

One year following the completion of the audit, the following data collection process was undertaken.

1. Office manager conducts a search for patients with EMIS code, "cervical smear verbal reminder", coded on or between 1/3/2017 – 29/2/2020 by the principal investigator.

2. Principal investigator uses the following protocol to review patients records and enter raw data into password protected Excel file:
a.   Patient EMIS number
b.   Patient DOB
c.   Date of first GP invitation
d.   Type of consultation
e.   Date of non-responders for screening appointment
f.   Date of any previous cervical screening
g.   Date of any previous practice reminders
h.   Date and type of last reminder
i.   If no longer registered, date and cause of deregistration
j.   Historical or current issues impeding screening uptake

3. Recognise exclusions:
a.   Incorrectly reminded
i.   Coding errors
ii.   Human error
b.   Temporary patients
i.   Did not remain registered for minimum of 6 months following invitation
c.   Screening refusal
d.   Inappropriate to include
i.   Terminal illness
ii.   Prolonged hospitalisation
iii.   Death due to non-cervical cancer attributable cause

4. Office manager conducts a search on EMIS Web for the control group and principal investigator enters raw data into Excel file:
i.   Any registered patient overdue screening between 1/3/2017 – 29/2/2020 between the ages of 24.5 and 64 years old
ii.   Received any of the following codes NOT by the principal investigator:
1.   Cervical Smear Verbal Reminder
2.   Cervical Smear Due
3.   Any of the 4K4 code family (repeat smear / screening needed)
iii.   No cervical screening code recorded up to 1 year after the search date indicating not attended for cervical screening
iv.   Any cervical screening code indicating screening completed
v.   Exclude any individual who were exempted (screening refusal, no longer registered, died or hysterectomy)

5.   Download Open Access data from gov.uk cervical screening statistics for the Gill Medical Centre, based on data uploaded to Open Exeter.

Results

A search of the patients coded with the EMIS code "cervical smear verbal reminder" by the principal investigator on the EMIS Web patient management system between the audit dates of 1 March, 2017 and 29 February, 2020 was undertaken. This revealed 152 patients. Using the designed protocol, a detailed review of each of these patients' notes was undertaken by the principal investigator and raw data was entered into an Excel spreadsheet.

• 2 patients were excluded as the physician had not spoken to the patients directly. The physician had typed a letter to one of the patients and coded the invitation. The second patient was asked by a receptionist to book in for cervical screening after the patient had left the physician's room and the physician sent an electronic request to the receptionist to remind the patient to book for a screening appointment. These invitations did not adhere to the protocol.
• 16 patients were excluded as they were incorrectly reminded to book for a screening appointment by the physician when they were already up to date. These occurred because of the miscoding of reminders or where the patient's most recent cervical screening test had not yet been coded and the patient was unsure.
• 1 patient was excluded as they were correctly advised by the physician to book for a screening appointment but due to human error, they were incorrectly advised by the practice nurse that due to their age, screening was no longer needed. They were invited to rebook upon discovery of the error following the audit.
• 5 patients were excluded as they deregistered within 6 months of registering (one went overseas, one was a temporary resident and returned to their usual place of residence and three moved out of the area).
• 1 patient was excluded as they disagreed with both their medical records and the national screening records as to when their last cervical screening had occurred – stating that it had been conducted when they were under gynaecology care. They refused to sign an exemption form and requested to remain on routine cervical follow-up.
• 4 patients were excluded for making informed decisions to refuse cervical screening – 3 signed exemption forms and 1 was verbally exempted as they refused to sign an exemption form.
• 1 patient was excluded as they died within 3 months of a verbal reminder of an unascertainable cause on post-mortem. The case was discussed in a practice meeting and the invitation was agreed to be unrelated.

Following these exclusion, 122 patients were included in the audit.

A search for the standard practice control group was then conducted using the EMIS Web search application to find non-responders who had received a follow-up letter from the practice or any reminder from any clinician, excluding the principal investigator, including results up to 12 months following the invitation date. A total of 602 women, of whom 353 attended for screening, gave coverage of 58.6%.

Finally, the practice level data from NHS Digital was analysed from 2016 – 2021. The results are summarised in Table 1.

The difference between the invitation and control groups of 11.1% (X^2 <2 p < 0.0001) was significant. This indicates that the structured invitations resulted in an 18.8% increase in screening uptake amongst non-responders. The relative risk was calculated as 1.188 with a 95% confidence interval of 1.038 and 1.360). This means that the results favoured the invitations.

There were six clinicians who could offer verbal reminders to patients in appointments (4 GPs, 1 nurse and 1 healthcare assistant). All of these clinicians worked full time during the audit period. The mean number of patients per clinician in the control group is 120 (602 patients ÷ 5 clinicians in control group), which is equivalent to that seen by the physician performing the invitation (n = 122). These figures are in keeping with the sample size calculations; 134 in the invitation arm and 670 in the control.

Of the 122 patients who received the invitations, this was made in four types of appointments; 39 were seen in face-to-face routine (F2FR) appointments, 27 in face-to-face emergency (F2FE) appointments, 16 were spoken to in routine telephone (RT) appointments and 3 in emergency telephone (ET) appointments. Of the 85 women who responded to the invitations, the mean time from the invitation to the time taken to book a screening appointment was F2FR 88.3 days, TE 125.0 days, F2FE 143.3 and TR 178.9 days – this is summarised in Graph 1.

The F2FR invitation led to the shortest mean time to undergo cervical screening. This is likely due to the combination of the verbal reminder and the booking slip. The TE group consisted of three patients and they had the next shortest mean time. As the number of invitations is small, the results cannot be considered significant. However, the difference between the times taken for the F2FR and TR groups was significant (p = 0.0134) and indicates that a physician booking slip improves the time taken to book by 90.6 days.

The maximum cost of the invitation is calculated as follows: a 2-minute review of the patient's records, a 2-minute invitation and 1 minute for documentation requires a total of 5 minutes of GP time at a rate of £120 per hour (including pension payments), which equates to £10.00 per invitation. Booking an appointment and having the screening done by a trained clinician are existing costs, so they are not included. As the invitation gives coverage of 69.7%, the cost to get one cervical screening test accepted by a non-responder is £14.35.

Table 1: Number of patients in the invitation arm, the control arm and total practice (data from 1/3/2017 to 1/3/2021):

p = <0.0001 One Sample Test	Invitation to non-responders	Standard Practice to non-responders (Control)	Total Practice; all eligible patients (NHS Digital data)
Population (n)	122	602	1775
Coverage (n)	85	353	1452
DNA (n)	37	249	323
Uptake (%)	69.7%	58.6%	81.8%

Graph 1: Type of verbal invitation and effect upon mean time (in days) taken to book screening appointment
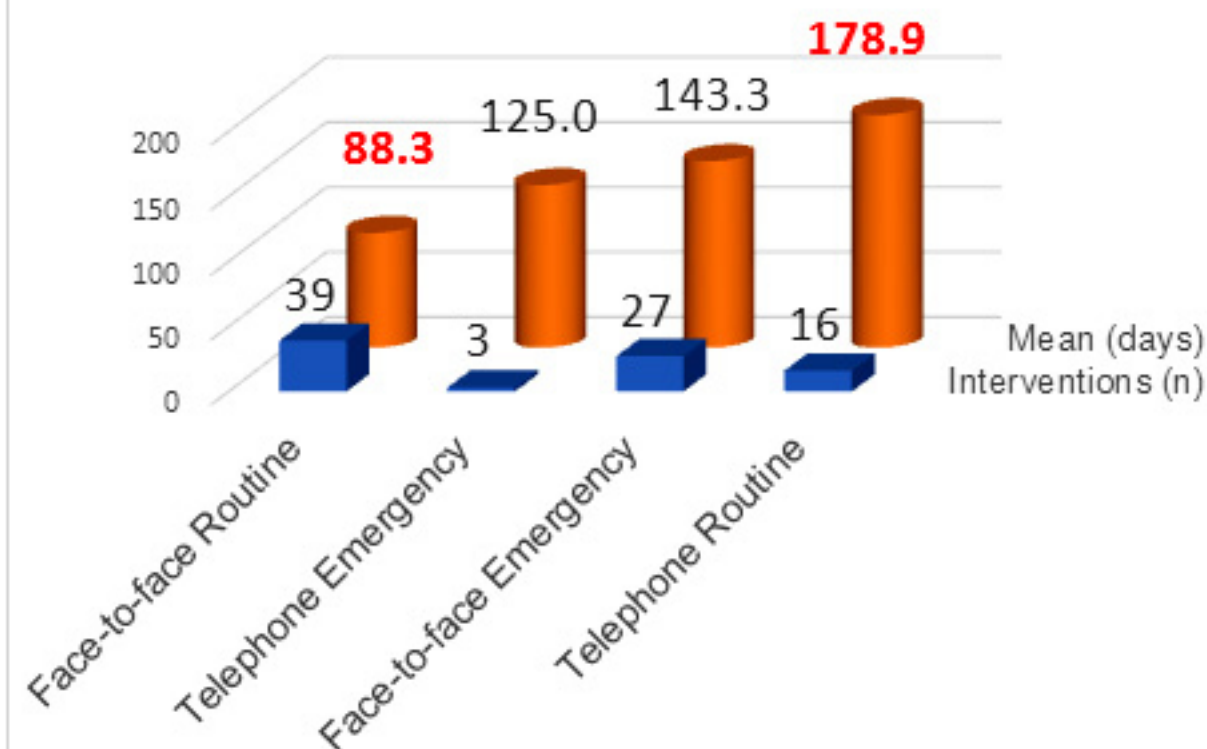
Discussion

The audit's main outcome was that, over a three-year period, one physician was able to increase cervical screening uptake amongst non-responders by 18.8% compared to a control group during usual care by following a four-step invitation. This indicates that verbal and written invitations given by GPs can improve uptake of cervical screening. The cost to increase screening uptake by one non-responder is estimated as being £14.35.

The strengths of the audit included that it was performed in a routine practice setting, required no additional training and compared usual reminders to a more structured invitation. As the invitation was embedded in routine practice, it achieved the expected recruitment levels across the patient population.

GP practices can ensure the best possible coverage by undertaking the following actions:

• All women who are HIV positive should have a code for annual cervical screening (although this should be monitored and arranged by their HIV medical team).
• Annual searches should be undertaken to manually check newly registered biologically female patients who have been coded as having a hysterectomy to cross-reference their history to confirm the cervix has not been retained. A read-code can be added to confirm that these patients' records have been reviewed to exclude them from future searches.
• New entrants to the UK should be informed of the national screening pathways and eligible patients added to Open Exeter as soon as possible. All adult new-entrants should also be offered a HIV test. An annual audit should be undertaken of achievement here.
• Add alerts to non-responder's electronic records to warn clinicians if they have never had a cervical screening test and are at high risk because of lifestyle factors such as previous history of sexually transmitted infections, alcohol or drug misuse or previous abnormal cells.
• Ensure administration errors that lead to patients not receiving follow-up practice invitations are eliminated.

Conclusion

The authors recognise the workload in primary care is already substantial, and to administer an additional invitation may be a barrier to its widespread use. It is clear, however, that the invitation significantly increases the uptake of cervical screening. Most GPs will require less than two minutes to administer and document the invitation. As cervical screening rates being maintained above 80% is now an essential service included in the GMS contract, this is a high impact and low-cost process that can also be used as an opportunity to exempt patients who make an informed decision to refuse screening.

The implications for research are vast. Measuring the effects of physician advice-giving upon uptake of other screening programmes is an example. Reviewing patient satisfaction and retention following physician reminders is another possible topic. Time taken to perform screening reminders versus physician satisfaction with the consultation is another. Over time, the wording of the invitations may change as HPV vaccinations become more prevalent and cervical cancer rates fall even further. Until then, these feasible, safe and standard invitations should be considered a part of every consultation with patients who are non-responders to cervical screening.

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Irritable gastrointestinal syndrome

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Abstract

Background: Recurrent upper abdominal discomfort may be the cause of nearly half of the applications to the Internal Medicine Clinics, and irritable bowel syndrome (IBS) and chronic gastritis (CG) may be the most commonly diagnosed disorders in such cases.

Method: Consecutive patients with the IBS and age and sex-matched controls were included.

Results: The study included 936 patients with the IBS (592 females) and 346 control cases, totally. Mean age of the patients was 41.0 years, and 63.2% of them were female. Although gastric sample biopsies were taken just in suspected cases, CG was diagnosed nearly in all of the patients with the IBS (80.4% versus 15.0%, p<0.001). Similarly, prevalences of antidepressants use (46.4% versus 16.1%, p<0.001), smoking (35.2% versus 20.8%, p<0.001), hemorrhoids (37.1% versus 7.2%, p<0.001), and urolithiasis (22.0% versus 9.5%, p<0.001) were all higher in the IBS patients, significantly. Beside that the mean values of fasting plasma glucose (FPG) (111.9 versus 105.4 mg/dL, p= 0.002) and plasma triglycerides (167.0 versus 147.3 mg/dL, p= 0.013) were also higher in the IBS patients, significantly.

Conclusion: Because FPG and triglycerides are well-known acute phase reactants in the body, IBS and CG may be low-grade inflammatory processes initiated with anxiety, depression, infection, inflammation, trauma, and cancer fear-like stresses of the body, and eventually terminate with smoking, antidepressants use, hemorrhoids, and urolithiasis. Because of the highly significant association of the IBS and CG, they may actually be the two sides of the same paper, and should be called as the irritable gastrointestinal syndrome.

Key words: Irritable bowel syndrome, chronic gastritis, depression, smoking, acute phase reactant, fasting plasma glucose, triglycerides

Introduction

Recurrent upper abdominal discomfort may be the cause of nearly half of the applications to the Internal Medicine Clinics, and irritable bowel syndrome (IBS) and chronic gastritis (CG) may be the most commonly diagnosed disorders in such cases (1). According to the literature, nearly 20% of general population have IBS, and it is more common in females (2). Flatulence, periods of diarrhea and constipation, repeated toilet visits due to urgent evacuation or early filling sensation, excessive straining, feeling of incomplete evacuation, frequency, urgency, reduced feeling of well-being, and eventually disturbed social life are often reported with the IBS. A meaningful dietary role is doubtful, and psychological factors seem to precede onset and exacerbation of gut symptoms. Many potentially psychiatric disorders including anxiety, depression, sleep disorders, cancer fear, or death fear usually coexist with the IBS (3). For example, thresholds for sensations of initial filling, evacuation, urgent evacuation, and utmost tolerance recorded via a rectal balloon decreased by focusing the examiners' attention on gastrointestinal stimuli by reading pictures of gastrointestinal malignancies in the IBS (4). In other words, although IBS is described as a physical disorder according to Rome II guidelines, psychological factors may be crucial for triggering of these physical changes. IBS may have a more complex mechanism by affecting various systems of the body with a low-grade inflammatory process (5). Eventually, IBS may even terminate with CG, urolithiasis, and hemorrhoids (6-8). Similarly, some authors studied the role of inflammation in the IBS by means of colonic biopsies in 77 patients (9). Although 38 patients had normal histology, 31 patients demonstrated microscopic inflammation, and eight patients fulfilled criteria for lymphocytic colitis. However, immunohistology revealed increased intraepithelial lymphocytes as well as increased CD3 and CD25 positive cells in lamina propria of the group with "normal" histology. These features were more evident in the microscopic inflammation group who additionally revealed increased neutrophils, mast cells, and natural killers. All of these immunopathological abnormalities were the most evident in the lymphocytic colitis group who also demonstrated HLA-DR staining in the crypts and increased CD8 positive cells in the lamina propria (9). Some other authors demonstrated not only an increased mast cell degranulation in the colon but also a direct correlation between proximity of mast cells to neuronal elements and severity of pain in the IBS (10). In addition to the above findings, there is some evidence for extension of the inflammatory process behind the mucosa. Some authors addressed this issue in ten patients with the severe IBS by examining full-thickness jejunal biopsies obtained, laparoscopically (11). They detected a low-grade infiltration of lymphocytes into the myenteric plexus of nine patients, four of whom had an associated increase in intraepithelial lymphocytes and six demonstrated evidence of neuronal degeneration (11). Nine patients had hypertrophy of longitudinal muscles, and seven had abnormalities in the number and size of interstitial cells of Cajal (11). The finding of intraepithelial lymphocytosis was consistent with some other reports in the colon and duodenum, too (9, 12). We tried to understand whether or not there is a significant association between the IBS and CG in the human body.

Materials and Methods

The study was performed in the Internal Medicine Clinic of the Dumlupinar University between August 2005 and March 2007. Consecutive patients with upper abdominal discomfort were taken into the study. Their medical histories including smoking, alcohol, urolithiasis, and already used medications including antidepressants at least for a period of six months were learned. Patients with devastating illnesses including eating disorders, malignancies, acute or chronic renal failure, cirrhosis, hyper- or hypothyroidism, or heart failure were excluded. Current daily smokers at least for the last six months and cases with a history of five pack years were accepted as smokers. Patients with regular alcohol consumption (one drink a day) were accepted as drinkers. A routine check up procedure including fasting plasma glucose (FPG), total cholesterol (TC), triglycerides, high density lipoproteins (HDL), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), albumin, creatinine, thyroid function tests, hepatic function tests, markers of hepatitis A, B, C, and human immunodeficiency viruses, a urinalysis, a posterior-anterior chest x-ray graphy, an electrocardiogram, a Doppler echocardiogram in case of requirement, an abdominal ultrasonography, an abdominal x-ray graphy in supine position, a rectosigmoidoscopy just in patients symptomatic for hemorrhoids, and a questionnaire for the IBS was performed. IBS was diagnosed according to Rome II criteria in the absence of red flag symptoms including pain, nocturnal diarrhea, weight loss, fever, and any abnormal finding of the physical examination. An upper gastrointestinal endoscopy was performed, and sample biopsies were taken just in cases with suspicion. CG is diagnosed, histologically. Infiltrations of neutrophils and monocytes into the gastric mucosa is the hallmark of CG (13). An additional intravenous pyelography was performed according to the results of the urinalysis and abdominal x-ray graphy. So urolithiasis was diagnosed either by medical history or as a result of current clinical and laboratory findings. Body mass index (BMI) of each case was calculated by measurements of Same Physician instead of verbal expressions. Cases with an overnight FPG level of 126 mg/dL or greater on two occasions or already using antidiabetic medications were defined as diabetics (14). An oral glucose tolerance test with 75-gram glucose was performed in cases with FPG levels between 100 and 126 mg/dL, and diagnosis of cases with two-hour plasma glucose levels of 200 mg/dL or greater is diabetes mellitus (DM) (14). Office blood pressure (OBP) was checked after five minutes of rest in seated position with mercury sphygmomanometer on three visits, and no smoking was permitted during the previous two hours. Ten days twice daily measurements of blood pressure at home (HBP) were obtained in all cases, even in normotensives in the office due to the risk of masked hypertension after an education about proper blood pressure (BP) measurement

techniques (15). The education included recommendation of upper arm devices, using a standard adult cuff with bladder sizes of 12 x 26 cm for arm circumferences up to 33 cm in length and a large adult cuff with bladder sizes of 12 x 40 cm for arm circumferences up to 50 cm in length, and taking a rest for a period of five minutes in seated position before measurements. An additional 24-hour ambulatory blood pressure monitoring was not required due to the equal efficacy of the HBP measurements to diagnose hypertension (HT) (16). HT is defined as a mean BP of 140/90 mmHg or greater on HBP measurements, and white coat hypertension (WCH) is defined as an OBP of 140/90 mmHg or greater, but a mean HBP value of lower than 140/90 mmHg (15). Eventually, all patients with the IBS were collected into the first and age and sex-matched control cases were collected into the second groups, and compared in between. Mann-Whitney U test, Independent-Samples T test, and comparison of proportions were used as the methods of statistical analyses.

Results

The study included 936 patients with the IBS (592 females) and 346 control cases, totally. Mean age of the patients was 41.0 years, and 63.2% of them were female. Although gastric tissue biopsies were taken just in suspected cases, CG was diagnosed nearly in all of the patients with the IBS (80.4% versus 15.0%, p<0.001). Similarly, prevalences of antidepressants use (46.4% versus 16.1%, p<0.001), smoking (35.2% versus 20.8%, p<0.001), hemorrhoids (37.1% versus 7.2%, p<0.001), and urolithiasis (22.0% versus 9.5%, p<0.001) were all higher in the IBS patients, significantly. Beside that the mean values of FPG (111.9 versus 105.4 mg/dL, p= 0.002) and plasma triglycerides (167.0 versus 147.3 mg/dL, p= 0.013) were also higher in the IBS patients, significantly (Table 1). Due to the limited number of cases with alcoholism among the study cases, regular alcohol consumption was not included in comparison.

Table 1 Comparison of patients with irritable bowel syndrome and without

Variables	Patients with IBS*	p-value	Control cases
Number	936		346
Mean age (year)	41.0 ± 14.7 (13-86)	Ns†	41.4 ±14.4 (15-82)
Female ratio	63.2%	Ns	63.0%
CG¶	80.4%	<0.001	15.0%
Antidepressants use	46.4%	<0.001	16.1%
Hemorrhoids	37.1%	<0.001	7.2%
Smoking	35.2%	<0.001	20.8%
Urolithiasis	22.0%	<0.001	9.5%
Mean BMI‡ (kg/m2)	27.2 ±5.6 (15.0-51.1)	Ns	27.7 ±5.9 (16.5-49.0)
WCH§	27.7%	Ns	31.4%
HT‖	12.8%	Ns	14.7%
DM**	8.3%	Ns	10.0%
Mean FPG*** (mg/dL)	111.9 ± 42.8 (66-392)	0.002	105.4 ± 32.9 (70-323)
Mean TC**** (mg/dL)	199.8 ±43.9 (105-352)	Ns	196.5 ±43.6 (110-296)
Mean triglycerides (mg/dL)	167.0 ± 106.5 (20-622)	0.013	147.3 ±102.9 (27-857)
Mean LDL***** (mg/dL)	125.4 ±35.8 (10-282)	Ns	124.0 ±32.5 (54-231)
Mean HDL****** (mg/dL)	46.6 ±13.5 (24-124)	Ns	45.0 ±10.3 (26-72)

*Irritable bowel syndrome   †Nonsignificant (p>0.05)   ¶Chronic gastritis   ‡Body mass index   §White coat hypertension   ‖Hypertension   **Diabetes mellitus   ***Fasting plasma glucose   ****Total cholesterol   *****Low-density lipoprotein   ******High-density lipoprotein

Background

The monolayer of endothelial cells that forms the inner lining of arteries, veins, capillaries, and lymphatics is called as the endothelium. Probably, the whole endothelium all over the body may act as a separate organ that may be the largest organ of the body. It may contract vasculature of the peripheral organs while relaxing the internal ones during cold, anxiety, and depression-like stresses. Because we measure the systolic and diastolic BPs of the arms and legs, they may not show the actual BPs of the brain, heart, lung, liver, and kidney-like internal organs. The endothelium may be the main organ in the control of blood fluidity, platelets aggregation, and vascular tone all over the body. It may control vascular tone and blood flow by releasing nitric oxide, reactive oxygen species, and metabolites of arachidonic acid into the circulation. It may also be important for synthesizing of vasoactive hormones such as angiotensin II. An endothelial dysfunction-induced accelerated atherosclerosis all over the body may be the main cause of end-organ insufficiencies, aging, and death. Such a dysfunction may also be important in the development of cancers by preventing clearance of malignant cells by the natural killers in terminal points of the circulation. Similarly, physical inactivity, animal-rich diet, excess weight, higher BP and glucose levels, chronic inflammations, prolonged infections, cancers, smoking, and alcohol may be accelerating factors of the chronic endothelial inflammation and dysfunction terminating with the accelerated atherosclerosis-induced end-organ insufficiencies (17). The much higher BP of the afferent vasculature may be the major accelerating factor by inducing recurrent injuries on the vascular endothelium. Probably, whole afferent vasculature including capillaries are mainly involved in the process. Thus the term of venosclerosis is not as famous as atherosclerosis in the medical literature. Due to the chronic endothelial damage, inflammation, edema, fibrosis, and dysfunction, vascular walls thicken, their lumens narrow, and they lose their elastic natures, those eventually reduce blood flow to the terminal organs, and increase systolic and decrease diastolic BPs further. Some of the irreversible consequences of the systemic inflammatory process are obesity, HT, DM, cirrhosis, peripheric artery disease, chronic obstructive pulmonary disease (COPD), coronary heart disease (CHD), chronic renal disease (CRD), mesenteric ischemia, osteoporosis, stroke, dementia, early aging, and premature death (18). Although early withdrawal of the accelerating factors may delay terminal consequences, endothelial changes can not be reversed, completely after development of the irreversible end-points due to their fibrotic natures. The accelerating factors and irreversible consequences are researched under the titles of the metabolic syndrome, aging syndrome, and accelerated endothelial damage syndrome in the literature, extensively (19, 20).

Obesity may be one of the irreversible end-points of the metabolic syndrome. Although some transient successes can be achieved, nonpharmaceutical approaches provide limited benefit to reverse the obesity, permanently. Due to the excess weight-induced chronic low-grade inflammation on the vascular endothelium, the risk of death from all causes including cardiovascular diseases and cancers increases parallel to the range of excess weight in all age groups (21). The chronic low-grade inflammation may even cause genetic changes of the endothelial cells, and the systemic atherosclerosis may prevent clearance of malignant cells, effectively. Similarly, the effects of excess weight on the BP were shown in the literature, extensively (22). For example, prevalences of sustained normotension (NT) were higher in the underweight than the normal weight (80.3% versus 64.0%, p<0.05) and overweight groups (80.3% versus 31.5%, p<0.001) (22), and 52.8% of patients with HT had obesity against 14.5% of patients with the sustained NT (p<0.001) (23). So the major underlying cause of the metabolic syndrome appears as weight gain that may be the main cause of insulin resistance, hyperlipoproteinemias, impaired fasting glucose, impaired glucose tolerance, and WCH (24). Interestingly, weight gain before the development of an obvious overweight or obesity may even cause development of several components of the metabolic syndrome. For example, WCH alone may be a strong indicator of weight gain even before development of excess weight (22, 23). On the other hand, prevention of the weight gain with physical activity even in the absence of a prominent weight loss usually results with resolution of many parameters of the syndrome (25). According to our experiences, excess weight may actually be a result of physical inactivity instead of an excessive eating habit. In another words, there is a problem with burning of calories instead of getting them. Therefore prevention of weight gain cannot be achieved by diet, alone (26). On the other hand, limitation of excess weight as an excessive fat tissue around abdomen under the heading of abdominal obesity may be meaningless; instead it should be defined as overweight or obesity by means of the BMI. Because adipocytes function as an endocrine organ, and they release leptin, tumour necrosis factor (TNF)-alpha, plasminogen activator inhibitor-1, and adiponectin-like cytokines into the plasma (27). Eventual hyperactivities of sympathetic nervous system and renin-angiotensin-aldosterone system are probably associated with insulin resistance, elevated BP, and chronic endothelial inflammation and dysfunction. Similarly, the Adult Treatment Panel (ATP) III reported that although some people classified just as overweight with larger muscular masses, most of them also have excess fat tissue predisposing to the irreversible end-points of the metabolic syndrome (14).

Smoking may be the second common cause of systemic vasculitis in the world. It is one of the major risk factors for the atherosclerotic end-organ insufficiencies (28). Its atherosclerotic effect is the most obvious in Buerger's disease. Buerger's disease is an obliterative vasculitis characterized by inflammatory changes in the small and medium-sized arteries and veins, and it has never been reported in the absence of smoking in the literature. Smoking may cause a low-grade systemic inflammation on vascular endothelium terminating with an accelerated atherosclerosis-induced end-organ insufficiencies all over the body. Plasma triglycerides, low density lipoproteins (LDL), ESR, and CRP may be positive whereas HDL and FPG may be negative acute phase reactants (APRs)

indicating such inflammatory effects in the body (29). Beside the obvious atherosclerotic effects of smoking, some studies reported that smoking in human being and nicotine administration in animals are associated with the lower values of BMI (30). Some evidences revealed increased energy expenditure during smoking both on the rest and light physical activity (31). Nicotine supplied by patch after smoking cessation decreased caloric intake in a dose-related manner (32). According to an animal study, nicotine may lengthen inter-meal time, and decrease amount of meal eaten (33). Smoking may be associated with a post cessation weight gain, but the risk is the highest during the first year, and decreases with the following years (34). As the opposite findings to the above studies, the mean weight and BMI were similar both in the smokers and non-smokers in the other study (29). Similarly, prevalence of smoking were similar in the normal weight (35.9%), overweight (32.9%), and obesity groups (33.7%, p>0.05 between all) in another study (35). On the other hand, although the CHD was detected with similar prevalence in both genders, prevalences of smoking and COPD were higher in males against the higher BMI, LDL, triglycerides, WCH, HT, and DM in females (36). Beside that the prevalence of myocardial infarctions is increased three-fold in men and six-fold in women who smoked at least 20 cigarettes per day (37). In another words, smoking may be more dangerous for women about the atherosclerotic end-points probably due to the higher BMI and its consequences in them. Several toxic substances found in the cigarette smoke get into the circulation, and cause a vascular endothelial inflammation in all organ systems of the body. For example, smoking is usually reported together with depression, IBS, CG, hemorrhoids, and urolithiasis in the literature (6, 7). There may be several underlying mechanisms to explain these associations in the smokers (38). First of all, smoking may have some additional antidepressant properties with several side effects. Secondly, smoking-induced vascular endothelial inflammation may disturb epithelial functions for absorption and excretion in the gastrointestinal and genitourinary tracts. These functional problems may terminate with urolithiasis and components of the IBS including loose stool, diarrhea, and constipation. Thirdly, diarrheal losses-induced urinary changes may even cause urolithiasis (6, 7). Fourthly, smoking-induced sympathetic nervous system activation may cause motility problems in the gastrointestinal and genitourinary tracts terminating with the IBS and urolithiasis. Eventually, immunosuppression secondary to smoking-induced vascular endothelial inflammation may even terminate with the gastrointestinal and genitourinary tract infections causing loose stool, diarrhea, and urolithiasis, because some types of bacteria can provoke urinary supersaturation, and modify the environment to form crystal deposits in the urine. Actually, 10% of urinary stones are struvite stones which are built by magnesium ammonium phosphate produced during infections with the bacteria producing urease. Parallel to the results above, urolithiasis was detected in 17.9% of cases with the IBS and 11.6% of cases without in the other study (p<0.01) (6).

Alcohol may be the third common cause of systemic vasculitis in the world. It is addictive to humans, and can result in alcohol use disorder (AUD), dependence, and withdrawal. Alcohol is causally associated with more than 200 different pathologies including cancers in whole body (39). Eventually, people hospitalized with AUD have an average life expectancy of 47-53 years in men and 50-58 years in women, and die 24-28 years earlier than the others (40). People with AUD have three-fold higher mortality in men and four-fold in women (41). Similar to smoking, alcohol may be more dangerous for women about the atherosclerotic end-points probably due to their lower body mass induced lower capacity to metabolize alcohol and higher body fat. A very substantial part of the Danish excess mortality and lower life expectancy compared to Sweden can be attributed to higher mortality related with alcohol and smoking (40). It may even cause unconsciousness and sudden death if taken in high amounts. Hepatic alcohol dehydrogenase is the main enzyme to metabolize alcohol that requires the cofactor, nicotinamide adenine dinucleotide (NAD). Normally, NAD is used to metabolize fats in the liver but alcohol competes with these fats for the use of NAD. Eventually, prolonged exposure of alcohol causes fatty liver. Ethanol is the only alcohol that is found in alcoholic beverages. Ethanol crosses biological membranes and blood-brain barrier by means of the passive diffusion, easily. Alcohol works particularly by increasing effects of the gamma aminobutyric acid that is the main inhibitory neurotransmitter of the brain. Alcohol causes happiness and euphoria, decreased anxiety, increased sociability, sedation, generalized depression of central nervous system, and impairment of cognitive, memory, motor, and sensory functions. It may even cause fetal disorders in pregnancy since ethanol is classified as a teratogen. Regular alcohol consumption leads to cell death in the liver, scarring, cirrhosis, and hepatocellular carcinoma. Heavy alcohol consumption may even terminate with permanent brain damage. Alcohol is the major contributing factor of elevated triglycerides which are the sensitive APRs in the plasma (24). Although regular alcohol consumers were excluded, plasma triglycerides were higher in the smokers (163.1 versus 151.3 mg/dL, p<0.05), indicating the inflammatory effects of smoking (42).

The acute phase response occurs in case of infection, infarction, cancer, trauma, and burn-like inflammatory conditions of the body. Certain mediators known as APRs are increased or decreased during the response (43, 44). These markers are commonly used in the clinical practice as the indicators of acute and chronic inflammations in the body. The terms of acute phase proteins and APRs are usually used synonymously, although some APRs are polypeptides rather than proteins. Positive and negative APRs are those whose concentrations increase or decrease during the acute phase response, respectively. The response is predominantly mediated by the pro-inflammatory cytokines including TNF, interleukin-1, and interleukin-6 secreted by neutrophils and macrophages into the circulation. The liver and other organs respond to the cytokines by producing many positive APRs. ESR, CRP, fibrinogen, ferritin, procalcitonin, hepcidin, haptoglobin,

ceruloplasmin, complement proteins, and serum amyloid A are some of the well-known positive APRs. CRP is a useful indicator of the acute phase response, clinically. It is responsible for activation of the complement pathway. CRP reaches up to the maximum concentration within two days, and decreases with the resolution of the inflammation with a half-life of 6-8 hours, rapidly. It correlates with ESR, but not simultaneously since ESR is largely dependent upon elevation of fibrinogen with a half-life of one week, approximately. Thus ESR remains higher for a longer period of time despite the removal of the inflammatory stimulus. Similarly, white blood cells and platelet counts may also behave as some other positive APRs in the body (45). On the other hand, productions of the negative APRs are suppressed, simultaneously. Albumin, transferrin, retinol-binding protein, antithrombin, transcortin, alpha-fetoprotein, and hemoglobin are some of the well-known negative APRs in the body. Suppressions of such negative APRs are also used as the indicators of the acute phase response in the body. Suppressions of such negative APRs may actually be secondary to the protection of amino acids and polypeptides required for the production of positive APRs, sufficiently. As also observed in the smokers in the above study (42), production of HDL may also be suppressed in the liver during the acute phase response (46). Similarly, triglycerides, DM, and CHD were all higher in patients with plasma HDL values of lower than 40 mg/dL, significantly (46). So HDL may actually behave as negative whereas triglycerides positive APRs in the plasma. Similarly, the highest CHD of the group with HDL values of lower than 40 mg/dL can also be explained by the same hypothesis in the other study (24). Additionally, plasma triglycerides increased whereas HDL decreased during infections (47). On the other hand, a 10 mg/dL increase of plasma LDL values was associated with a 3% lower risk of hemorrhagic stroke (48). Similarly, the highest prevalence of HT and DM parallel to the elevated values of LDL and HDL, and the highest prevalence of COPD, CHD, and CRD in contrast to the lowest values of LDL and HDL may show initially positive but eventually negative behaviors of LDL and HDL as the APRs (49). Probably, HDL turns to the negative direction much earlier than LDL in the plasma. Interestingly, the most desired values were between 80 and 100 mg/dL for LDL, between 40 and 46 mg/dL for HDL, and lower than 60 mg/dL for triglycerides in the plasma (24). Parallel to ESR and CRP, plasma triglycerides and LDL may behave as positive whereas FPG and HDL negative APRs in smokers in the above study (42). In another words, lower HDL values should alert clinicians for researching of any acute phase response in the body (50, 51).

Cholesterol, triglycerides, and phospholipids are the major lipids of the body. They do not circulate in the plasma, freely instead they are bound to proteins, and transported as lipoproteins. There are five mjor classes of lipoproteins in the plasma. Chylomicrons carry exogenous triglycerides to the liver via the thorasic duct. Very low density lipoproteins (VLDL) are produced in the liver, and carry endogenous triglycerides to the organs. VLDL are converted into the intermediate density lipoproteins

(IDL) by removal of 90% of triglycerides by lipases in the capillaries of adipocytes and muscle tissues. Then the IDL are degraded into LDL by removal of more triglycerides. So VLDL are the main source of LDL in the plasma, and LDL deliver cholesterol from the liver to organs. Although the liver removes majority of LDL from the circulation, a small amount is uptaken by scavenger receptors of the macrophages migrating into the arterial walls, and become the foam cells of atherosclerotic plaques. HDL remove fats and cholesterol from cells including the arterial wall atheroma, and carry the cholesterol back to the adrenals, ovaries, and testes-like steroidogenic organs and liver for excretion, re-utilization, or disposal. All of the carrier lipoproteins are under dynamic control, and are readily affected by diet, drug, inflammation, infection, cancer, trauma, smoking, alcohol, and excess weight. Thus lipid analysis should be performed during a steady state, but the metabolic syndrome alone is a low-grade inflammatory process, and it may even cause abnormal lipoproteins levels in the plasma. HDL may normally show various anti-oxidative, anti-inflammatory, and anti-atherogenic properties including reverse cholesterol transport (52). However, HDL may become 'dysfunctional' in pathologic conditions which means that relative compositions of lipids and proteins, as well as the enzymatic activities of HDL are altered (52). For example, properties of HDL are compromised in patients with DM by means of the oxidative modification, glycation, and/or transformation of HDL proteomes into the proinflammatory proteins. Additionally, the drugs increasing HDL values such as niacin, fibrates, and cholesteryl ester transfer protein inhibitors can not reduce all cause mortality, CHD mortality, myocardial infarction, and stroke (53). In other words, HDL may just be some indicators instead of being the main actors of the health. Similarly, BMI, DM, and CHD were the lowest between the HDL values of 40 and 46 mg/dL, and the prevalence of DM was only 3.1% between these values against 22.2% outside these limits (54). Similar to the above study (42), HDL and FPG values were also suppressed in the sickle cell diseases (SCDs), probably due to the severe inflammatory nature of the diseases (55). Smoking may reduce HDL and FPG by means of the moderate or severe inflammatory effects on the vascular endothelium all over the body (29). On the other hand, triglycerides alone may be one of the most sensitive APRs indicating the metabolic syndrome (56). Although ATP II determined the normal plasma triglycerides as lower than 200 mg/dL in 1994 (57), World Health Organisation in 1999 (58) and ATP III in 2001 reduced the normal limits as lower than 150 mg/dL (14). Although these cutpoints, there are still suspicions about the safest values of triglycerides in the plasma (56). Beside that triglycerides are the only lipids which were not suppressed with the pathological weight losses (59). For example, plasma triglycerides increased in contrast to the suppressed body weight and BMI in the SCDs (59). Similarly, prevalences of excess weight, DM, HT, and smoking were all higher in the hypertriglyceridemia group (200 mg/dL and higher) in the other study (60). Interestingly, the greatest number of deteriorations of the metabolic parameters was observed with the triglycerides values of 60 mg/dL and higher **(56).**

The body's homeostatic mechanism keeps blood glucose levels within a narrow range with two groups of mutually antagonistic hormones. Glucagon, cortisol, and catecholamines are the catabolic hormones increasing the blood glucose, whereas insulin is the anabolic hormone decreasing the blood glucose levels. Glucagon is secreted from the alpha cells while insulin is secreted from the beta cells of pancreatic islets which are the bundles of endocrine tissues. When the blood glucose levels are too high, insulin tells muscles to take up excess glucose for storage as glycogen. When the blood glucose levels are too low, glucagon informs the tissues to produce more glucose from the stores of glycogen. Catecholamines prepare the muscles and respiratory system for a 'fight to fight' response. Cortisol prepares the body for the various stresses. A blood glucose level of four grams, or about a teaspoon, is critical for the normal function of millions of cells of a person with the weight of 70 kg (61). The constant blood glucose levels are maintained via the hepatic and muscular glycogen stores on fasting. There are approximately 100 and 400 grams of glycogen stored in the skeletal muscles and liver, respectively (61). The brain consumes about 60% of the blood glucose on fasting. FPG is the most commonly used indication of overall glucose homeostasis, and it is measured after a fasting period of 8 hours. Infection, inflammation, surgical operation, depression, alcohol, and smoking-like stresses may affect the blood glucose homeostasis. For example, smoking was negatively associated with the FPG and DM in Chinese men with the normal weight, but not in men with excess weight or in women (62). Similarly, smokers have a lower likelihood of newly-diagnosed DM in Chinese men with a lower BMI in the other study (63). Parallel to the above studies, FPG and DM were also lower in the smokers (102.3 versus 111.6 mg/dL, p=0.007 and 8.9% versus 14.3%, p<0.05, respectively), and although majority of the smokers were male again (70.0%), BMI was higher (26.6 kg/m2) in contrast to the above studies (42).

As a conclusion, because FPG and plasma triglycerides are well-known APRs in the body, IBS and CG may be low-grade inflammatory processes initiated with anxiety, depression, infection, inflammation, trauma, and cancer fear-like stresses of the body, and eventually terminate with smoking, antidepressants use, hemorrhoids, and urolithiasis. Because of the highly significant association of the IBS and CG, they may actually be the two sides of the same paper, and should be called as the irritable gastrointestinal syndrome in the literature.

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Self-management behaviours and glycemic control in diabetic patients. A cross sectional study

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Abstract

Objective: The aim of this study was to explore the status of diabetes self-management (DSM) among patient with diabetes in Qatar and its relationship with glycemic control and other demographic variables.

Methods: A cross sectional study using A structured questionnaire-based study (DSMQ,) and the hospital electronic medical records system to collect sociodemographic and clinical information. among diabetic patients registered in 3 primary health care clinics in Qatar. With a convenience sample of 400 patients with diabetes.

Results : Mean age of participants was 54.36±11.58 years and mean duration of diabetes was 10.53±7.47years. Nearly one third of the patients used insulin and the majority used oral hypoglycemic. The results of this study revealed that good adherence to diabetes self-management was reported among 52.8% of adult diabetic patients while the inadequate cases where around 47.3 % which demonstrated lack of diabetes self-management and subsequently at increased risk of complications. There was no gender difference regarding self-care of diabetes. Additionally, adequate DSM was significantly associated with later onset of DM and with college education. HA1C was significantly negative correlated with Glucose management, Physical activity, positive correlated with Diet control, and total score. For DSM subscales, glucose management was the best followed by diet control, health care utility. however, physical activity scored the lowest mean.

Conclusion: Results indicated that around 47 % of diabetic patients in Qatar do not perform Diabetes self-management (DSM) consistently.

Practice implications: The findings of this study set the stage to empower patient centered care, develop an easy clear teaching strategies for diabetic patients with a lower educational status and activate the role of wellness centers performing regular physical activity sessions for them & the multidisciplinary team that will improve DSM and subsequently improve diabetes management in diabetic patients in Qatar.
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Keywords:
Diabetes mellitus, Self-management behaviors, Diabetes self-management questionnaire (DSMQ).

Introduction / background

Diabetes mellitus is a prevalent and growing chronic disease with multisystem complications and a high burden. The WHO anticipates that diabetes will be the seventh leading cause of death by 2030. In Qatar, the prevalence of diabetes among Qatari adults was estimated at 16.7% in 2012, higher in women, and peaked in the age group 40-49 years of 31.2% [1]. Diabetes is not only the leading cause of short and long-term health complications, but also one of the top deadly diseases worldwide [2,3]. While there has been no cure for diabetes, people with diabetes can maintain individualized glycemic control to protect against the development of complications, and to live a healthy life via treatment modalities including lifestyle modification and/or anti-diabetes medications and self-management strategies which are strongly recommended [4,5,8,12]. Notably, the American Diabetes Association (ADA) emphasizes the importance of person-centered care, defined as being respectful of and responsive to the individuals' preferences, needs, and values; and ensures that the person with diabetes guides all clinical decisions [6,17, 18,20]. Diabetes self-management (DSM) has been defined as how people with diabetes practice self-care. It involves the knowledge, attitude, and behaviors to both maintain personal health and prevent long-term diabetes complications [6,8,9, 21,22]. The target is to empower the patient to be the key player in his diabetic care, and maintenance of individualized goals for glycemic control through comprehensive lifestyle behaviors including 'Glucose Management', 'Dietary Control', 'Physical Activity', and 'Health-Care Use' [9,10, 22,23, 25].

The effect of self-management training on glycemic control is supported by Multiple systematic review and many RCTs [10,11,19,24,26]. Therefore it is important to consider self-management behaviors as a key determinant of diabetic patient outcome. Because DSM and patient-centered care are cornerstones of successful diabetes care, around 40 validated instruments have been developed to investigate its features, prevalence, and related factors which impact DSM.[23]. The majority of these surveys allow evaluation of multiple dimensions of core diabetes treatment such as diet, physical activity, medication, self-monitoring of blood glucose, foot care, interactions with a physician, and management of hypoglycemia [21,23,27,28,29,30, 33,34].

The Diabetes Self-Management Questionnaire (DSMQ) is a 16 item questionnaire to assess self-care activities associated with glycemic control through four subscales, 'Glucose Management' (GM), 'Dietary Control' (DC), 'Physical Activity' (PA), and 'Health-Care Use' (HU), as well as a 'Sum Scale' (SS) as a global measure of self-care. This scale has been shown to have good internal consistency (Cronbach's alpha) of (0.84), and consistencies of the subscales were acceptable (GM: 0.77; DC: 0.77; PA: 0.76; HU: 0.60), and to correlate significantly with HbA1c levels (Schmitt et al., 2013). It was developed, based on theoretical considerations and a process of empirical improvements [23].

Participants answered other questions about their demographics and treatment. Recent blood glucose levels (HbA1c) were obtained from patients' medical files.

No research regarding the suggested behavioral mechanisms of self-care assessment has been yielded here in Qatar yet, therefore, in our research we tried to explore if self- management, correlates with glycemic control. This knowledge gap is important because such elements are likely to influence diabetic patients' insights to actively engage in their glycemic control. Therefore, newer information is currently needed to help us understand such influences within the local context.

Methods, Study design and sampling

A cross-sectional study was conducted among diabetic patients registered in 3 primary health care clinics in Qatar, (West Bay, Alrayan, LBB Health Care Centers) which provide health services in the northern, western and central regions of Qatar, from March 2020 to March 2021, Patients with DM were invited to enroll in this study if they met the following inclusion criteria:

1. Patients from 18 to 65 years of age diagnosed with diabetes according to ADA criteria, with and without complications who have been receiving treatment for at least 6 months before the enrollment.
2. Those who can communicate either in English or Arabic.
3. Stable patients with no emergency issues.

A structured questionnaire-based study (DSMQ,) and the hospital electronic medical records system were used to collect sociodemographic and clinical information.

Outcome: evaluate self-care activities as high score of DSMQ indicating a high level of autonomy

The sample size for this study was calculated to be 360 participants. With an anticipated 10% for a refusal rate, the final sample size for the study was 400 participants.

Residents were trained in administration of the DSMQ and covered the total of 400 patients over a duration of 8 weeks.

Ethical approval
The Institutional Review Board of the primary health care corporation (PHC/DCR/2020/10/118) approved the study protocol prior to initiation of study activities. Each participant was informed of the purposes of this study in detail via an information sheet and provided an informed consent form if they agreed to join the study. Participants were free to withdraw at any time, without giving any reason for doing so and without affecting their present or future medical treatment. All participant information was kept confidential and used only for study purposes.

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Data analysis

Data collected throughout history, laboratory investigations and outcome measures were coded, entered, and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represents as number and percentage, quantitative continuous group was represented by mean ± SD. The following tests were used to test differences for significance, difference, and association of qualitative variable by Chi square test (X2). Differences between quantitative independent groups by t test or Mann Whitney, P value was set at <0.05 for significant results & <0.001 for high significant result.

Data were collected and submitted to statistical analysis. The following statistical tests and parameters were used.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4833481/

1- Mean

$$\overline{x} = \sum x \, / \, \mathbf{n}$$

$\sum x$ is the sum of the values

n is the number of subjects.

2- Standard deviation (SD):

$$SD = \sqrt{\frac{\sum \left(x - \overline{x}\right)^2}{n - 1}}$$

$$\sum \left(x - \overline{x}\right)^2$$

is the sum of the square of the differences of each observation from the mean.

3. The chi square $\left(x^2\right)$ test:

This test was used to compare two groups regarding the distribution of different variables.

$$x^2 = \sum \frac{(O - E)^2}{E}$$

Where:

O: The observed value.
E: The expected value.

4. The t statistic to test whether the means are different can be calculated as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_{X_1 X_2} \cdot \sqrt{\frac{2}{n}}}$$

Results

Table 1: Demographic data distribution among studied group (n=400)

		N	%
Age	<30	8	2.0
	30-40	42	10.5
	41-50	104	26.0
	>50	246	61.5
	Mean ±SD	54.36±11.58	
Sex	Female	187	46.8
	Male	213	53.3
Education	Illiterate	27	6.8
	Primary	64	16.0
	Secondary	97	24.3
	College	166	41.5
	Tertiary	46	11.5
Marital Status	Divorced	32	8.0
	Married	334	83.5
	Single	34	8.5
Family support	No	93	18.5
	Yes	307	76.8
Lives with	Alone	60	15.1
	Colleges	1	.3
	Family	299	74.8
	Flat mate	24	6.0
	Friends	2	.6
	Sponsor	14	3.5
Occupation	Employed	250	62.6
	Unemployed	148	37.0
Nationality	Non-Qatari	226	56.5
	Qatari	174	43.5
Salary Enough	No	234	58.4
	Yes	166	41.6
	Total	400	100.0

Age was distributed as 54.36±11.58, males were 53.3% and females 46.7%. The majority were educated in college, (41.5%), and the majority were married 83.5%. 76.8% had family support and the majority lived with their family. 74.8% and 62.6% were employed and 43.5% were Qatari and 56.5% were not Qatari, 58.4% said they had not enough salary.

Table 2: Medical history and clinical data distribution among studied group (n=400)

		Mean± SD	Median (Range)
Age of onset of DM		41.51±9.84	41.0 (10-63)
Duration of DM		10.53±7.47	10.0 (1-43)
Last HBA1C		8.37±1.82	7.7 (5.1-14.3)
		N	%
PMH	Negative	104	26.0
	Positive	296	74.0
Number of medications	None	12	3.0
	1-2	190	47.6
	3-4	180	45.1
	>4	18	4.6
On insulin	No	272	68.0
	Yes	128	32.0
FH of DM II	No	102	24.3
	Yes	303	75.8
	Total	400	100.0

Age of onset of DM, Duration of DM and Last HBA1C were distributed as 41.51±9.84, 10.53±7.47 and 8.37±1.82 respectively, PMH was in 74.0%, 47.6% had 1-2 medications and 47.6% had 3-4 medications, 32.0% were on insulin and 75.8% had a family history of DM.
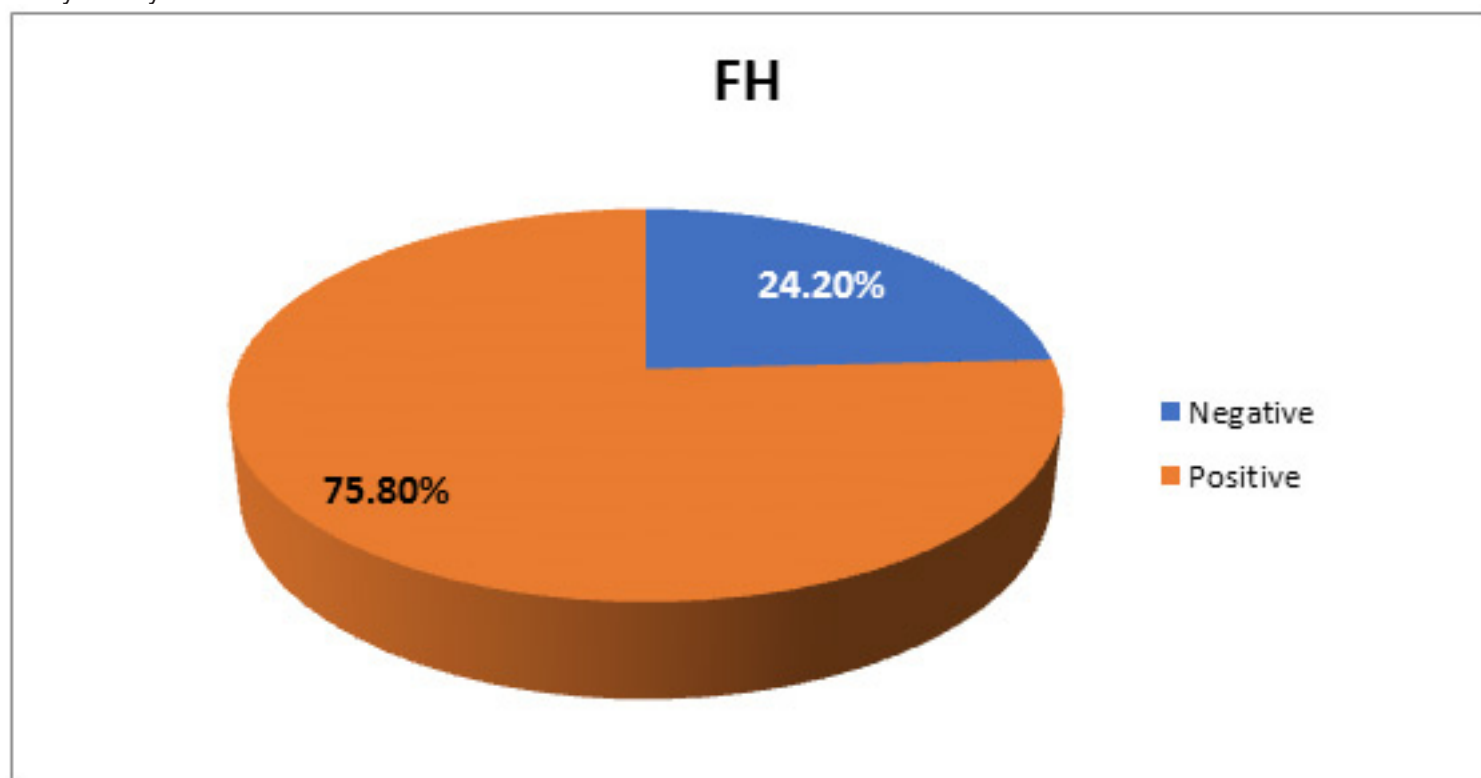
Table 3: Questionnaire parameters distribution among studied group (n=400)

		N	%
My diabetes self-care is poor	Does not apply to me	136	34.0
	Applies to me in some degree	82	20.5
	Applies to me to a considerable degree	83	20.8
	Applies to me very much	99	24.8
The food I choose to eat makes it easy to achieve optimal blood sugar levels	Does not apply to me	54	13.5
	Applies to me to some degree	150	37.5
	Applies to me to a considerable degree	136	34.0
	Applied me to me very much	60	15.0
I keep all doctors' appointments recommended for my diabetes treatment.	Does not apply to me	15	3.8
	Applies to me to some degree	42	10.5
	Applies to me to a considerable degree	56	14.0
	Applies to me very much	287	71.8
I take my diabetes medication (e.g. insulin, tablets) as prescribed	Does not apply to me	14	3.5
	Applied to me to some degree	14	3.5
	Applies to me to a considerable degree	64	16.0
	Applies to me very much	308	77.0
Occasionally I eat lots of sweets or other foods rich in carbohydrates	Does not apply to me	89	22.3
	Applies to me to some degree	190	47.5
	Applies to me to a considerable degree	94	23.5
	Applies to me very much	27	6.8
I record my blood sugar levels regularly (or analyse the value chart with my blood glucose meter).	Does not apply to me	207	51.8
	Applies to me to some degree	64	16.0
	Applies to me to a considerable degree	53	13.3
	Applies to me very much	76	19.0
I tend to avoid diabetes-related doctors' appointments	Does not apply to me	333	83.3
	Applies to me to some degree	33	8.3
	Applies to me to a considerable degree	21	5.3
	Applies to me very much	13	3.3
I do regular physical activity to achieve optimal blood sugar levels	Does not apply to me	141	35.3
	Applies to me to some degree	89	22.3
	Applies to me to a considerable degree	65	16.3
	Applies to me very much	105	26.3
I strictly follow the dietary recommendations given by my doctor or diabetes specialist.	Does not apply to me	78	19.5
	Applies to me to some degree	154	38.5
	Applies to me to a considerable degree	123	30.8
	Applies to me very much	45	11.3

Table 3: Questionnaire parameters distribution among studied group (n=400) (continued)

I do not check my blood sugar levels frequently enough as would be required for achieving good blood glucose control	Does not apply to me	139	34.8
	Applies to me to some degree	76	19.0
	Applies to me to a considerable degree	71	17.8
	Applies to me very much	114	28.5
I avoid physical activity, although it would improve my diabetes.	Does not apply to me	158	39.5
	Applies to me to some degree	51	12.8
	Applies to me to a considerable degree	64	16.0
	Applies to me very much	127	31.8
I tend to forget to take or skip my diabetes medication (e. g. insulin, tablets).	Does not apply to me	314	78.5
	Applies to me to some degree	51	12.8
	Applies to me to a considerable degree	25	6.3
	Applies to me very much	10	2.5
Sometimes I have real 'food binges' (not triggered by hypoglycaemia)	Does not apply to me	253	63.3
	Applies to me to some degree	92	23.0
	Applies to me to a considerable degree	44	11.0
	Applies to me very much	11	2.8
Regarding my diabetes care, I should see my medical practitioner(s) more often.	Does not apply to me	198	49.5
	Applies to me to some degree	82	20.5
	Applies to me to a considerable degree	57	14.3
	Applies to me very much	63	15.8
I tend to skip planned physical activity.	Does not apply to me	141	35.3
	Applies to me to some degree	66	16.5
	Applies to me to a considerable degree	62	15.5
	Applies to me very much	131	32.8
My diabetes self-care is poor	Does not apply to me	127	31.8
	Applies to me to some degree	128	32.0
	Applied to me to a considerable degree	105	26.3
	Applies to me very much	40	10.0
	Total	400	100.0

Table 4: total questionnaire score distribution among studied group (n=400)

G management	Mean± SD	9.29±3.56	
	Median (Range)	9.0 (1-15)	
Diet control	Mean± SD	7.16±2.32	
	Median (Range)	7.0 (0-12)	
Physical activity	Mean± SD	4.47±3.52	
	Median (Range)	4.0 (0-9)	
Health care utility	Mean± SD	6.21±1.45	
	Median (Range)	6.0 (0-9)	
Poor control (Q16)	Mean± SD	1.14±0.98	
	Median (Range)	1.0 (0-3)	
Total score	Mean± SD	29.01±7.38	
	Median (Range)	29.0 (11-47)	
		N	%
Total score	Inadequate <60%	189	47.3
	Adequate >60%	211	52.8
	Total	400	100.0

Total score was 29.01±7.38 and adequate was 52.8%
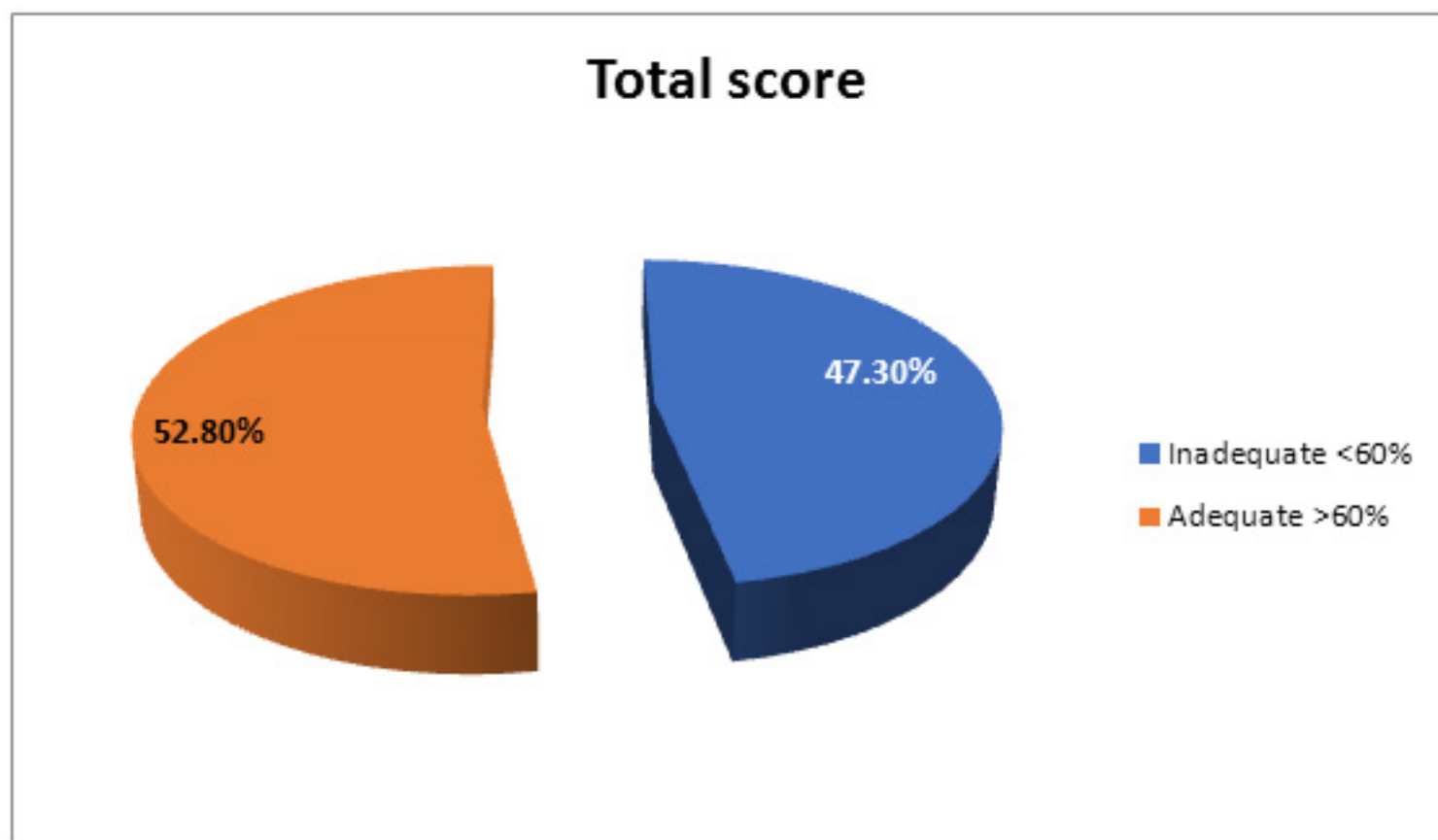
		Last HBA1C
G management	r	-0.116*
	P	0.021
Diet control	r	0.279**
	P	0.000
Physical activity	r	-0.113*
	P	0.025
Health care utility	r	-0.015
	P	0.763
Control	r	0.386**
	P	0.000
Total score	r	0.226**
	P	0.000

HA1C was significantly negative correlated with G management, Physical activity, positive correlated with Diet control, Control and total score
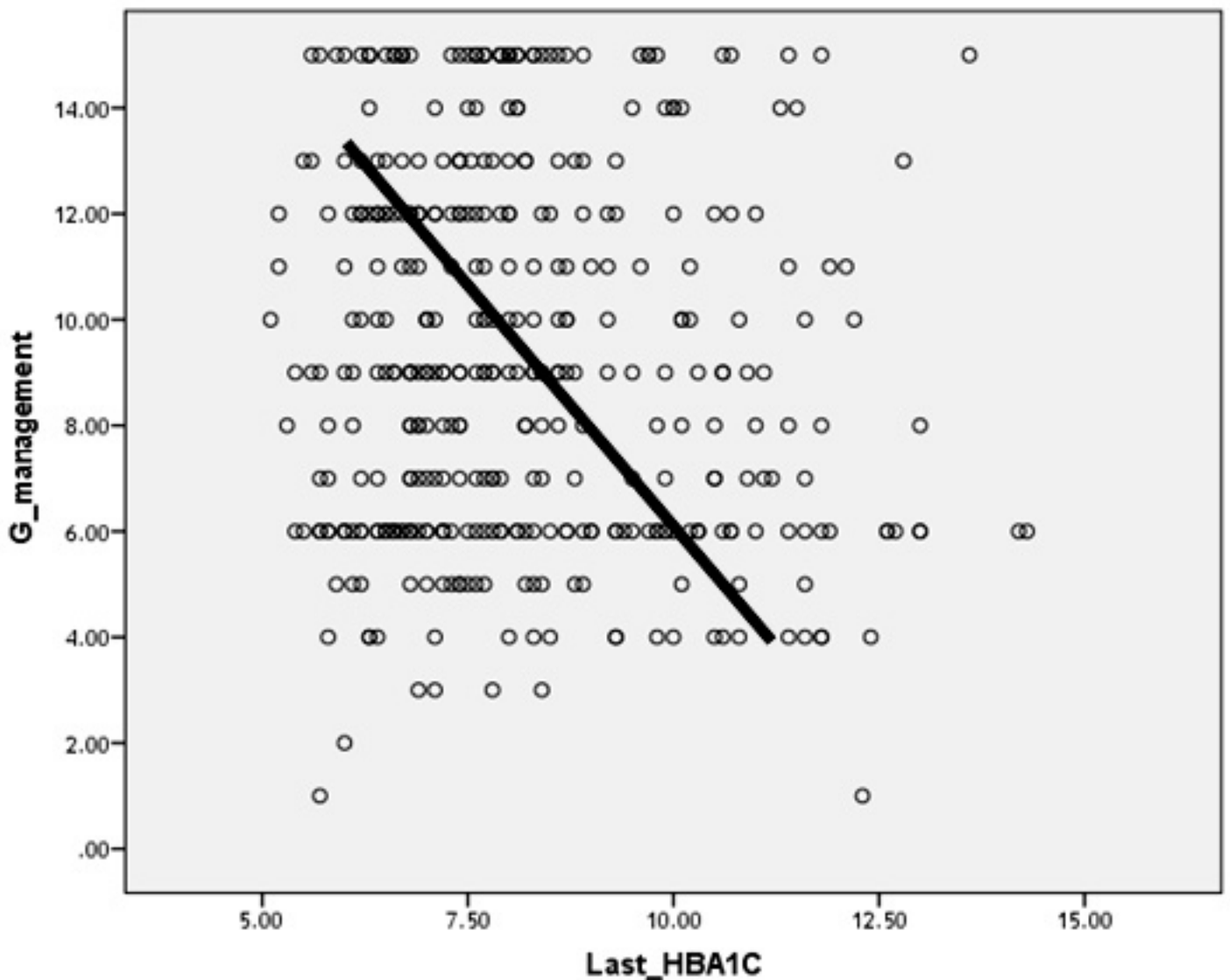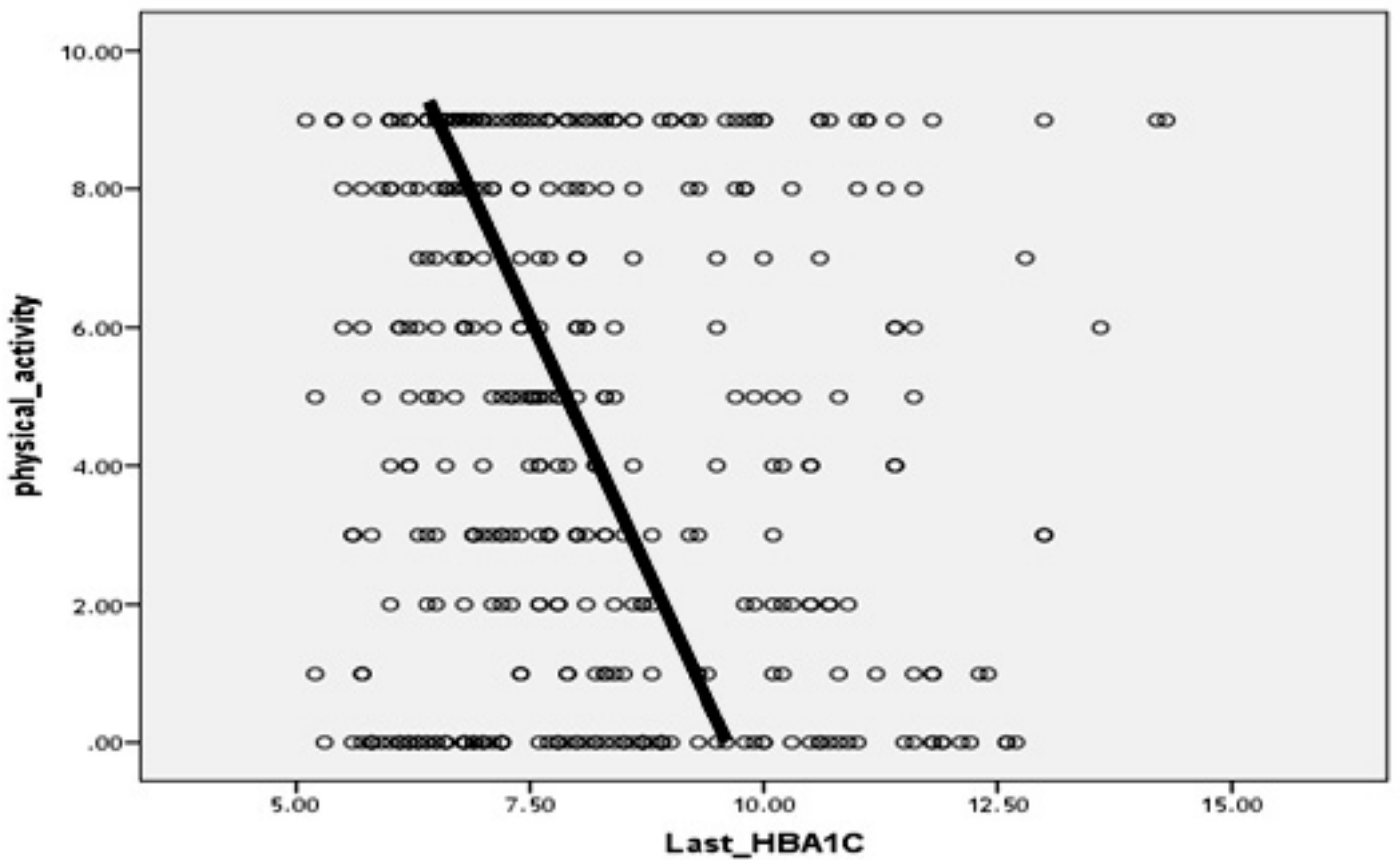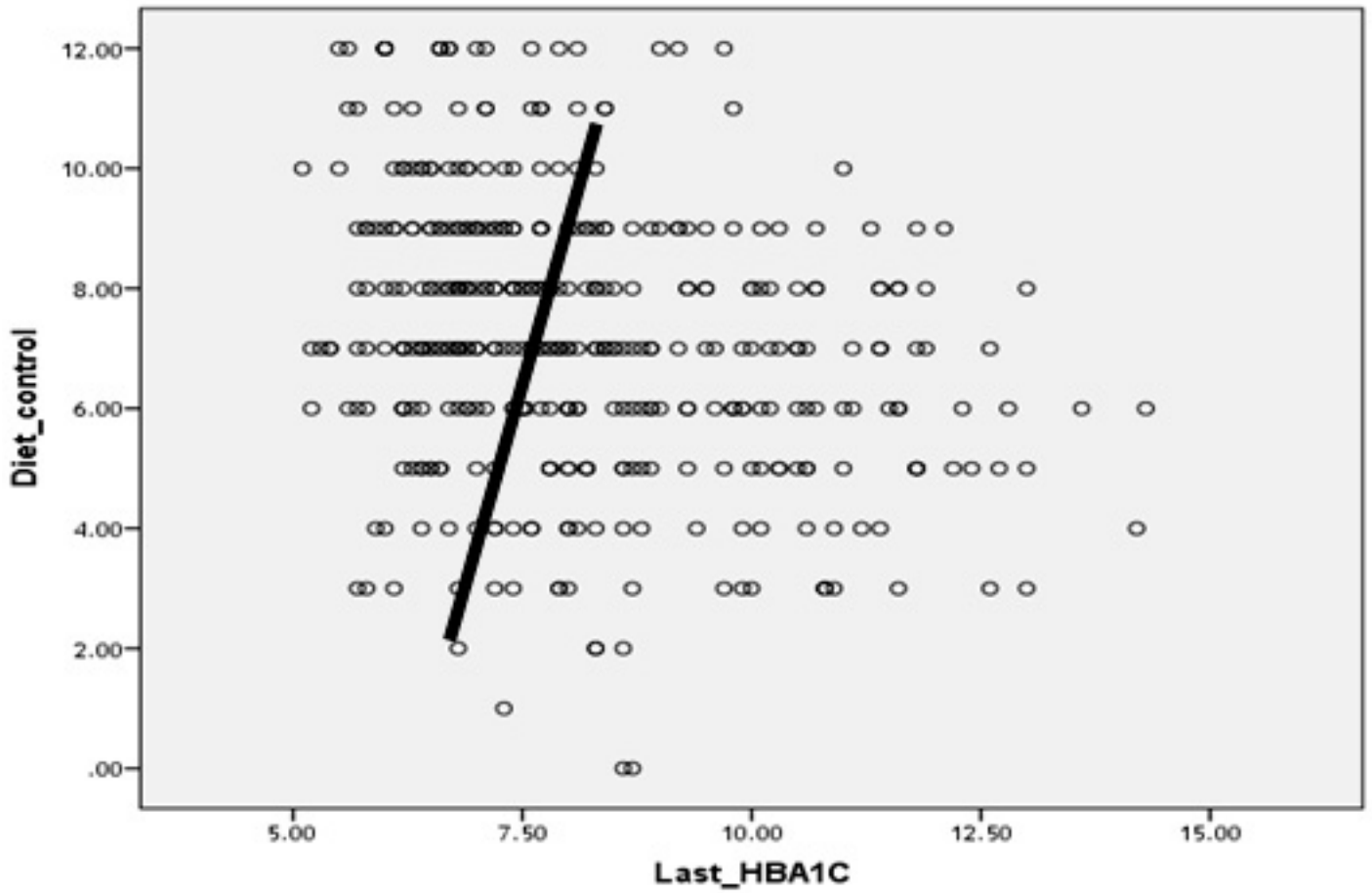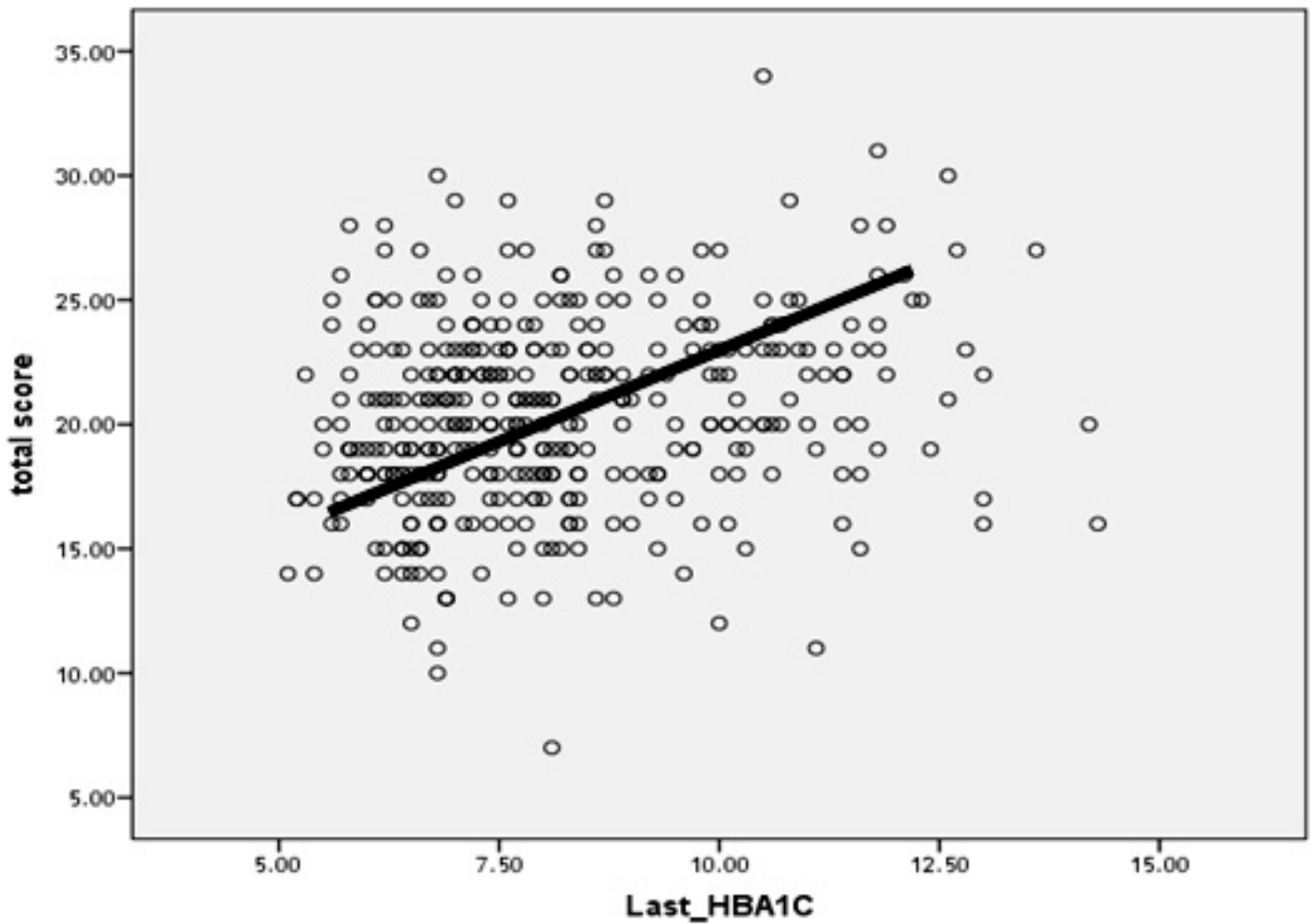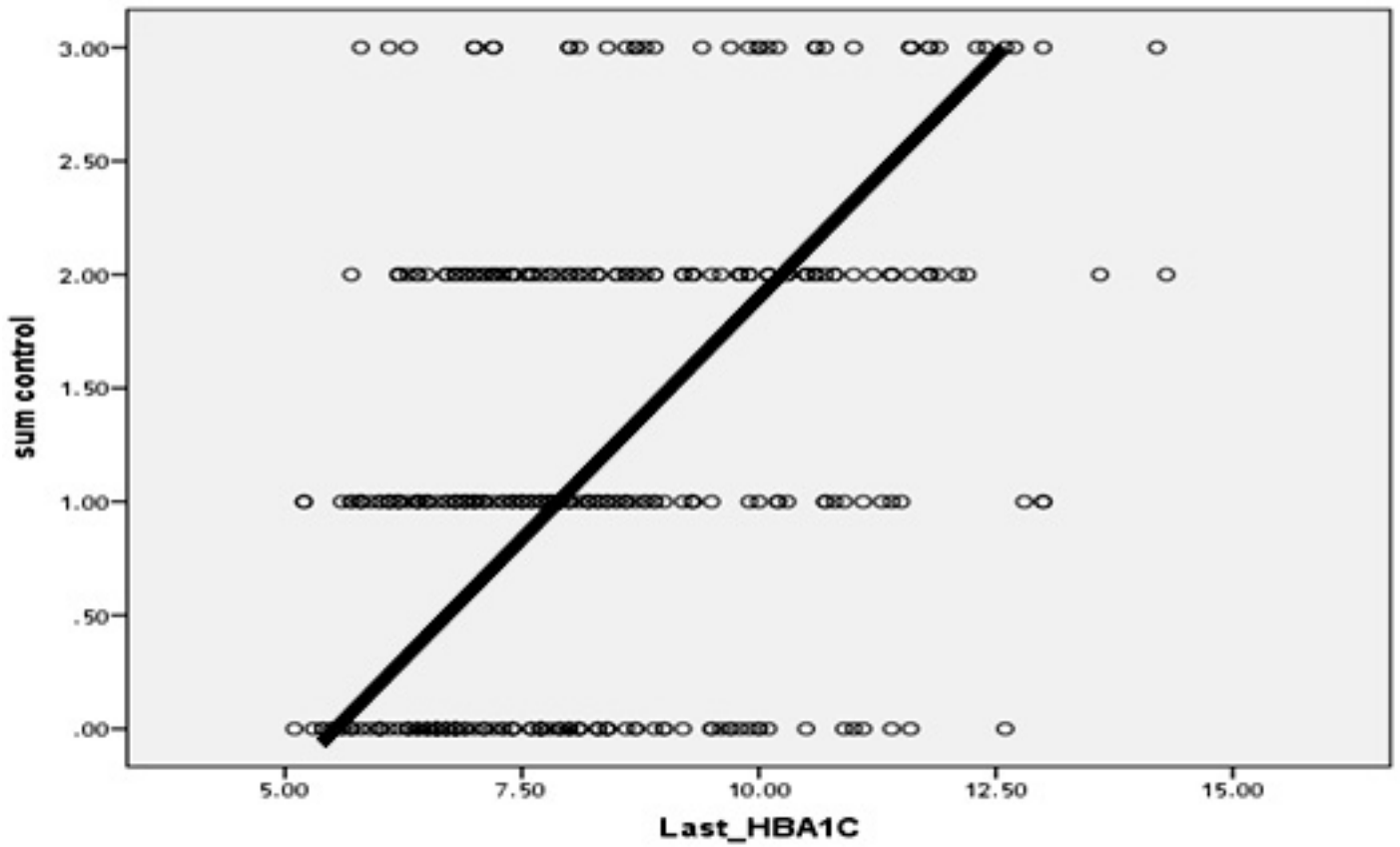
Table 5: relation of adequate score with other parameters

			Inadequate	Adequate	t/Mann Whitney / X²	P
Age of onset of DM			40.37±9.78	43.51±9.81	2.289	0.023*
Duration of DM			10.68±4.42	10.39±5.53	1.240	0.216
Last HBA1C			8.67±2.0	7.68±1.56	4.488	0.00++
Age	<30	N	4	4		
		%	2.1%	1.9%		
	30-40	N	23	19		
		%	12.2%	9.0%		
	41-50	N	56	48	4.49	0.21
		%	29.6%	22.7%		
	>50	N	106	140		
		%	56.1%	66.4%		
Gender	Female	N	84	103		
		%	44.4%	48.8%		
	Male	N	105	108	0.76	0.38
		%	55.6%	51.2%		
Education level	Illiterate	N	20	9		
		%	10.6%	4.2%		
	Primary	N	39	25		
		%	20.6%	11.8%		
	Secondary	N	47	48	22.93	0.00++
		%	24.9%	22.7%		
	College	N	60	106		
		%	31.7%	50.2%		
	Tertiary	N	23	23		
		%	12.2%	10.9%		
Marital Status	Divorced	N	17	15		
		%	9.0%	7.1%		
	Married	N	156	178		
		%	82.5%	84.4%	0.48	0.78
	Single	N	16	18		
		%	8.5%	8.5%		
PMH	Negative	N	56	48		
		%	29.6%	22.7%		
	Positive	N	133	163	3.31	0.19
		%	70.4%	77.3%		
Occupation	Employed	N	123	127		
		%	65.1%	50.2%		
	Unemployed	N	66	84		0.56
		%	34.9%	39.8%		
Nationality	Non-Qatari	N	110	116		
		%	58.2%	55.0%		
	Qatari	N	79	95	0.42	0.51
		%	41.8%	45.0%		

Table 5: relation of adequate score with other parameters (continued)

On Insulin	No	N	123	149		
		%	65.1%	70.6%		
	Yes	N	66	62	4.73	0.094
		%	34.9%	29.4%		
FH of DM II	No	N	42	55		
		%	22.2%	26.1%		
	Yes	N	147	156	1.95	0.37
		%	77.8%	73.9%		
Total		N	189	211		
		%	100.0%	100.0%		

Adequate cases significantly associated with later onset of DM and with lower HA1C also significantly associated with college education.

Error Bars: +/- 2 SD
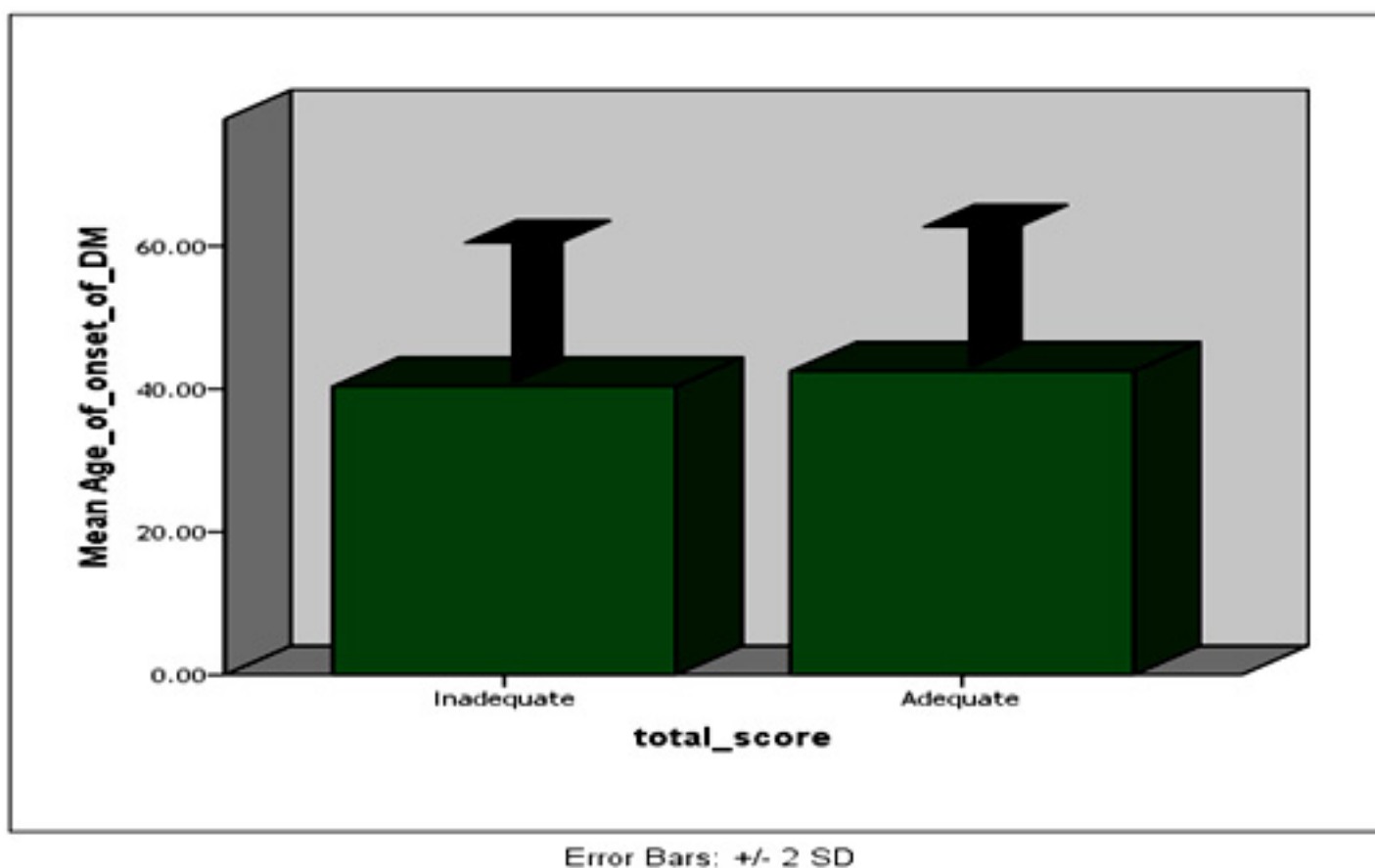
Discussion

In Qatar, there is limited information about the self-care practices of patients with diabetes mellitus. Thus, this study has tried to assess the self-care practices (glucose management, dietary control, physical activity, and health care use) and associated factors among patients with diabetes (PWD) in three health centers serving the central, northern, western regions of Qatar. To adequately evaluate diabetes self-management behaviors and glycemic control, a well validated tool (DSMQ) was used [23]

This tool with 16 self-care items has four subscales as follows: 1) Glucose Management (GM), consisting of five statements: 1, 4, 6, 10, 12, which are related to medication adherence and blood glucose monitoring; 2) Dietary Control (DC), consisting of four statements: 2, 5, 9, 13, which are related to diabetes-associated dietary management behaviors; 3) Physical Activity (PA) consisting of three statements: 8, 11, 15, which are related to exercise or activity for management of diabetes and 4) Health Care Use (HU) consisting of three statements: 3, 7, 14, which are related to adherence to diabetes-related physicians' appointments. The last item (item 16) requires the respondents to rate their overall diabetes self-care, hence its score is included only in the "sum scale" (23).

The scoring process of the DSMQ involves adding up the scores of all 16 items after reversing the scores of nine negatively keyed statements. Higher scores will represent more effective self-care. Finally, the DSMQ scores will be transformed to a scale ranging from 0 to 10, where a score of 10 will indicate the most effective self-care behavior.

A High score of DSMQ reflects the autonomy of the patient of actively participating in his/her diabetes self-management (DSM) and we have correlated the result by current glucose readings from patient records (HbA1c). DSMQ is a preferable tool when analyzing behavioral problems related to reduced glycemic control. We found that most studies in the Middle East, Gulf area focused on sociodemographic factors in DM. In our study we focused on the diabetes profile of the patient and self-management behaviors. In the studies we identified many similarities when it came to patient gender distribution, nationality, marital status, occupation, education, living situation, co-morbidities, and family history. To elaborate on that we found that most of our diabetic patients were married, employed, had at least one comorbidity, and lived with family. Moreover, what our study mainly emphasized and complemented with other studies is the level of education of the patients. In this study 61.5% diabetic patients were found to be more than 50 years of age and around a quarter 26% were between 41 to 50 years old, Compared to Similar study done in Egypt showed that 66% of diabetic patients were less than 60 years of age and 44% were more than 60 years of age (32). The present study showed that 3% (PWD) use no diabetic medications, the majority use oral medications (47.6% had 1-2 medication and 47.6% had 3-4 medication) and 32.0% were on insulin respectively compared to study carried out in United States revealed that three-quarters of the patients received hypoglycemic agents (oral or insulin) (31,32).

Diabetes self-Management is crucial for diabetic care and reflects the tasks performed by the patient to manage his disease. To manage DM effectively, patients must have the ability to define their goal, make decisions related to their medications, fitting their lifestyle and values (20,21,29,33,34) education was strongly correlated with DSM in this study where we found that college educated patients comprised the majority in the studies; there was a statistically significant difference between college education and DSM, additionally it revealed that longer duration of the disease results in poor out comes. Similarly, as A study done in Egypt nearly one quarter (26%) of illiterates were not adhered to dietary management of diabetes and also revealed that shorter disease duration had a positive impact on DSM (32).

The results inferred from our study showed that, 77% compliant with their diabetes medication (e.g., insulin, tablets) as prescribed, this result was higher from study result of Malaysia (54 %) and Nigeria (54 %) (28,30,33). Additionally, 71.8% said they keep all doctors' appointments recommended for their diabetes treatment This study revealed HbA1c mean is inadequate 8.37 for corresponding patients' age, having said that the majority were on oral medications, and only 32% were on insulin could raise the suspension of therapeutic inertia along with other psychosocial barriers, considering that most of the patients in the study had reported that they keep all doctor's appointments, This suggests shedding the light in our context specifically on physician inertia, continuity of care , or patients refusal of insulin therapy which delays insulin application for a long period of time, "Psychologic Insulin resistance (PIR)" (33,34). All this need to be explored with other studies. Results reflected the degree of poor insight of diabetic patients regarding their diabetes self-care. When they asked if they considered their diabetes self-care as poor, only 24.8% said it applied to them very much although actual score of DSM inadequacy was 47%. Additionally, only 26.3% did regular physical activity to achieve optimal blood sugar levels, only 15% choose to eat the food that makes it easy to achieve optimal blood sugar levels and only 11.3% strictly follow the dietary recommendations given by my doctor or diabetes specialist. The study found a low rate of referral for dietitian concluding that applicability of nutritional counseling remains a challenge in medical practice, same as exercise counseling [3]. Only 19% record their blood sugar levels regularly. Additionally, the results of this study revealed a strong negative correlation between self-care activities score and HbA1c levels. This finding is in line with our hypothesis, as patients with higher DSMQ scores were expected to perform better self-care behavior and thus had better glycemic control, that poor glycemic control is associated with poor self-care practices of the patient (12,13,14).

In the present study, linear regression analysis revealed that GM, which includes medication intake and regular self-monitoring of blood glucose level, was the most significant predictor for low HbA1c levels, followed by Diet and HU , whereas Physical activity was observed to be the least predictor for low HbA1c levels. Our study concluded that Total score was 29.01±7.38; Glucose management mean score was 9.29 and diet control (mean score 7.16) got the highest scores followed by the utility of health care (mean score 6.2)1and the lowest score was for physical activity (mean score 4.47) . Our patients total adequate control was 52.8% and around 47.2% showed inadequate control.

Diet plays an important role in controlling the blood glucose levels and disease progression. Diet was observed as a significant predictor for glycemic control in patient with diabetes Many interventional studies had shown the beneficial outcome of dietary educational programs on patients' glycemic control (4,6,7,12). Health care professionals should instead provide patient-tailored recommendations, considering their affordability, personal and cultural preferences (15,16,17).

Inadequate practice of exercise was evident from the low median scores of patients' PA. It was observed in our study that patients with good glycemic control scored significantly higher for PA as compared to patients with poor glycemic control.

Besides the self-care practices, patients' demographic factors could also influence the glycemic control, such as duration of disease. Diabetes is a progressive disease and one of the possibilities could be that euglycemic therapy is not being suitably intensified in those patients.

Strengths and Limitations of the study:
The Strengths of the study were Use of a high reliable standardized questionnaire, and since there is no similar study conducted in the area, it can contribute a lot as baseline information for future studies. Limitations, Limitation of related literatures to compare and discuss some of the findings and because the study design were cross-sectional method, the direction of causal relationship between variables can't always be determined

Conclusion

The results of this cross-sectional study of the diabetes self-management behavior among patients with diabetes in Qatar at Three primary health care centers covering the three regions in Qatar (central , western and northern) demonstrates that the status of diabetes self-management may be classified as average at this time, as reflected in the mean DSMQ score of 29.01±7.38 and adequate was 52.8% . Adequate cases significantly associated with later onset of DM and with lower HA1C also significantly associated with college education. HA1C was significantly negative correlated with Glucose management, Physical activity, positive correlated with Diet control, disease Control and total score. These findings demonstrate a need for improvement in diabetes self-management in Qatar. There is clearly a need for further research into strategies to provide diabetes self-management education and support, particularly among those who, have a lower educational status and are not following physical activity regimens with poor access to health care. The findings can serve to help clinicians have a better understanding on the extent to which different self-efficacy parameters have an influence on self-management behaviors in Qatari community, which will in turn lead to better glycemic control and thus improving HbA1c levels.

Declaration of interests
The authors report no conflicts of interest.

Data availability statement:
All data related to the article are available upon request.

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Knowledge and attitude toward epilepsy and seizure first aid among school teachers in Al-Kharj City, Saudi Arabia

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Abstract

Background: Teachers' knowledge about epilepsy and seizures can have a significant effect on building well-educated and socially developed students. Hence, teachers' positive behaviors encourage social acceptance of children with epilepsy from their classmates and prevent social stigmatization at school. In schools, seizures are a common emergency, and emergency management training is required for school teachers. This study aimed to assess the knowledge and attitude toward epilepsy and seizure first aid among school teachers in Al-Kharj City, Saudi Arabia.

Methods: This was a cross-sectional study conducted among school teachers in Al-Kharj City, Saudi Arabia. A self-administered questionnaire was distributed among teachers using an online survey. The questionnaire included sociodemographic characteristics and assessment of knowledge and attitude toward epilepsy and seizure first aid.

Results: In total, 500 school teachers were included in this study. The most common age group was 31–40 years. The prevalence of teachers who had witnessed a student with a seizure attack was 32.4%. The levels of knowledge regarding epilepsy and seizure first aid were moderate, poor, and good in 50.2%, 47%, and 2.8% of the teachers, respectively. The factors associated with increased knowledge were older age (>40 years) and being a non-Saudi teacher.

Conclusion: Despite adequate knowledge and attitude demonstrated by the school teachers, nearly half of them showed a lack of understanding about epilepsy and seizure first aid. More education and training are required among school teachers to narrow the gaps in their knowledge about epilepsy and seizure management.

Keywords
Epilepsy, seizure first aid, school teachers, knowledge, attitude

Introduction

Seizure is defined as a burst of uncontrolled, hypersynchronous discharge of the brain's electrical activity that is associated with an alteration in the level of consciousness and behavioral or personality changes(1). It is one of the most common medical conditions and the most common chronic neurological disease in children(2). The prevalence of epilepsy in Saudi Arabia among school age children is 5.5%(3). Teachers are an important group in every community as they contribute to raising new generations. Teachers' knowledge about epilepsy and seizures can have a significant effect on building well-educated and socially developed students(4). Thus, teachers' positive behaviors encourage social acceptance of children with epilepsy from their classmates and prevents social stigmatization at school(5). In schools, seizures are a common emergency, and emergency management training is required for school teachers(6). Studies in Saudi Arabia, such as in Riyadh and Khamis Mushait, showed that school teachers have good knowledge about epilepsy(7,8). Other studies from Tabuk, Arar, and Makkah found that teachers had inadequate knowledge about epilepsy, and a recent study in Jeddah reported that teachers had moderate knowledge about epilepsy and lacked first aid training(9). Since there is no study in Al-Kharj that assesses the knowledge about epilepsy among teachers, this study aimed to assess the knowledge and attitude toward epilepsy and seizure first aid and investigate the causative factors that affect attitude toward epilepsy and seizure first aid among school teachers in Al-Kharj City.

Methods

This study was approved by the local Research Ethics Committee (December 2021). This was a cross-sectional descriptive study that used an electronic and self-administered prevalidated questionnaire in Arabic language among teachers in Al-Kharj City to assess their knowledge and attitude toward epilepsy and seizure first aid from January to March 2022. We aimed to include all teachers in Al-Kharj City from public and private schools, including male and female teachers of all educational levels. An approval formal letter was distributed from the Ministry of Education to all schools in Al-Kharj City to encourage teachers to participate and share the QR code, which included electronic questionnaire, with their colleagues. The study sample size was 500, which was calculated using Google form questionnaire. The questionnaire was used from a previous study that assessed knowledge about epilepsy and seizure first aid among teachers in Jeddah, Saudi Arabia (9). The questionnaire had three sections: the first section included a question regarding agreement to participate in the study, the second section included demographic questions (age, sex, nationality, educational level, type of school, experience years), and the third section included questions on knowledge about epilepsy and seizure first aid. The level of teachers' knowledge about epilepsy and seizure first aid was assessed using 7 questions, where the correct answer for each question was identified and coded with 1, and the incorrect answer was coded with 0. The total knowledge score was calculated by adding the 7 items, and a possible score range from 0 to 7 was generated, which generally indicates that the greater the score, the greater the knowledge about epilepsy and seizure first aid. The total knowledge was divided into three categories representing the level of knowledge, where 0–3, 4–5, and 6–7 points were classified as poor, moderate, and good knowledge levels, respectively.

Statistical Analyses

The data were analyzed using the Statistical Package for the Social Sciences version 26 (Armonk, NY, IBM Corp.). In descriptive statistics, all categorical variables are presented using numbers and percentages, whereas all continuous variables are summarized using mean and standard deviation (SD). The knowledge score was compared to the sociodemographic characteristics of the teachers using the Mann–Whitney Z-test and Kruskal–Wallis H test. The overall distribution of knowledge scores was performed using the Shapiro–Wilk test. The knowledge score followed the abnormal distribution. Thus, nonparametric tests were applied. A p-value cut-off point of 0.05 at 95% confidence interval was used to determine statistical significance.

Results

In total, 500 school teachers were recruited in this study. Table 1 presents the sociodemographic characteristics of the school teachers. The most common age groups were 31–40 (39.8%) and 41–50 (38.6%) years. Moreover, 51.6% and 48.4% of the participants were male and female, respectively, and nearly all were Saudis (92.8%). Respondents who had bachelor's degrees constituted most of the teachers (93.2%). A significant proportion of the teachers were teaching at government schools (83.6%), with primary and secondary schools being the most common school year levels of teaching (38.6% and 34.8%, respectively). Approximately 53.4% of the teachers had more than 10 years of teaching experience. The prevalence of teachers who witnessed a seizure from one of their students was 32.4%.

Table 1: Sociodemographic characteristics of school teachers (n = 500)

Study data	N (%)
Age group	
• 21–30 years	83 (16.6%)
• 31–40 years	199 (39.8%)
• 41–50 years	193 (38.6%)
• >50 years	25 (05.0%)
Sex	
• Male	258 (51.6%)
• Female	242 (48.4%)
Nationality	
• Saudi	464 (92.8%)
• Non-Saudi	36 (07.2%)
Qualification	
• Bachelor's degree	466 (93.2%)
• Master's degree	31 (06.2%)
• PhD	03 (0.60%)
Type of school	
• Government	418 (83.6%)
• Private	82 (16.4%)
Which educational level do you teach?	
• Kindergarten	35 (07.0%)
• Primary	193 (38.6%)
• Secondary	174 (34.8%)
• High school	98 (19.6%)
Years of teaching experience	
• 1–5 years	89 (17.8%)
• 6–10 years	144 (28.8%)
• >10 years	267 (53.4%)
Have you witnessed a seizure on one of your students before?	
• Yes	162 (32.4%)
• No	338 (67.6%)

Regarding the assessment of the knowledge and attitude toward epilepsy and seizure first aid, most of the teachers knew that neurological disorder is the cause of epilepsy (89.6%). Teachers were aware that there was available treatment for epilepsy (78%). Only 37.2% of the teachers believed that continuous taking of epilepsy medication could lead to drug addiction. The most common action to be taken if one of the students had a seizure attack was to ensure the patient's safety and ask for help (53.8%), whereas the most common action to be taken after the seizure ended was to lay the student on his/her side and ask for help (58%). Only 35.2% of the teachers knew that the patients should be brought to a hospital if a seizure continued for more than 5 minutes or if it reoccurred and the student was not able to wake up. Only 8% of the teachers had attended training related to epilepsy. Based on the provided criteria, the overall mean knowledge score was 3.59 (SD, 1.10), with poor, moderate, and good knowledge detected among 47%, 50.2% and 2.8% of the teachers, respectively (Table 2).

Table 2: Assessment of the knowledge and attitude toward epilepsy and seizure first aid among school teachers (n = 500)

Knowledge and attitude statements	N (%)
1. What are the causes of epilepsy?	
• Psychological	43 (08.6%)
• Neurological disorder*	448 (89.6%)
• Demonic possession	09 (01.8%)
2. Is there a treatment for epilepsy?	
• Yes*	390 (78.0%)
• No	110 (22.0%)
3. Do epilepsy treatment drugs cause addiction?	
• Yes*	186 (37.2%)
• No	314 (62.8%)
4. What is your response if one of your students has a seizure attack?	
• Ensure the patients safety, and ask for help*	269 (53.8%)
• Read the Quran	21 (04.2%)
• Open his/her mouth and put a gauze in it, "a piece of cloth"	210 (42.0%)
5. What do you do after a seizure ends?	
• Lay the student on his/her side and ask for help*	290 (58.0%)
• Try to wake him/her up	102 (20.4%)
• Read the Quran	10 (02.0%)
• Wash his/her face with water and provide him/her water to drink	98 (19.6%)
6. When do you have to transport the student to a hospital?	
• Immediately, if a seizure occurred	116 (23.2%)
• If a seizure continued for more than 5 minutes	68 (13.6%)
• If a seizure continued for more than 10 minutes	26 (05.2%)
• If a seizure continued for more than 20 minutes	21 (04.2%)
• If the seizure reoccurred, and the student did not wake up	16 (03.2%)
• Options 1 and 2	77 (15.4%)
• Options 2 and 5*	176 (35.2%)
7. Did you get any training on how to deal with epileptic seizures?	
• Yes*	40 (08.0%)
• No	460 (92.0%)
Total knowledge score (mean ± SD)	3.59 ± 1.10
Level of knowledge	
• Poor	235 (47.0%)
• Moderate	251 (50.2%)
• Good	14 (02.8%)

* Correct answer

Table 3: Association between the knowledge score and sociodemographic characteristics of school teachers (n = 500)

Factor	Knowledge score (7) Mean ± SD	Z/H test	P-value
Age group[a]			
• ≤40 years	3.53 ±1.09	1.997	0.046**
• >40 years	3.68 ±1.12		
Sex[a]			
• Male	3.56 ±1.12	0.846	0.397
• Female	3.64 ±1.09		
Nationality [a]			
• Saudi	3.57 ±1.09	2.180	0.029**
• Non-Saudi	4.00 ±1.26		
Qualification[a]			
• Bachelor's degree	3.58 ±1.10	1.210	0.226
• Master of PhD	3.82 ±1.11		
Type of school[a]			
• Government	3.55 ±1.08	1.945	0.052
• Private	3.82 ±1.19		
Which educational level do you teach? [b]			
• Kindergarten	3.51 ±1.15		
• Primary	3.70 ±1.06	3.016	0.389
• Secondary	3.49 ±1.13		
• High school	3.61 ±1.13		
Years of teaching experience [b]			
• 1–5 years	3.51 ±1.00		
• 6–10 years	3.56 ±1.07	1.450	0.484
• >10 years	3.65 ±1.16		
Witnessed a seizure on one of your students before [a]			
• Yes	3.59 ±1.28	0.332	0.740
• No	3.60 ±1.01		

a P-value was calculated using the Mann–Whitney Z-test.
b P-value was calculated using the Kruskal–Wallis H test.
 ** Significant at p < 0.05 level

When assessing the association between the knowledge score according to the sociodemographic characteristics of the teachers, a higher knowledge score was more associated with the above 40-year-old group (Z = 1.997, p = 0.046) and non-Saudi teachers (Z = 2.180, p = 0.029). Other variables, such as sex, qualification, type of school, educational level of teaching, years of teaching experience, and having witnessed a seizure from one of the students, did not show significant differences when compared to the knowledge score (p > 0.05).

Discussion

This study aimed to determine the knowledge of school teachers about epilepsy and examine their understanding of seizure first aid. Our results revealed that 50.2% and 47% of the teachers had moderate and poor knowledge about epilepsy, respectively. These findings are consistent with the results of Kanjo et al.'s study(9). According to their study, the majority of the teachers (69%) had moderate knowledge about epilepsy, 16.8% had good knowledge, and 14.2% had poor knowledge and insufficient training regarding seizure first aid. In contrast, poor knowledge about epilepsy and its first aid has been reported by Abulhamail et al.(4) and Al-Hashemi et al.(25). This could be attributed to teachers' belief that epilepsy was related to spirit possession or an evil eye. The appropriate knowledge of school teachers about epilepsy and seizure first aid is important since they are the ones responsible for the welfare of the children at school. Lack of knowledge about epilepsy will lead to panic during its incidence. Thus, more education about epilepsy and epilepsy first aid is imperative to achieve better handling of children with epilepsy(25).

Better knowledge about epilepsy and its management can be significantly predicted among older age groups (>40 years) and non-Saudi teachers. These results were inconsistent with those of Abulhamail et al.'s study(4). According to them, Saudi teachers who had higher education exhibited better knowledge regarding epilepsy; however, they found no differences in the knowledge according to age, sex, years of experience, and type of school. In Nigeria(26), poor knowledge and attitude were more associated with lower grade school teachers and those with fewer years of experience. However, a survey conducted by Al-Qahtani et al.(27), found no differences between the knowledge score and demographic data of Saudi teachers. In our study, we also did not find significant differences between the knowledge according to sex, qualification, type of school, school level of teaching, years of teaching experience, and having witnessed a seizure from one of the students.

Regarding the specific assessment of knowledge, most teachers had a better understanding of epilepsy. For instance, 89.6% of the teachers were aware that the causes of epilepsy were mainly due to neurological disorders, and 78% were aware that there was an available treatment for epilepsy. Consistent with our results, Kanjo et al.(9) reported that most teachers acknowledge epilepsy as a neurological disorder, and 75.2% of the teachers believed that the treatment method is available for this type of disorder. In an opposing view, Babikar and Abbas(28) reported that nearly 60% of Sudanese teachers did not know the causes of epilepsy, whereas one-third of the teachers cited several causes, such as brain malformation, head injury, evil assault, hereditary and infection.

Surprisingly, a study conducted in the Southern part of Saudi Arabia(7) revealed that although 64.1% of the teachers were exposed to the incidence of seizures, they were not able to provide first aid to students who experienced epilepsy during their class. However, in our study, half of the teachers were aware of the appropriate action if one of the students had a seizure attack or what to do after the seizure ends. In contrast, Sudanese teachers exhibited a poor attitude and practice toward the action to be taken during epileptic incidence(28). According to a previous study, during seizure attacks, the majority of the teachers (74%) would not take any action and would stay away from the child, and other teachers would resort to potentially harmful actions, including pulling out the tongue and forcing a spoon inside the child's mouth. In this scenario, the most important step is to ask for help or rush the student to a nearby hospital. A proper understanding of the clinical manifestation of epilepsy is important to provide a precise response during the incidence of a seizure attack(28).

Despite having sufficient information in some of the knowledge indicators, our results confirmed that there were a considerable number of teachers (37.2%) who believe that excessive use of epileptic medication may lead to drug addiction. Furthermore, although 32.4% of the teachers had witnessed seizure attacks, only 8% were able to attend training or courses related to this condition. In Riyadh, Saudi Arabia(8), 42.2% of the teachers had witnessed a seizure attack from one of their students, wherein 27.5% of them expressed that they be able to provide proper medication along with appropriate first aid. Thus, we hypothesize that teachers who were teaching in Riyadh, Saudi Arabia, had a better way of handling children with epilepsy than the teachers in our study. This might be due to the presence of several awareness campaigns conducted about first aid of epilepsy annually in Riyadh City, and since Riyadh City is the capital city of Kingdom of Saudi Arabia, there are a considerable number of training centers that provide a course for appropriate seizure and epilepsy first aid. In our study, we covered all teachers in all educational levels and distributed the survey questionnaire to every school in Al-Kharj City.

This study has some limitations, including the following: some teachers were uncooperative and did not complete the survey, and there was a delay in the response after the administration of the survey in some teachers. Thus, more studies are required to obtain better and more accurate results regarding the knowledge of school teachers about epilepsy and its first aid in our region.

Conclusion

Despite adequate knowledge and attitude demonstrated by the school teachers, nearly half of them showed a lack of understanding about epilepsy and seizure first aid. Non-Saudi teachers who were older were more likely to exhibit better knowledge than the rest of the groups. More education and training are required among school teachers to narrow the gaps in their knowledge about epilepsy and seizure management. Increasing the level of knowledge and attitude among school teachers will increase their confidence to take action whenever there is an incidence of a seizure attack. Community epilepsy

awareness is necessary to educate children with epilepsy along with their families, which will eventually lead to a better quality of life among this population group.

List of abbreviations
QR = Quick Response
PhD = Doctor of Philosophy

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Cockroach Allergy: Is It Common in Jeddah City?
A retrospective study

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Abstract

Background: Cockroaches are a common indoor cause of allergic diseases. However, cockroaches are underestimated as a trigger.

Objective: To find which allergic diseases are associated with cockroach sensitization in Jeddah city.

Methods: This is a retrospective paper completed in 2021. The sample group of this paper involved 192 allergic patients with high levels of specific allergy testing (sIgE) to cockroaches. The data for this paper is from a private centre specialising in allergies in Jeddah, Saudi Arabia.

The in vitro tests used were indirect immunoassay tests for the most common indoor allergens. Clinical diagnosis of allergic diseases were also collected. Results were collected via special sheets and tables were extracted.

Results: The sample group for this paper was 192 allergic patients. Patients of middle ages are the most likely to experience sensitisation to cockroaches as follow: 56 between 30-40 years (29.1%) and 36 between 40-50 years (18.8%). The commonest indoor allergens associated with cockroach sensitisation are mites, cats and mould: dermatophagoides pteronyssinus as 109 (56.8%), dermatophagoides farinae as 114 (59.4%), cat as 89 (46.4%) and alternaria as 86 (44.8%). The commonest allergic diseases associated with cockroach sensitisation are allergic rhinosinusitis as 74 (38%), atopic dermatitis as 52 (27%) and asthma as 42 (21.8%). Cockroach sensitisation is mostly of mild severity (under class 2); however, this must be linked to clinical allergic symptoms.

Conclusion: Cockroach sensitisation is most common in the middle aged population(30-50 years). Cockroach sensitisation is commonly associated with other indoor allergens sensitisation (respectively: mites, cats, and alternaria). The commonest allergic diseases associated with cockroach sensitisation are allergic rhinosinusitis, atopic dermatitis, and asthma. Cockroach sensitisation is of mild severity in most of cases (under class 2); however, this must be correlated to a clinical allergic diagnosis.

Keywords: allergic diseases, asthma, allergic rhinitis, atopic dermatitis, atopy, cockroach sensitization, cockroach allergy

Introduction

Sensitization to cockroaches means the presence high sIgEs when exposed to cockroaches. This is type I hypersensitivity reaction (immediate). This means that the inhalation of cockroach allergens can trigger allergic symptoms quickly like allergy rhinosinusitis or asthma. Exposure to cockroach allergens is through nasal mucosa or bronchial epithelium. As cockroaches are typically an indoor allergen, we suspect that they can be associated with other indoors like mites, mould and animals (1).

The four most common cockroach types in Saudi Arabia are German, American, brown-banded and Oriental. The German type is the most common. The most common places where cockroaches are found are kitchens and bathrooms. Kitchens are the most common place (fridge, sink, trash bin, under cabinets). In bathrooms cockroaches are most common in washing machines or in the toilet. Other places where they can be typically found are hotels, restaurants, cafeterias, hospitals, groceries, butcheries, vegetable and fruit shops and bakeries (2).

Cockroach control first starts with an evaluation to be sure if there is infestation or not. Signs of infestation are when you see a cockroach in daylight, and can smell its droppings. The main way to control cockroaches is by using an anti-cockroach spray which is highly effective when used in the correct places. A second method is attracting and catching the cockroaches using a special gel formulation. The third method is by using special adhesive papers in all the suspected areas of infestation (3)

Cockroaches are predominantly indoor insects and that is why they are associated with other indoor allergens. House dust mites are the commonest indoor allergen associated with cockroaches. Other indoors allergens which are associated are mould and animals. In Saudi Arabia cats are the commonest associated pets. Indoor allergens are more common than outdoor allergic reactions, hence their control is crucial for suppressing a chronic inflammatory cascade (4).

Methods

The sample of this retrospective article was 192 allergic patients who were having a high sIgE level to cockroaches. Their ages ranged between 1 to 81 years (111 males, 81 females). The test used to measure sIgE levels to cockroaches was an in-vitro test (blood test). As cockroaches are the source of an indoor inhalant allergen, other indoor allergens were also collected like mites, moulds, and animals. Mites collected were dermatophagoides pteronyssinus and dermatophagoides farina. Moulds were aspergillus fumigatus, alternaria and cladosporium. The cat is the main animal source of indoor allergens in Saudi Arabia.

Associated clinical allergic diagnoses were also collected. This step is crucial to differentiate between atopy and allergy. An allergy is a high sIgE level to certain allergens plus the associated clinical allergic symptoms. Atopy is a high sIgE level to cockroaches without any allergic symptoms (that's why atopy is not important clinically). Allergic diseases identified were allergic conjunctivitis, allergic rhinosinusitis, asthma, eczema, urticaria, angioedema, food allergy, drug allergy and anaphylaxis.

These samples were gathered from the laboratory of an allergy clinic in Jeddah. This allergy centre is private clinic specialising in allergies. Allergy tests which are done routinely for type I hypersensitivity in this clinic are either via an in-vivo skin prick test or an in-vitro RAST blood test. Tests used in this retrospective article were RAST inhalants. Any positive sample for cockroaches was selected first then other variables were extracted after that. Results were recorded in excel sheet and tables were extracted.

Results

192 patients with high sIgE levels to cockroaches participated (111 males, 82 females). The most frequent age range was between 30-40 years (56/ 29.1%). The second most common age was between 40-50 years (36/ 18.8%). The remaining age groups were between 20-30 (26/ 13.5%), 10-20 years (20/ 10.4%), more than 60 (19/ (9.9%), between 50-60 (18/ 9.4%) and below 10 years (17/ 8.9%). These findings indicate that the middle aged patients (30 to 50 years) were the most likely to experience cockroach sensitization. There were 92 (47.8%), so approximately 50% of the total number of cases.

Table 1: Age ranges and distribution of cockroach sensitisation

Age ranges	Number of cases	Percentage
Below than 10 years	17	8.9%
10-20 years	20	10.4%
21-30 years	26	13.5%
31-40 years	56	29.1%
41-50 years	36	18.8%
51-60 years	18	9.4%
More than 60 years	19	9.9%
Total	192	100%

Cockroaches as indoor allergens are usually associated with other indoor allergens. In the study the most common indoor allergen associated with cockroaches were house dust mites, dermatophagoides pteronyssinus for 109 (56.8%) participants and dermatophagoides farinae for 114 (59.4%) participants. The second most common indoor allergens associated were cats for 89 (46.4%) particpants and alternaria fungus for 86 (44.8%) participants. The third most common indoor allergens associated were two moulds: aspergillus fumigatus for 76 (39.6%) participants and cladosporium for 70 (36.5%) participants. This mean that although all these indoor allergens are associated with cockroach sensitisation, mites are the most common.

Table 2: % of association level between indoor inhalant allergens and cockroach sensitisation

Allergens	Number of cases	Percentage
Dermatophagoides Pteronyssinus	109	56.8%
Dermatophagoides Farinae	114	59.4%
Cat	89	46.4%
Aspergillus Fumigates	76	39.6%
Cladosporium	70	36.5%
Alternaria	86	44.8%

The key point is to combine cockroach sensitisation results with the clinically associated allergic diseases. The first and most common allergic disease associated with cockroach sensitisation was allergic rhinosinusitis (74/ 38%). The second most common were atopic dermatitis (52/ 27%) and asthma (42/ 21.8%). Other common allergies associated were urticaria and angioedema (30/ 15.6%) and food allergies (21/ 11%). Other allergies are rarely associated.

Table3: % of allergic diseases associated with cockroach sensitisation

Allergic disease	No of cases associated with cockroach sensitisation	Percentage of association
Allergic rhinitis, sinusitis	74	38.5%
Atopic dermatitis	52	27%
Asthma	42	21.8%
Urticaria, angioedema	30	15.6%
Food allergy	21	11
Allergic conjunctivitis	12	6.25%
Contact dermatitis	11	5.73%
Drug allergy	9	4.7%
Anaphylaxis	3	1.6%

Cockroaches and other indoor allergens are mostly of mild severity (under class 2); however, this must be linked to clinical allergic symptoms. This link is crucial because it is not necessary that class severity and clinical severity are matched every time. Sometimes mild class severity is associated with severe clinical symptoms and vice versa. That is why a detailed history is the main key for everything. Mites are the cause of the most severe indoor allergens (DF 2.13, DF 2) and cockroaches are next at 1.9. Other indoor allergens are less severe such as cats 1.64, alternaria 1.5, aspergillus fumigatus 1.16 and cladosporium 1.11. This means that mites and cockroach are the most severe causes of indoor allergens.

Table 4: Severity class level of cockroach and indoor inhalant allergens sensitisation

Allergen	Severity class	% of class 6
Cockroach	1.9	31.7 %
Dermatophagoides pterosaurs	2	33.3 %
Dermatophagoides Farina	2.13	35.5 %
Cat	1.64	27.3 %
Aspergillus fumigates	1.16	19.3 %
Cladosporium	1.11	18.5 %
Alternaria	1.5	25 %

Discussion

Both rhinitis and sinusitis are triggered by cockroach allergen inhalation. Many parts of a cockroach can be inhaled after its death for example its faeces, body secretions, and others. This aeroallergen exposure is common for all ages. Cockroach exposure happens mainly inside low socioeconomic homes, restaurants, and hospitals. The nose is the first line of defense when inhaled cockroach allergens will come in direct contact with nasal epithelial mucosa. These inhaled cockroach parts will trigger a type I hypersensitivity reaction in nasal and sinus mucosa which will be followed by cytokines secretion. Allergic rhinosinusitis symptoms will appear after time if exposure to cockroach allergens continues (5).

Asthma is one of the most common allergic diseases which is linked to cockroach exposure particularly in houses of low socioeconomic populations or in urban areas. Infants' exposure to cockroach increases the incidence of a recurrent wheeze. Cockroach allergens are inhaled and absorbed through the bronchial epithelium of the respiratory tract. After that, antigen presenting cells will ingest and present cockroach proteins over its surface. This will prime T cells to secrete inflammatory cytokines which will switch on the airway inflammatory process. If exposure to cockroaches continues, airway inflammation will transform into chronic inflammation. Chronic airway inflammation is the base of airway hyperactivities and asthma symptoms (6).

Diagnosis of a cockroach allergy requires a detailed history as a main step. Tests needed are either an in-vitro skin prick test or an in-vivo RAST blood test. To diagnose a cockroach allergy (not sensitisation), we need to combine the history with the test results. A recent advance in diagnosis is the molecular cloning of cockroach protein subtypes (Bla g 1 and Bla g 2). This is called structural biology because it represents the recombinant cockroach allergens. When we determine the subtypes, we will be more able to prescribe specific immunotherapy against it and improve preventative measures (7).

Indoor allergens are commonly associated with each other. House dust mites are the greatest health burden and the most commonly associated with cockroach sensitisation followed by animals and moulds. Exposure to indoor allergens is continuous throughout the year because we spend most of our times indoor (perennial exposure). That is why symptoms of perennial allergic rhinitis are constant throughout the year. This continuous exposure and their possible symptoms are a huge burden on the quality of life. This is opposite to pollens which are outdoors and where exposure to them is largely seasonal (seasonal allergic rhinitis) (8).

The prevalence of indoor allergens is mainly inside homes. In a study in Singapore, these allergens were measured by ELISA both indoors and outdoors and were found to be concentrated indoors. Sleeping mattress, carpets and kitchens were the commonest places where they were found. Furnishings and fabrics also carry large amounts of these allergens. Similar research was completed in Baltimore in 42 homes and gave the same result. This means that a 'gate' for the control of indoor allergens is the control of furnishings and fabrics. If indoor allergens are well controlled, then we can alleviate many allergic symptoms (9).

The most common home place where indoor allergens are concentrated is the bedroom. It's the main location for house dust mites where sources are mainly mattresses, pillows, carpets, and curtains. For moulds, they are present in mainly rooms with high humidity like stores or which have wall leaks or which have had uncleaned air conditioners for a long time. For cockroaches, they are mainly found in kitchens and bathrooms. This insect usually lives in plumbing and sewer pipes. If there is no control, cockroaches will multiply quickly and will be present in large numbers (10).

Does early infancy exposure to indoor allergens induce asthma in later life or not? The answer seems to be controversial. In Sweden a study, shows that there are two significant factors, the presence of a positive family history of allergy plus early indoors exposure. Hence, low level exposure to indoor allergens may cause sensitisation if one parent or both are allergic patients, while low level exposure will not cause any sensitisation in others. However, in another study in Germany, it does not find any relation between the two factors. Nevertheless, it seems that we can advise allergic parents (with a positive family history of allergies) to keep their infants away from indoors allergens, otherwise they are at risk of developing an allergy (11).

Conclusion

Cockroach sensitisation is most common amongst the middle aged (30-50 years). Cockroach sensitisation is commonly associated with other indoor allergen sensitisation (respectively: mites, cats, and alternaria). The most common allergic diseases associated with cockroach sensitisation are allergic rhinosinusitis, atopic dermatitis, and asthma. Cockroach sensitisation is of mild severity in most of cases (under class 2); however, this must be correlated to a clinical allergic diagnosis.

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Sun-protective Behaviours among patients with Cutaneous Hyperpigmentation in Saudi Arabia: A Cross Sectional Study

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Abstract

Background: Hyperpigmentation is a dermatologic disorder, and because dermatologic diseases are visible, they have a profound psychological impact on persons who are affected.

Aim: To assess the sun protection practices in Saudi Arabia among patients with cutaneous hyperpigmentation.

Method: In October 2022, an online cross-sectional study of patients with cutaneous hyperpigmentation was conducted in Saudi Arabia. Data were collected by questionnaire-based survey, which was designed by the researcher after a thorough literature review. Using binary logistic regression analysis, the factors that influence sunscreen use were identified.

Results: A total of 418 people took part in this study. More than half (63.6%) of them reported post-inflammation or acne pigmentation. Almost half (49.0%) reported having this health condition for less than a year. Only about half of the patients (45.0%) said they use sunscreen. Approximately 47.0% of sunscreen users reported using sunscreen with a UV protection factor of 21-50. Almost one-third (35.0%) of the patients reported not reapplying sunscreen during the day. Only 4.8% of patients said they frequently use a hat or sunshade while they are outside, and 40.4% said they frequently stay in the shade when they are outside. Male patients were less likely than female patients to apply sunscreen (Odds ratio: 0.80 (95% CI: 0.64-0.99), (p≤0.05),

Conclusion: Saudi hyperpigmentation patients use sunscreen inadequately. Males used sunscreen less than females. Healthcare authorities should conduct an educational campaign to inform this group of patients about their condition and the necessity of sunscreen. Social media should be utilized to educate the public about different types of sunscreens and improve their use of sunscreens to prevent sun-related skin problems.

Keywords: Cutaneous Hyperpigmentation; Saudi Arabia; Sunscreen; Sun-protective

Introduction

Diffuse hyperpigmentation preferentially affects sun-exposed areas such as the hands, neck, and face [1]. There are several hyperpigmentation conditions, and melasma and lentigines are two of the most prevalent types of hyperpigmentation. UV radiation is the most potent environmental cause for Melasma [2, 3]. Furthermore, solar lentigines are known to range in size from less than 1 mm to a few centimeters in diameter, and they may consolidate into even larger lesions in sections of skin that has been badly sunburned [3]. All of these indications highlight the need to identify sun protection behaviours among hyperpigmented people in order to assess the relationship between this condition and potential sun protection behaviours and, ultimately, to eliminate harmful sun protection practices that increase the risk of hyperpigmentation. In 2022, researchers conducted a second study among Saudi university students. This study found that characteristics independently linked with sunscreen use included female gender, high family wealth, degree of education, history of sunburn, use of tanning beds, and utilization of other sun safety measures [4]. Another cross-sectional hospital-based study was conducted in Jordan in order to evaluate the degree of knowledge, attitude, and behaviour about sunscreen and sun-protective practices among 418 melasma patients [5]. The distribution of melasma was primarily centro-facial (49.8%). The findings revealed that only 40.7% of the patients thought sun exposure was a factor in their condition. For most participants (92.9%), skin browning was the most noticeable side effect of sun exposure. Almost 59.0% of respondents reported using sunscreens, with a higher percentage of females doing so while males used more broad-spectrum sunscreens. High cost (94%) was cited as the main deterrent to using sunscreen [5]. In another prospective study of 197 Tunisian patients, Guinot et al. found that the majority (84%) of patients identified sun exposure as exacerbating the condition while the majority (51%) of the female patients indicated sun exposure as a melasma trigger [6]. Higher outcomes were seen when using a sunscreen product (67.5%), according to Maymone et al's study on sun-protective behaviours in patients with cutaneous hyperpigmentation. Only 7.6% of respondents reapplied sunscreen every two hours, and nearly half of those were unaware whether their sunscreen offered wide spectrum protection. Additionally, males, those with disease durations of less than a year, and those with post-inflammatory hyperpigmentation reported less sunscreen use [7].

On the other hand, hyperpigmentation is a dermatologic condition, and because dermatologic diseases are visible, they have a significant psychological impact on those who are afflicted [8]. Therefore, in order to reduce the occurrence of hyperpigmentation and, in turn, the potential psychological effects that it may permit, the link between hyperpigmentation and sun protective behaviours must be sought out and measured. Furthermore, little is known, and nearly nothing is known in Saudi Arabia, concerning the sun protection practices of patients with diseases of hyperpigmentation [7]. We therefore intended to assess the sun protection practices in Saudi Arabia among patients who have cutaneous hyperpigmentation, which would also almost make our study the first in Saudi Arabia to investigate such an important problem. Therefore, the aim of our study was to assess the sun protection practices in Saudi Arabia among patients with cutaneous hyperpigmentation.

Method

Study design:
This was an online cross sectional study that was conducted in Saudi Arabia among patients with cutaneous hyperpigmentation, in October 2022.

Study population and sampling procedure:
In Saudi Arabia, the study population consisted of all patients who had cutaneous hyperpigmentation. Adult male or female participants who were 18 years of age or older met the inclusion criteria for the study. Patients who did not meet the inclusion criteria were not included in the study. The convenience sampling technique was used to recruit the study participants. This sampling technique involves the participation of any patient who is willing to participate and meets the inclusion criteria.

Data collection:
To accomplish the goal of the study, data were gathered by questionnaire-based surveys utilizing a questionnaire tool that was created by the researcher after a thorough literature review [4, 5, 7, 9]. 16 multiple choices and yes/no questions formed the questionnaire tool. The participants were asked to give their consent for participation before beginning the questionnaire after the study's goals and objectives were explained in the cover letter. There were two sections to our survey instrument. The study participants' demographic characteristics were covered in the first section (age, gender, nationality, level of education, colour of skin, type of hyperpigmentation, and duration of complaining of hyperpigmentation condition). The second section of the questionnaire asked the participants general questions about their use of sunscreen (whether the sun is the cause of their hyperpigmentation, whether they use sunscreen, sun protection factor (SPF) strength, frequency of reapplying sunscreen, whether their sunscreen is broad spectrum, hours spent in the sun on the weekends, hours spent in the sun on the weekdays, use of hats or umbrellas when outside in the sun, and how many times they reapply sunscreen).

Validity of the questionnaire:
Experienced clinicians assessed and validated the questionnaire tool itself. They were questioned about the questionnaire's items and whether or not they accurately measured the study's objectives and were simple enough for the target audience to understand. They confirmed the clarity and understandability of the questionnaire's items.

Piloting phase:
Prior to the actual data collection, a pilot study was conducted with a small sample of patients from the target group to see if they had any questions or comments concerning the questionnaire's items. The patients verified that the questionnaire was simple for them to complete and that all of the questions were understandable.

Sample size:
Using a 95% confidence interval, a 0.5 standard deviation (SD), and a 5% margin of error, the minimum required sample size was 385 people.

Statistical analysis:
Statistical Package for Social Science, version 27, was used to analyse the data (SPSS, Armonk, NY: IBM Corp). The demographics of the patients as well as qualitative data were presented using descriptive measures as frequency and percentage. The factors that affect sunscreen use were identified using binary logistic regression analysis. Based on the patients' reported use of sunscreen, the dummy variable for the regression analysis was defined. Two-sided $p<0.05$ was used to define statistical significance.

Results

1. Participants' demographic characteristics
A total of 418 individuals participated in this study. The majority of them (70.1%) were males and aged 18-24 years (70.3%). The vast majority of the study participants (93.5%) were Saudis. More than half of them (64.8%) reported that they hold bachelor degree and have a medium skin colour (57.9%). More than half of them (63.6%) reported that they have post-inflammation or acne pigmentation. Almost half of them (49.0%) reported that they have had this health condition for less than one year. For further details on the demographic characteristics of the patients, refer to Table 1.

Table 1: Participants' demographic characteristics

Variable	Frequency	Percentage
Gender		
Males	293	70.1%
Females	125	29.9%
Age categories		
18-24 years	294	70.3%
25-34 years	70	16.7%
35-44 years	29	6.9%
45-54 years	18	4.3%
55 years and over	7	1.7%
Nationality		
Saudis	391	93.5%
Education level		
High school level or lower	122	29.2%
Bachelor degree	271	64.8%
Higher education	25	6.0%
What colour is your skin?		
White	162	38.8%
Medium	242	57.9%
Black or dark	14	3.3%
The type of skin hyperpigmentation patients have:		
Melasma	152	36.4%
Post-inflammation or acne pigmentation	266	63.6%
Duration of skin hyperpigmentation?		
Less than one year	205	49.0%
1-5 years	79	18.9%
More than 5 years	134	32.1%

2. Sunscreen utilisation profile

When the patients were asked about the role of exposure to sun and the emergence of skin pigmentation, more than half of them (56.7%) confirmed that sun exposure is a contributing factor and has a role in the emergence of skin pigmentation . Less than half of the patients (45.0%) reported that they use sunscreen. Around 47.0% of sunscreen users reported that they use sunscreen of 21-50 sun protection factor (SPF). Almost one-third of the patients (35.0%) reported that they do not reapply the sunscreen during the day. More than half of them (57.4%) reported that they use wide spectrum sunscreen. More than half of the patients (53.3%) reported that they expose to the sun 1-2 hours during the weekdays and 76.6% during the weekends. Only 4.8% of the patients reported that they frequently use a hat or sunshade when you they are outside and 40.4% reported that they frequently stay in the shade when they are outside. For further details on the patients' sunscreen utilisation pattern, refer to Table 2.

Table 2: Sunscreen utilisation profile

Variable	Frequency	Percentage
Does exposure to the sun have a role in the emergence of skin pigmentation?		
Yes	237	56.7%
Do you use sunscreen?		
Yes	188	45.0%
What is the sun protection factor (SPF) for your sunscreen?		
10-20	37	19.7%
21-50	88	46.8%
More than 50	63	33.5%
How many times do you reapply sunscreen per day?		
Every two hours	17	9.0%
1-3 times daily	39	20.7%
Every now and then	66	35.1%
I do not reapply it during the same day	66	35.1%
Do you use a broad spectrum sunscreen?		
Yes	108	57.4%
Hours you spend exposed to the sun during weekdays:		
1-2 hours	223	53.3%
2-5 hours	141	33.7%
More than 5 hours	54	12.9%
Hours you spend exposed to the sun during weekends:		
1-2 hours	320	76.6%
2-5 hours	87	20.8%
More than 5 hours	11	2.6%
Do you use a hat or sunshade when you are outside?		
Rarely	316	75.6%
Sometimes	82	19.6%
Frequently	20	4.8%
How often do you stay in the shade when you are outside?		
Rarely	45	10.8%
Sometimes	204	48.8%
Frequently	169	40.4%

3. Factors influencing the use of sunscreen among patients with skin hyperpigmentation
Binary logistic regression analysis identified that male patients were less likely to use sunscreen compared to female patients (Odds ratio: 0.80 (95% CI: 0.64-0.99), (p≤0.05), Table 3.

Table 3: Factors influencing the use of sunscreen among patients with skin hyperpigmentation

Variable	Odds ratio of using sunscreen (95% confidence interval)	P-value
Gender		
Female (Reference group)	1.00	
Males	0.80 (0.64-0.99)	0.044*
Age categories		
18-24 years (Reference group)	1.00	
25-34 years	1.09 (0.65-1.83)	0.749
35-44 years	0.50 (0.22-1.13)	0.097
45-54 years	0.81 (0.30-2.18)	0.679
55 years and over	0.191 (0.02-1.60)	0.127
Nationality		
Non-Saudis (Reference group)	1.00	
Saudis	1.67 (0.72-3.83)	0.230
Education level		
High school level or lower (Reference group)	1.00	
Bachelor degree	1.16 (0.77-1.74)	0.486
Higher education	0.83 (0.36-1.91)	0.655
What colour is your skin?		
White (Reference group)	1.00	
Medium	0.78 (0.53-1.16)	0.217
Black or dark	0.34 (0.09-1.26)	0.106
The type of skin hyperpigmentation patients have:		
Melasma (Reference group)	1.00	
Post-inflammation or acne pigmentation	0.81 (0.50-1.30)	0.382
Duration of skin hyperpigmentation?		
Less than one year (Reference group)	1.00	
1-5 years	1.13 (0.75-1.71)	0.565
More than 5 years	0.79 (0.48-1.31)	0.362

*p≤0.05

Discussion

The aim of this study was to assess the sun protective practices in Saudi Arabia among patients with cutaneous hyperpigmentation. The key findings were as the following: 1) more than half of the study participants identified that exposure to the sun has an important role in the emergence of skin pigmentation, 2) sunscreen was used by less than half of the patients with cutaneous hyperpigmentation, 3) around half of the patients use sunscreen of 21-50 SPF, 4) one-third of the patients do not reapply the sunscreen during the day, 5) more than half of them use wide spectrum sunscreen, 6) more than half of them expose to the sun 1-2 hours during the weekdays and the weekends, and 7) the use of hat or sunshade was not common among the patients when they are outside.

In our study, when the patients were asked about the role of exposure to sun and the emergence of skin pigmentation, more than half of them (56.7%) confirmed that. Due to photo-oxidation of produced melanin, acute UV radiation exposure causes an acute pigment-darkening reaction [10]. This is followed by a delayed tanning reaction; where the mechanism is uncertain. Uneven pigment distribution is a side effect of prolonged UV exposure. Ephelides, solar lentigines, and pigmented solar keratoses are the most prevalent pigmented lesions in chronically sun-exposed skin. Idiopathic guttate hypomelanosis, which is frequent in skin that has been exposed to the sun, could be viewed as a symptom of photo-aging. It also seems that persistent UV causes cutaneous melanomas [10]. Additionally, a number of keratinocyte-related tumours are connected to enhanced pigmentation, which raises the possibility of a concurrent change in melanocyte function, as is the case with pigmented actinic keratoses and pigmented epitheliomas [10].

In our study, less than half of the patients (45.0%) reported that they use sunscreen. Around 47.0% of sunscreen users reported that they use sunscreen of 21-50 sun protection factor (SPF). According to a previous cross-sectional survey, the majority of non-medical students in Saudi Arabia, are aware of the risks of unprotected sun exposure [9]. However, 34.1% of respondents claimed that sunscreens are harmful for the skin. The most popular means of sun protection were seeking shade and wearing protective clothes (58.1% and 43.1%, respectively). Only a third (23.6%) of people used sunscreen. Another study in Jordan also showed similar findings that almost one-third of the study participants were aware of the harmful effect of sun exposure on their skin condition [5]. Additionally, 64.9% of participants were unaware of sunscreen products' SPF. Melanin production rises as a result of many reasons in pigmentary disorders such as melasma and post-inflammatory hyperpigmentation. Particularly in places that are exposed, such as the face, the hyperpigmentation that develops can significantly affect the patients' quality of life [11]. Sunscreen use is a crucial part of treatment for photosensitive diseases including melasma and post-inflammatory hyperpigmentation since exposure to UV and visible light exacerbates these conditions [12]. Sunscreen with both UV and visible light protection is a

crucial adjuvant therapy to reduce hyperpigmentation exacerbation and to make these conditions look better. This is particularly true for individuals with skin of colour who are less inclined to employ photo-protection, even when they have been identified as having these photo-exacerbated conditions [12]. According to the American Academy of Dermatology, SPF 30 filters out 97%, which is the recommended starting point for SPF levels [13]. The American Food and Drug Administration (FDA) has issued a number of recommendations to lower the risk of skin aging and cancer through routine use of broad spectrum sunscreen with an SPF value of 15 or higher in conjunction with other protective measures like restricting time spent in the sun, particularly between the hours of 10 AM and 2 PM, covering exposed skin with clothing, using a water-resistant sunscreen, and reapplying sunscreen, even if it is water-resistant, at least every 2 hours [14]. In addition, it's worth mentioning that there isn't enough evidence to support the claim that products with SPF values higher than 50 offer users greater protection than those with SPF values of 50 [14].

In our study, almost one-third of the patients (35.0%) reported that they do not reapply the sunscreen during the day. No matter how often you reapply sunscreen, using one that is easily washed off your skin won't provide any protection from the sun [15]. The lowest skin exposure occurs from early reapplication into the sun exposure time, not at 2 to 3 hours after first application, for sunscreens that bind to skin moderately or well, characteristic of modern waterproof or water-resistant formulations. Usually, reapplying sunscreen at 20 minutes only protects against 60% to 85% of the UV radiation that would otherwise occur at 2 hours [15]. The recommendation for sunscreen users should be to apply sunscreen thoroughly to exposed locations 15 to 30 minutes before going outside and then again 15 to 30 minutes after sun exposure starts. After engaging in strenuous activities like swimming, towelling, or prolonged periods of intense perspiration and rubbing, additional reapplication may be required [15].

In our study, more than half of the patients (57.4%) reported that they use wide spectrum sunscreen. In addition, more than half of the patients (53.3%) reported that they are exposes to the sun 1-2 hours during the weekdays and 76.6% during the weekends. Only 4.8% of the patients reported that they frequently use a hat or sunshade when they are outside and 40.4% reported that they frequently stay in the shade when they are outside. This was aligning with the findings of a previous study [7], which reported that approximately 67.5% of respondents said they regularly use sunscreen, and 91% supported the use of sunscreen with a UV protection factor of 21 or higher. Only 7.6% of participants reapplied sunscreen every two hours, and 48.5% were unsure if their sunscreen offered broad-spectrum protection [7]. Another study in Saudi Arabia reported that the majority of the participants were not aware if their sunscreen is broad spectrum and only one–third of them use sunscreen on both sunny and cloudy days [4]. A broad-spectrum sunscreen is designed to protect your skin from both UVA and UVB rays, which are both hazardous to the skin [13]. The more potent UVB

radiation can result in sunburns and the majority of skin malignancies. While UVA rays are often responsible for early aging, they may also play a role in some cases of skin cancer [13]. Compared to former organic filters, large molecular last generation UVB-UVA broad spectrum sunscreens have a higher benefit-risk ratio because they provide better UVA band protection and are non-toxic and non-allergenic. With the help of these compounds, sunscreen efficacy could be improved, particularly in terms of preventing primary skin cancer [16].

Male patients were less likely to use sunscreen compared to female patients (Odds ratio: 0.80 (95% CI: 0.64-0.99), (p≤0.05). This confirms the findings of a previous study by Maymone et al., which reported that males were less likely to use sunscreen compared to females [7]. Another study by Seetan in Jordan and other studies in Saudi Arabia also confirmed the same findings [4, 5, 17].

Limitations:
This study has several strengths. This is among the first few studies to explore the use of sun protectors among patients with cutaneous hyperpigmentation conditions in Saudi Arabia. The use of online survey enabled us to reach a wide group of patients across the country. At the same time, this study has limitations. The cross-sectional study design did not allow us to follow up with the patients or explore causality. The use of online survey might have missed some of the targeted population. Therefore, our findings should be interpreted carefully.

Conclusion

In Saudi Arabia, the pattern of sunscreen use among patients with cutaneous hyperpigmentation is suboptimal. Males were significantly less likely to apply sunscreen. The healthcare authorities should conduct educational campaigns to inform this group of patients about this type of condition and the need of using sunscreen for their condition. Social media platforms should be utilized to improve public awareness about the usage of different types of sunscreens and to educate the public about the many types of sunscreen products. This will increase the public's use of sunscreens and prevent the development of sun-related skin conditions.

Statement of the Institutional Review Board:
The IMSIU research ethics committee approved the study (project number 310-2022; approval date, 27 September 2022). All writings were made in accordance with 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. The participants were told that consent was given by filling out the survey. All participants' consent and data were obtained in complete confidence throughout the study.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Authors' Contributions:
All authors have contributed equally to all the processes of the research work. They have read and agreed to the published version of the manuscript.

Data Availability Statement:
Data supporting the findings of this study are available from the corresponding author, Mohammed Almashali., upon reasonable request.

Conflicts of interest:
The authors report that there are no conflicts of interest in this work.

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Quality of Life among the Parents of Saudi Arabian children with Autistic Spectrum Disorder, Riyadh, KSA

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Abstract

Objective: To assess the factors influencing the quality-of-life differences between families caring for a child with Autistic Spectrum disorder diagnosis.

Methods: Cross-sectional study of either parent of ASD child aged 1 to 14 years following up at the OPD setting in Riyadh, KSA from June 2019 through to the end of January 2020 at the Division of Developmental Pediatrics at King Saud medical city in Riyadh, Saudi Arabia via a structured questionnaire, (The World Health Organization Quality of Life Assessment-BREF

(WHOQOL-BREF). Inclusion criteria: Parent of child with ASD who has been diagnosed by a developmental pediatrician at least 6 months prior to the commencement of this study, parent of child with ASD who receives follow-up treatment at the King Saud medical city children's Hospital. Parent should be the primary caregiver of the child with ASD. (For the purposes of this study, "primary caregiver" is defined as the individual in the family whose main responsibility is to provide care to the ASD child). Parent who has no history of previous psychological, psychiatric disorder or physical disability. Parents who have been residing in Saudi Arabia for at least 6 months prior to the commencement of this study. Parent who has offered informed consent. Exclusion criteria: parent of any

child who has dysmorphic features or a diagnosed genetic syndrome, parent of child with ASD who has sibling diagnosed with ASD, or parents of child with ASD who has sibling diagnosed with other chronic medical illness.

Results: Marital status, housing settings, total household income, current employment, being part of support groups and associated illness in the ASD child significantly impacted at least one domain of WHOQOL-BREF.

Conclusion: Modifiable factors that have the ability to elevate the quality of life for parents of ASD children are marital status, housing settings, total household income, current employment, being part of support groups and overall care of ASD children.

Key words: ASD, Quality of Life, Autism Spectrum disorder, WHOQOL-BREF

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder affecting children with various degrees in relation to their communication, social interaction, and milestones acquisition (1) and poses social and economic challenges on families caring for their beloved offspring afflicted by ASD across diverse cultures in the world (2).

WHO defines health as an equilibrium of physical, mental, and social well-being and not merely the absence of diseases or burdens (3). Many factors play a role in the development of the overall wellbeing of families, such as coping mechanisms, the family support system and acceptance by society and is largely affected by cultural contexts (4).

Research on the effects of parenting an ASD child is needed (5). Over recent years there has been an increasing body of research in evaluating the quality of life (QOL) through WHO questionnaires (6) in hope of creating the most supportive environments for ASD children.

Reports from developed and developing countries alike show Japan, and Italy, South Africa, and India (7,8,9,10) have illustrated a reduced QOL in families caring for an ASD child. Regionally too, reports from Oman, Qatar, and Saudi Arabia (11,12,13) have shown similar findings.

This study sets out to explore, evaluate and compare the QOL among parents of children with ASD in Riyadh, Saudi Arabia, and explores correlations between QOL and diverse
socio-demographic differences of parents and ASD children and provides insights and suggestions for further studies.

Material and Methods

This study was conducted from the first of June 2019 through to the end of January 2020 at the Division of Developmental Pediatrics at King Saud medical city in Riyadh, Saudi Arabia via a structured questionnaire, (The World Health Organization Quality of Life Assessment-BREF (WHOQOL-BREF) (14) Arabic language version (Appendix 1) which contains 26 items of measurement of QOL. This instrument includes four domain scores (physical, psychological, social, and environmental health) and two separate items regarding an individual's overall perception of their QOL and health. Scores range from 1 to 5, with higher scores denoting higher QOL. The World Health Organization Quality of Life Assessment-BREF (WHOQOL-BREF) interpretation was conducted according to the manual protocol. (Appendix 2).

Parents characteristics were collected; (gender, age, marital status, education level, current employment, total household income, housing settings, the total number of children, and affiliation to family support groups). Children's characteristics were also collected: (gender, age, age at diagnosis, gestational age, schooling, and receiving specialized care programs in terms of speech therapy, occupational therapy or behavioral therapy, level of global developmental delay and associated disorders).

Inclusion criteria:
- Parent of child with ASD who has been diagnosed by a developmental pediatrician at least 6 months prior to the commencement of this study.
- Parent of child with ASD who receives follow-up treatment at the King Saud medical city children's Hospital.
- Parent of child with ASD who is between the age of 1 years and 14 years.
- Parents should be the primary caregiver of the child with ASD. (For the purposes of this study, "primary caregiver" is defined as the individual in the family whose main responsibility it is to provide care to the ASD child.)
- Parents who have no history of previous psychological, psychiatric disorder or physical disability.
- Parents who have been residing in Saudi Arabia for at least 6 months prior to the commencement of this study.
- Parent who has offered informed consent.

Exclusion criteria:
- Parents of any child who has dysmorphic features or a diagnosed genetic syndrome.
- Parent of child with ASD who has sibling diagnosed with ASD,
- Parent of child with ASD who has sibling diagnosed with other chronic medical illness.

Analysis was carried out using SPSS 25.0 (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). The variables under study were categorical and presented as percentages. One-way ANOVA for correlations and eta squared for the level of association.

Results

54 children with ASD met the inclusion criteria and were enrolled in the study (n. 54), 75.9% were males (Table 1).

Table 1

Gender of the ASD Child	Number (54)	Percentage %
Female	13	24.1%
Male	41	75.9%

Age at Diagnosis		
Mean (years)	Minimum	Maximum
3.54 ± 1.6	1	8

Current age of ASD child		
Mean	Minimum	Maximum
7.76 ±2.5	4	14

Gestational age	Number (54)	Percentage %
Preterm	4	7.4%
Term	50	92.6%

ASD child attend school	Number (54)	Percentage %
No	12	22.2%
Yes	42	77.8%

Type of school	Number (54)	Percentage %
ASD center	17	31.5%
General education	12	22.2%
Intellectual disability school	10	18.5%
Merged	2	3.7%

Table 1 (continued)

Type of specialized care

	Number (54)	Percentage %
Speech Therapy	14	25.93%
Speech Therapy & Occupational Therapy	22	40.74%
None	18	33.33%

Medications

	Number (54)	Percentage %
Atomoxetine	1	1.9%
Risperidone	8	14.8%
Methylphenidate	8	14.8%
None	37	68.5%

Child speaks more than 10 words

	Number (54)	Percentage %
No	32	59.3%
Yes	22	40.7%

Global Developmental delay

GDD	Number (54)	Percentage %
Mild	23	42.6%
Moderate	22	40.7%
Severe	9	16.7%

Associated disorders

	Number (54)	Percentage %
ADHD	40	74.1%
ADHD, Aggression, Destructive	1	1.9%
Defiant	1	1.9%
N/A	10	18.5%
Self-harm	2	3.7%

One of the primary caregivers of our study population were included in the study; 51% of were fathers, and 49% were mothers. They were further sub-grouped into age intervals of 10 years (20 – 30 years, more than 30 - 40 years, more than 40 - 50 years, more than 50 years of age) (Table 2).

Table 2

Parents' Characteristics

Gender of the parent

	Number (54)	Percentage %
Father	28	51.90%
Mother	26	48.10%

Age

In years	Number (54)	Percentage %
20-30	4	7.41%
31-40	24	44.44%
41-50	19	35.19%
>50	7	12.96%

Marital Status

Status	Number (54)	Percentage %
Divorced	4	7.40%
Married	48	88.90%
Separated	2	3.70%

Currently Employed

No	Number (54)	Percentage %
Yes	16	29.60%
	38	70.40%

Income

Total income	Number (54)	Percentage %
equal or < 5k	8	14.81%
>5k - <10k	20	37.04%
10k - < 15k	18	33.33%
equal or > 15k	8	14.81%

Housing

Type of housing	Number (54)	Percentage %
Family house	9	16.70%
Apartment	16	29.60%
Floor	11	20.40%
Villa	18	33.30%

Table 2 (continued)

Level of Parents' Education

	Number (54)	Percentage %
primary school	4	7.40%
secondary school	4	7.40%
high school	16	29.60%
university	30	55.60%

Part of Family support group

	Number (54)	Percentage %
No	29	53.70%
Yes	25	46.30%

Number of Siblings

Total children	Number (54)	Percentage %
1	11	20.37%
2	12	22.22%
3	7	12.96%
4	6	11.11%
5	8	14.81%
more than 5	10	18.52%

The World Health Organization Quality of Life Assessment-BREF (WHOQOL-BREF) estimates the mean of four different domains: physical, psychological, emotional, social, and environmental aspects as well as the mean of the total domains (Table 3). The scoring of each domain takes from 4 to 20 before converting the score on a 100-scale based on WHO manual. A higher number closer to 100 would signify a positive report, while a score closer to 0 would signify a negative report. There is no cut-point to signify a good score.

Table 3

Scores of WHOQOL-BREF in our studied population

	Mean	Std. Deviation
Physical	50.7	±11.6
Psychological	61.7	±13.7
Social Relationships	74.2	±25.1
Environment	72.5	±18.3
Total Score	259.2	±55.3

Table 4

WHOQOL-BREF in relation to Marital Status

	P-value
Physical	0.381
Psychological	0.735
Social Relationships	**0.011**
Environment	**0.014**
Total Score	**0.028**

Table 5

WHOQOL-BREF in relation to Housing settings

	P-value
Physical	0.024
Psychological	0.041
Social Relationships	0.659
Environment	**0.016**
Total Score	**0.033**

Table 6

WHOQOL-BREF in relation to total household Income

	P-value
Physical	0.501
Psychological	0.616
Social Relationships	**0.000**
Environment	0.164
Total Score	**0.021**

Table 7

QOL domain in relation to current Employment

	P-value
Physical	0.208
Psychological	0.673
Social Relationships	0.406
Environment	**0.037**
Total Score	0.134

Table 8

WHOQOL-BREF in relation to Part of Support Groups

	P-value
Physical	0.444
Psychological	0.156
Social Relationships	**0.02**
Environment	0.195
Total Score	0.065

Table 9

WHOQOL-BREF in relation to other associated illnesses

	P-value
Physical	0.526
Psychological	0.412
Social Relationships	0.114
Environment	**0.037**
Total Score	**0.038**

No statistical significance was observed in terms of quality of life and other studied elements in terms of parental age, gender, level of education, number of total siblings, level of global developmental delay or gestational age of ASD children, school attendance of ASD child, nor ability of ASD child to speak 10 words (Table 10).

Table 10

WHOQOL-BREF in relation to age

	P value
Physical	0.371
Psychological	0.644
Social Relationships	0.488
Environment	0.208
Total Score	0.354

Table 10 (continued)

WHOQOL-BREF in relation to Level of Parents' Education

	P-value
Physical	0.471
Social Relationships	0.194
Environment	0.343
Total Score	0.211

WHOQOL-BREF in relation to Number of Siblings

	P-value
Physical	0.086
Psychological	0.142
Social Relationships	0.124
Environment	0.171
Total Score	0.085

WHOQOL-BREF in relation to Type of support school

	P-value
Physical	0.91
Psychological	0.305
Social Relationships	0.323
Environment	0.246
Total Score	0.26

WHOQOL-BREF in relation to level of Global Developmental Delay (Mild, moderate, severe)

	P-value
Physical	0.952
Psychological	0.515
Social Relationships	0.732
Environment	0.904
Total Score	0.912

Discussion

An increasing body of research has adopted the questionnaire of World Health Organization Quality of Life Assessment-BREF (WHOQOL-BREF) and established lower QOL scores in parents caring for ASD child when compared to families of healthy, or children with chronic illnesses like Cerebral Palsy (8, 9), while others have reported no statistical differences between quality of life (12). Fewer studies have focused on assessing the particular differences among families caring for Autistic children.

A study conducted in Arar (13), in Saudi Arabia with similar cultural, and regional populations has demonstrated a poor quality of life in 63% of families of ASD children. The authors found significantly poorer reports in relation to employment status (p=0.03), gender of the parent (p= 0.001) for mothers, and total household income (p= 0.01). Although the researchers (11) have identified a cut-off point in WHOQOL-BREF to be below 50 as a score that would indicate a poor QOL, their report might underestimate the status quo of this population as no consensus in the scientific community has yet been reached (Appendix 2).

Silva, et al created the first statistical cut-off point for WHOQOL-BREF as a measure of quality of life in 2010 (15). The authors established a statistical cut-point at 60 or below in elderly population and advised need for further studies of validity and reliability to identify different cut-off points for various age groups.

The World Health Organization Quality of Life Assessment-BREF (WHOQOL-BREF) estimates the mean of four different domains: physical, psychological, social, and environmental aspects as well as the mean of the total domains (Appendix 2).

The Physical domain explores the activities of daily living, dependence on medicinal or medical aids, energy and fatigue, mobility, pain and discomfort, sleep and rest, and work capacity. We found this domain to be positively affected in relation to the housing settings of our population (p= 0.024). This might be explained by the cultural context; in Saudi Arabia, families live in the same household of the extended family or close by. This would create added responsibilities explaining the physical domain, and with recent decades of growth in Saudi Arabia, autonomy has become a major value. This might explain higher scores in other domains, psychological domain

(P= 0.041), environmental domain (P=0.016) and overall quality of life scores (P=0.033) in families caring for ASD child living alone in Villas, or apartments, whereas lower scores of QOL in families living in the same household with their extended family.

Environmental domain explores the financial resources, freedom, and physical safety and security, health and social care quality and accessibility, along with home environment, participation in recreational activities, and gaining new skills and information. This domain was impacted positively (p= 0.014) in contrast to similar studies, (9,10, 13) in relation to marital status; married parents have better quality of life also in Social Relationships domain (P= 0.011), and total score of WHOQOL-BREF (p= 0.028). This finding might be explained by the cultural context of Saudi Arabia around the importance of family cohesiveness.

Understanding cultural differences can help in creating tools and programs to support these families. Understanding the cultural context of different families can play a major role in improving the quality of life. This has been observed in a study conducted by Fong VC et al (16) studying the differences between immigrants and locals in Canada. Family bond and social acceptance were the key factors in immigrants' well-being whereas it was emotional support for locals.

Similar findings have demonstrated the impact of total household income on QOL (9, 13, 17). This might be explained by the need for quality tools and resources to educate, support and care for an ASD child, although, a study by Bassema et al showed no impact as governmental subsidies were allocated to support ASD children's schooling and resources (11). Similar governmental aid in Saudi Arabia has not changed the need for better total household income (18).

Our study is consistent with studies (13,17, 19) in light of current employment status effects on the quality of life. We observed a positive impact on the environmental domain (p= 0.037). This finding was not in line with a study conducted in South Africa (9); cultural context might play a role in explaining the disparity in home environments, participation in recreational activities and financial resources. The environmental aspect was also impacted by the presence of associated illness in the ASD child (ADHD, Aggression, Destructive, Defiant, Self-Harm) (p= 0. 037). This might be explained by the environmental measure of physical safety and security of the families (Appendix 2).

Similar findings to our study have highlighted the positive impact of support groups in the social domain (p= 0.02). This can be explained by the generated sense of empathy, understanding and shared experience (20).

Modifiable factors have the ability to elevate the quality of life. These elements: marital status, housing settings, total household income, employment, and being part of support groups can ultimately provide ASD children the required environment to gain needed social skills, and communication skills. In Saudi Arabia, the housing setting has the most impact on the quality of life in all domains except social relationships. Further research is warranted to describe the differences in the quality of life in families caring for an ASD child.

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Appendix 1

The Arabic version of WHOQOL-Brief

الأسئلة التالية تستفسر عن مدى تعرضك لأشياء معينة خلال الأسبوعين الماضيين

بدرجة بالغة	كثير جدا	بدرجة متوسطة	قليلا	لا يوجد		
5	4	3	2	1	إلى أي حد تشعر بأن الألم الجسدي يمنعك من القيام بالأعمال التي تريدها؟	3 (F1.4)
5	4	3	2	1	الى أي مدى أنت بحاجة للعلاج الطبي لتتمكن من القيام بأعمالك اليومية؟	4(F11.3)
5	4	3	2	1	إلى أي مدى تستمتع بالحياة؟	5(F4.1)
5	4	3	2	1	إلى أي مدى تشعر بأن حياتك ذات معنى؟	6(F24.2)
5	4	3	2	1	الى أي مدى أنت قادر على التركيز؟	7(F5.3)
5	4	3	2	1	الى أي مدى تشعر بالأمان في حياتك اليومية؟	8)(F16.1
5	4	3	2	1	إلى أي حد تعتبر أن البيئة المحيطة بك صحية؟	9(F22.1)

الأسئلة التالية تستفسر عن مدى قدرتك على إتمام أمور معينة خلال الأسبوعين الماضيين

بدرجة بالغة	كثير جدا	بدرجة متوسطة	قليلا	لا يوجد		
5	4	3	2	1	هل لديك طاقة كافية لمزاولة الحياة اليومية؟	10(F2.1)
5	4	3	2	1	هل أنت قادر على قبول مظهرك الخارجي؟	11(F7.1)
5	4	3	2	1	هل لديك من المال ما يكفي لتلبية احتياجاتك؟	12(F18.1)
5	4	3	2	1	ما مدى توفر المعلومات التي تحتاجها في حياتك اليومية؟	13(F20.1)
5	4	3	2	1	إلى أي مدى لديك الفرصة لممارسة الأنشطة الترفيهية؟	14(F21.1)

جيدة جدا	جيدة	لا بأس	سيئة	سيئة للغاية		
5	4	3	2	1	الى أي مدى أنت قادر على التنقل بسهولة؟	15(F9.1)

برجى قراءة كل سؤال وتقيم وتقيم ما تشعر به ووضع دائرة حول الرقم الأي يعطي أفضل إجابة بالنسبة لك

جيدة جدا	جيدة	لا بأس	سيئة	سيئة للغاية		
5	4	3	2	1	كيف تقيم نوعية حياتك	1(G1)

راض تماما	راض	لا راض ولا غير راض	غير راض	غير راض على الاطلاق		
5	4	3	2	1	ما مدى رضاك عن صحتك	2(2G4)

الأسئلة التالية تطلب منك أن تعبر عن مدى رضاك نحو جوانب مختلفة من حياتك خلال الأسبوعين الماضيين

راض تماما	راض	لا راض ولا غير راض	غير راض	غير راض على الاطلاق		
5	4	3	2	1	كم أنت راض عن نومك؟	16(F3.3)
5	4	3	2	1	إلى أي مدى أنت راض عن قدرتك على القيام بنشاطاتك اليومية؟	17(F10.3)
5	4	3	2	1	كم أنت راض عن قدرتك على العمل؟	18(F12.4)
5	4	3	2	1	كم أنت راض عن نفسك؟	19(F6.3)
5	4	3	2	1	كم أنت راض عن علاقاتك الشخصية؟	20(F13.3)
5	4	3	2	1	كم أنت راض عن حياتك الجنسية؟	21(F15.3)
5	4	3	2	1	كم أنت راض عن الدعم أو المساعدة من الأصدقاء؟	22(F14.4)
5	4	3	2	1	كم أنت راض عن الأوضاع في مكان سكنك؟	23(F17.3)
5	4	3	2	1	كم أنت راض عن الخدمات الصحية المتوفرة لك؟	24(F19.3)
5	4	3	2	1	كم أنت راض عن وسائل المواصلات التي تستخدمها؟	25(F23.3)

يرجى قراءة كل سؤال وتقيم ما تشعر به ووضح دائرة حول الرقم الذي يعطي أفضل إجابة بالنسبة لك

جيدة جدا	جيدة	لا بأس	سيئة	سيئة للغاية		
5	4	3	2	1	كيف تقيم نوعية حياتك	1(G1)

راض تماما	راض	لا راض ولا غير راض	غير راض	غير راض على الاطلاق		
5	4	3	2	1	ما مدى رضاك عن صحتك	2 (G4)2

الأسئلة التالية تطلب منك أن تعبر عن مدى رضاك نحو جوانب مختلفة من حياتك خلال الأسبوعين الماضيين

راض تماما	راض	لا راض ولا غير راض	غير راض	غير راض على الاطلاق		
5	4	3	2	1	كم أنت راض عن نومك؟	16(F3.3)
5	4	3	2	1	إلى أي مدى أنت راض عن قدرتك على القيام بنشاطاتك اليومية؟	17(F10.3)
5	4	3	2	1	كم أنت راض عن قدرتك على العمل؟	18(F12.4)
5	4	3	2	1	كم أنت راض عن نفسك؟	19(F6.3)
5	4	3	2	1	كم أنت راض عن علاقاتك الشخصية؟	20(F13.3)
5	4	3	2	1	كم أنت راض عن حياتك الجنسية؟	21(F15.3)
5	4	3	2	1	كم أنت راض عن الدعم أو المساعدة من الأصدقاء؟	22(F14.4)
5	4	3	2	1	كم أنت راض عن الأوضاع في مكان سكنك؟	23(F17.3)
5	4	3	2	1	كم أنت راض عن الخدمات الصحية المتوفرة لك؟	24(F19.3)
5	4	3	2	1	كم أنت راض عن وسائل المواصلات التي تستخدمها؟	25(F23.3)

الأسئلة التالية تشير إلى كم من المرات شعرت أو تعرضت فيها لأشياء معينة خلال الأسبوعين الماضيين

دائما	غالبا جدا	غالبا	نادرا	أبدا		
5	4	3	2	1	كم من المرات كانت لديك مشاعر سلبية مثل المزاج السيء، اليأس، القلق، الاكتئاب؟	26(F8.1)

لا	نعم		هل قام أحد هم بمساعدتك لتعبئة هذه الاستمارة؟ (رجاءً قم بوضع دائرة: نعم أو لا)

كم استغرق من الوقت لتعبئة هذه الاستمارة؟ ....

شكرا لك

Appendix 2

The reference for interpretations of WHOQOL-Brief
https://github.com/seschneck/arc_scoring_code/raw/main/WHOQOL-BREF/WHOQOL-BREF_Introduction%2C%20Administration%2C%20Scoring.pdf

Diabetic Care Challenges during COVID-19 Pandemic: Primary Healthcare Physicians' Perspective

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Abstract

Background: Diabetes mellitus (DM) is the leading chronic disease worldwide. During the COVID-19 pandemic, primary healthcare centers were the main entry point for patients with diabetes. Additionally, the COVID-19 pandemic strained the primary healthcare system, including diabetic care.

Objective: This study aimed to carry out an assessment of diabetes care challenges from the perspective of primary care physicians during the COVID-19 pandemic in Bisha, Saudi Arabia.

Method: This cross-sectional study was conducted between 1 May 2021 and 30 June 2021 in primary health centers using a self-report questionnaire from PHC physicians. Challenges in providing health services for type 2 diabetes were assessed. Statistical analysis was conducted with SPSS software using descriptive statistics, T-tests, chi-square tests, and the ANOVA test. Statistical significance was set at $p < 0.05$.

Results: Two hundred and twenty-two primary care physicians participated in the study. Half of them, 114 (51%), had adequate confidentiality in treating patients with COVID-19. The majority of participating physicians (216; 97.3%) faced challenges in managing diabetic patients during the COVID-19 pandemic (p-value ≤ 0.05). Male, non-Saudi physicians > 40 years, working in rural areas, without training were more likely to have faced challenges managing DM patients during COVID-19 (p-value ≤ 0.05).

Conclusions: Most PHC physicians face challenges in managing patients with diabetes mellitus who have COVID-19. Decision makers should increase preparedness for future emergencies to address the significant challenges identified.

Keywords: primary healthcare; physicians; COVID-19; chronic diseases; diabetes

Introduction

In most countries, patients typically make physical contact with the healthcare system, especially for chronic and non-communicable diseases (NCDs). The COVID-19 closures led to a significant decrease in the healthcare consultation rate [1]. The PHC system was constrained by weak infrastructure during the 2019 coronavirus epidemic (COVID-19), contributing to suboptimal patient safety and infection control measures [2]. The Australian experience highlights the importance of self-care and the adoption of preventive measures, particularly for people with long-term chronic conditions who frequently use health services [3–5]. Improvements in the care and behavior related to chronic health problems reduced hospitalizations and severe health events [6–9]. More than one-tenth of the confirmed COVID-19 cases in Afghanistan involved physicians and other healthcare workers, suggesting that the war-torn country is struggling to cope with the pandemic. Many healthcare workers felt that strengthening teams and regular contact could help them discuss decisions and review their well-being [10]. Some countries have the infrastructure to establish audio/telephone consultations and telemedicine visits [11]. Recent data showed that complications were more common in people with severe and non-severe COVID-19. A strategic continuation of health services is needed to avoid the exacerbation of diabetes due to the lack of access to care. Because of the COVID-19 pandemic, PHC centers limited or eliminated in-person clinic visits [12–14]. In developing countries such as Pakistan, disease outbreaks are among the most critical challenges to providing health services. Lack of basic health facilities, inadequate policies, and indifferent attitudes toward general protective measures exacerbate the situation [15,16]. In Saudi Arabia, DM is the second most common chronic disease compared with other middle east countries [17]. Critical challenges remain despite the tremendous work and valuable improvements in the primary care system. Improving gaps in the referral system will lead to better services [18]. This study aimed to assess the diabetes care challenges from the perspective of primary care physicians during the COVID-19 pandemic in Bisha, Saudi Arabia.

Methods

Study Design and Settings

This is a cross-sectional PHC-based study among PHC physicians at health centers under the Bisha Health Affairs. PHC centers belonging to the Bisha Health Affairs are large catchment areas, including the nearest provinces (Belgaran, Tathleeth, Al Amoha) in the Asir region, Saudi Arabia.

Study Population

All physicians working in PHC centers belonging to the Bisha Health Affairs between 1 May 2021 and 30 June 2021 were included in the study. Physicians on vacation during the data collection period and those not dealing with diabetes patients were excluded from the study.

The majority of PHC physicians were family physicians. However, other physicians, including pediatricians, obstetricians, gynecologists, and internal medicine physicians, share in providing services in the PHC in Saudi Arabia.

Data Collection

Data collection was conducted using a self-administered questionnaire to explore the challenges of providing healthcare services for type 2 diabetes from the perspective of PHC physicians.

The questionnaire was designed to achieve the study objectives based on the opinions of five experts and the review of a similar study [19]. A statistician checked the validity of the questionnaire. Some questions were modified based on the feedback and then sent to the email addresses of PHC physicians via a Google form after approval from the health administration. The questionnaire contained 14 questions divided into two sections. The first section contained questions about physician demographics. The second section addressed questions about the main diabetes care challenges that PHC physicians face from their perspective, including the inability to have face-to-face management, the inability to adjust treatment, and the inability to obtain prescriptions.

Statistical Analysis

Statistical analysis was conducted with SPSS software using descriptive statistics, t-tests, chi-square tests, and the ANOVA test. Statistical significance was set at $p < 0.05$.

Results

Two hundred and twenty-two physicians providing diabetic care in PHC in Bisha province in southwestern Saudi Arabia participated in this study. Most participants were male (126; 56.8%), non-Saudi (220; 99.9%), and > 40 years (130; 58.6%). Almost half of them reported significant problems encountered by patients during the COVID-19 pandemic.

Of those who received formal training on managing diabetic patients during the current pandemic of COVID-19, 102 (45.9%) faced challenges. Of the considerable number of PHC physicians, 111 (50%) experienced problems during the COVID-19 pandemic; of them, 67 (30.2%) felt that they were unable to have a face-to-face conversation, 34 (15.3%) were unable to adjust treatment, and 10 (4.5%) were unable to obtain prescriptions. Data collection was conducted using a self-administered questionnaire to explore the challenges of providing healthcare services for type 2 diabetes from the perspective of PHC physicians. Male physicians, non-Saudi, > 40 years old, working in rural areas, and those not receiving training on how to deal with Covid cases were more likely to have challenges in dealing with DM patients with COVID-19 (p-value ≤ 0.05), as shown in (Table 1).

Table 1. Characteristics and challenges of PHC physicians caring for diabetic patients during the COVID-19 pandemic, Bisha, Saudi Arabia (n = 222).

Characteristics		Challenges No (%)			Total No (%)	p-Value
		Inability to Adjust Treatment	Inability to Have Face to Face Management	Inability to Obtain Prescriptions		
Sex	Female	14 (6.3)	30 (13.5)	4 (1.8)	96 (43.2)	0.02
	Male	20 (9)	37 (16.7)	6 (2.7)	126 (56.8)	
Nationality	Non-Saudi	33 (14.9)	67 (30.2)	10 (4.5)	220 (99.1)	0.05
	Saudi	1 (0.4)	0 (0)	0 (0)	2 (0.9)	
Age	> 40	17 (7.7)	40 (18)	8 (3.6)	130 (58.6)	0.05
	< 40	17 (7.7)	27 (12.2)	2 (0.9)	92 (41.4)	
Profession	Family Physician	32 (14.4)	55 (24.8)	8 (3.6)	206 (92.8)	0.05
	Others	2 (0.9)	12 (5.4)	2 (0.9)	16 (7.2)	
Place of work	Urban	18 (8.1)	54 (24.3)	4 (1.8)	76 (34.2)	0.03
	Rural	16 (7.2)	13 (5.9)	6 (2.7)	146 (65.8)	
Received Training		20 (9)	67 (30.2)	10 (4.5)	102 (45.9)	0.00
Total		34 (15.3)	67 (30.2)	10 (4.5)	222 (100)	

COVID-19, coronavirus disease 2019; PHC, primary healthcare.

In this study, 216 (97.3%) physicians faced challenges when dealing with diabetic patients during COVID-19. During the current pandemic of COVID-19, 130 (58.6%) PHC physicians worked at usual capacity, in addition to 28 above capacity and 64 below capacity in Bisha Health Affairs. During COVID-19, counseling was provided by scheduled visits (178; 80.2%) and by telemedicine (WhatsApp; 44; 19.8%). Most PHC centers (146; 65.8%) witnessed a decrease in patient numbers during the COVID-19 pandemic. In comparison, 32 (14.4%) PHC centers depicted an increase in the number of patients, while 44 (19.8%) PHC centers had the same number of patients during the COVID-19 pandemic. A total of 186 (83.8%) PHC physicians thought the COVID-19 pandemic would affect the treatment outcomes. Most PHC physicians (189; 85.1%) provided direct care to patients confirmed of having COVID-19. Approximately 171 (77%) physicians offered face-to-face contact (within 1 m) with a patient who had COVID-19 verified at a healthcare facility. The majority of PHC physicians (212; 95.5%) had some degree of confidence in dealing with patients with COVID-19 (Table 2).

Table 2. Assessment of diabetes care challenges faced by PHC physicians during the COVID-19 pandemic, Bisha, Saudi Arabia (n = 222)

Assessment Question Items	Response	No (%)
Did you face a challenge dealing with patients with diabetes mellitus having COVID-19?	Yes	216 (97.3)
	No	6 (2.7)
How is the working capacity of the PHC facility during the COVID-19 pandemic?	Below capacity	64 (28.8)
	Above capacity	28 (12.6)
	With usual capacity	130 (58.6)
Have you provided counseling during COVID-19?	Scheduled visit	178 (80.2)
	Telephone/WhatsApp	44 (19.8)
Did the number of patients increase or decrease during COVID-19?	Decreased	146 (65.8)
	Increased	32 (14.4)
	Stayed the same	44 (19.8)
Do you think the COVID-19 pandemic will affect the treatment outcomes?	Yes	186 (83.8)
	No	36 (16.2)
Did you provide direct care to a patient confirmed to have COVID-19?	Yes	189 (85.1)
	No	33 (14.9)
Did you have face-to-face contact (within 1 m) with a patient confirmed of having COVID-19 in a healthcare facility?	Yes	171 (77)
	No	51 (23)
Did you feel confident in dealing with patients with COVID-19?	A little confident	22 (9.9)
	Somewhat confident	76 (34.2)
	Confident	86 (38.7)
	Very confident	28 (12.6)
	Not confident at all	10 (4.5)

Discussion

Diabetic care challenges during the COVID-19 pandemic from the perspective of PHC physicians are vital in dealing with COVID-19 and similar future conditions [18].

Diabetes mellitus is a chronic disorder, and morbidity increases with disease duration and age. During the COVID-19 pandemic, most mortalities were observed in patients with comorbid conditions, such as diabetes. The focus of doctors who work in PHC centers was the control of the COVID-19 pandemic. Therefore, routine clinical visits and blood glucose monitoring were hampered due to social distancing and fear. Reasonable glycemic control might help reduce disease severity [20,21].

PHC clinicians support patients with diabetes, help them reduce related complications, and maintain a good lifestyle [22–24]. In this study, we found that 80.2% of patients with diabetes in the Bisha region were counseled during their scheduled visits. The remaining 19.8% were counseled via telephone or WhatsApp. Even though a small portion of patients could not visit their doctors regarding scheduled visits, there were no significant changes. Many doctors (83.8%) felt that the COVID-19 pandemic affected the treatment outcomes of some patients. The inability to have face-to-face management was greatest during the COVID-19 pandemic. With the introduction of 'social distancing,' technology may help maintain an acceptable level of service quality [14]. Prescribing disruptions can be prevented despite overall visit reductions. The results also showed no direct relationship between the frequency of visits and glycemic control [25]. During the COVID-19 pandemic, PHC services were the primary contact point for patients with diabetes. Most PHC centers worked in a normal representative capacity, and patients with diabetes could make their scheduled visits to the Bisha region.

Conclusions

Most PHC physicians face challenges in managing patients with diabetes mellitus who have COVID-19, including the inability to have face-to-face management, adjust treatment, and provide prescriptions. Planning decision makers should increase preparedness for future emergencies to address the significant challenges identified.

Limitations of the Study
A consistent approach limits this study because each physician has a unique approach and way of working with patients and promoting their health. Physicians belong to different training backgrounds that may be compatible with some patients. This difference may affect the answers to the research questions.

Informed Consent Statement: Obtained from all the participants of the study.

Data availability Statement: Data sharing is not applicable.

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Conflicts of Interest: The author declares no conflict of interest.

Ethical Approval: This study was conducted in accordance with the Declaration of Helsinki.

Abbreviations
COVID-19: coronavirus disease 2019; PHC, primary healthcare; NCDs, non-communicable diseases; OPD, outpatient department.

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The Effect of Online Learning on the Psychological State of Medical Students during Covid-19 at a public Saudi University

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Abstract

Background: Coronavirus (COVID-19) is a pandemic infectious disease that caused a global health problem. Many countries suffered from this virus including impoverished and developed countries. Several studies have shown that COVID-19 affected the mental state of undergraduate medical students. This study aims to show the impact of online learning on the psychological state of medical students at Imam Mohammad Ibn Saud Islamic University (IMSIU) in Riyadh.

Methods: Cross-sectional, online survey. A 16-item questionnaire was designed and distributed to all medical students of IMSIU through emails and social media groups. Five-point Likert questions were used, ranging from strongly agree to strongly disagree.

Result: Out of 400 who participated in the study, 317 (79%) completed the survey; the majority were male (64.7%). The mental state was worsened in 143 (46.5%) students. At the same time, 77 (25%) felt psychologically improved and 97 (32%) students did not notice any change in their mental health.

Conclusion: The results show an effect on the mental state of the medical students during the quarantine measures imposed during the COVID-19 pandemic.

Keywords: Online learning, psychological well-being, COVID-19 pandemic, medical students, Saudi Arabia

Introduction

Coronavirus-2019 (COVID-19) is one of the biggest health challenges humanity has ever faced (1–4). It comes from a family of coronaviruses, large, enveloped, single-stranded RNA viruses. They can be found in humans and other mammals like cats, dogs, chickens, cattle, pigs, and birds (5). In addition to the Middle East Respiratory Syndrome (MERS-CoV), which first appeared in 2012 and is transmitted from dromedary camels to humans, and severe acute respiratory syndrome (SARS-CoV) (6–8), which appeared in 2002 and is transmitted from civet cats to humans, COVID-19 has been linked to the seafood and animal market in Wuhan, China (9,10). COVID-19 is one of the most aggressive diseases caused by coronaviruses. It is caused by a SARS-CoV-2 virus that affects the respiratory system and causes respiratory symptoms such as fever, cough, shortness of breath, and difficulty breathing (11,12). In some patients, more severe symptoms like pneumonia, severe acute respiratory syndrome, kidney failure, and even death might occur, but the main issue with COVID-19 is its ability to spread (13,14). In Saudi Arabia, 350,984 people were infected, and 5,559 died of COVID-19 (15). On 9 March 2020, a decision to suspend schools and universities led to the introduction of online learning from that date until the end of the semester of 2020-2021. This decision to close the face-to-face attendance at educational institutions was crucial to control the spread of the virus, but how it might affect students and their psychological welfare was unknown. A recent national survey reported that 94.4% of Saudi medical students reported moderate to high perceived stress as a result of their changed learning circumstances(16). The study aimed to explore the psychological state of medical students and the effects of online learning during the COVID-19 pandemic at a public University in Saudi Arabia.

Methods

Design and setting:
This observational, cross-sectional study was conducted between November and December 2020 in Riyadh, Saudi Arabia.

Subjects of the study: The study targeted medical students from Imam Mohammad Ibn Saud Islamic University (IMSIU) School of Medicine. The sample size was calculated to be 274 using Raosoft (Raosoft Inc., Seattle, Washington, USA) based on a confidence level of 95% and a 5% margin of error.

Tools of the study: The questionnaire consisted of two main parts; The first part included questions about the participants' demographic data, such as gender, year of education, and academic GPAs. The second part consisted of twelve questions to explore online education students' mental well-being during the COVID-19 pandemic. The five-point Likert scale was used to scale responses. The authors approached students in their respective classes and provided them with printed copies of the questionnaire. Pre-testing was done to assess the reliability of the questionnaire for the sample. Data was collected using anonymous, self-administered online questionnaires distributed by emails followed by Short Message Service (SMS) and social media as reminders to enhance the response rate.

Data Analysis
The mean and standard deviation were used to describe the continuous variables, and the frequency and percentage were used to describe categorically measured variables. The histogram and the statistical Kolmogrove-Smirnov test of normality were used to assess the statistical normality of metric variables. A total score for the students' perceived psychological impact from the quarantine was computed by adding up responses to the nine indicators measured with a 1-5 Likert scale (items 1-7 and 9-10), resulting in a total score bounded between 9-45 points characterizing the students' total perceived impact of the effects of Covid19 on their psychological well-being. The independent samples t-test was used to assess the statistical significance of the \mean differences in students' age and other metric perceptions across the levels of their dichotomized study hour changes. The chi-squared test of independence was used to assess the associations between categorically measured variables. The Multivariate Logistic Binary regression was used to determine the combined and individual associations between the students' sociodemographic, academic, and perceived psychological impacts from quarantine on their odds of increased study hours/burden. The association between these factors and covariates with the students' odds of having been studying longer hours was expressed as Odds Ratio with a 95% confidence interval. The SPSS IBM v21, commercially available, statistical analysis programme was used, and the alpha significance level was considered at 0.050.

Results

The survey was distributed amongst 400 convenient samples of medical students and 317 (79%) successfully responded. The mean age for all participants was 21.4 years and most of them were in their sophomore years (2nd and 3rd years). 201 (63.4%) participants had a GPA of more than 4.6 out of five. About two-thirds (64.7%) of them were male, as shown in Table 1.

Concerning the productivity of students, Table 2 shows the number of hours participants spent studying related to their GPA and identifies a decrease, no change or an increase. Most of the students have a GPA of more than 4.0, (231 students) and have higher degrees. 116 of them reported an increase in their study hours and 115 reported no change or a decrease.

Regarding their mental state, Table 3 illustrates the number of students who felt depressed during online learning. A total of 317 participants, 175 (55.5%) responded by agreeing or strongly agreeing that they had felt depressed. On the other hand, 80 were undecided, while 62(19,6%) students did not feel depressed throughout online learning.

Another question related to their psychological state was about feeling anxious or having insomnia during the online learning programme imposed during the COVID-19 period. Table 4 confirms that 146 (46.1%) students had felt anxious or had insomnia while 89 (28.1%) disagreed that they had this negative experience, 82 were unsure if they had felt anxious or had insomnia during this period.

At the end of the questionnaire, there was a vital inquiry related to our research topic and concluded the 'psychological state' of the students of both genders during online learning for the period of the quarantine; whether it had improved, worsened, or remained the same.

Table 5 shows the answers to the question regarding the study hours. It shows the perceived psychological impact of the quarantine, the mean (S.D.) with a p-value of 0.228, and other important information. Regardless of the study hours, 77 participants reported an improvement in their mental state, while for 143 their psychological conditions had worsened. The other 97 students did not notice any change in their mental health.

Table 1: Descriptive analysis of the sociodemographic and academic characteristics of the student. N=317

Table 2: Hours of study	Frequency	Percentage
1-Sex		
Male	205	64.7
Female	112	35.3
2-Age (years), mean (S.D.) :		21.40 (1.60)
3-Study year		
Junior-1st year	57	18
Sophomore (2nd and 3rd years)	201	63.4
Senior (4th and 5th year)	59	18.6
4-GPA		
2.5 or below points	6	1.9
2.6-3 points	5	1.6
3.1-3.5 points	13	4.1
3.6-4 points	62	19.6
4.1-4.5 points	113	35.6
>=4.6	118	37.2

Table 2: Hours of study

Crosstab

| | | | rec11.dic 15 – Are the hours of studying increased or decreased? | | |
			same, decreased	Increased	Total
GPA_Academic.perf 4 – GPA:	2.5 or below points	Count	3	3	6
		% within rec11.dic 15 – Are the hours of studying increased or decreased?	1.8%	2.0%	1.9%
		Adjusted Residual	-.1	.1	
	2.6-3 points	Count	3	2	5
		% within rec11.dic 15 – Are the hours of studying increased or decreased?	1.8%	1.3%	1.6%
		Adjusted Residual	.4	-.4	
	3.1-3.5 points	Count	7	6	13
		% within rec11.dic 15 – Are the hours of studying increased or decreased?	4.3%	3.9%	4.1%
		Adjusted Residual	.2	-.2	
	3.6-4 points	Count	36	26	62
		% within rec11.dic 15 – Are the hours of studying increased or decreased?	22.0%	17.0%	19.6%
		Adjusted Residual	1.1	-1.1	
	4.1-4.5 points	Count	56	57	113
		% within rec11.dic 15 – Are the hours of studying increased or decreased?	34.1%	37.3%	35.6%
		Adjusted Residual	-.6	.6	
	>=4.6	Count	59	59	118
		% within rec11.dic 15 – Are the hours of studying increased or decreased?	36.0%	38.6%	37.2%
		Adjusted Residual	-.5	.5	
Total		Count	164	153	317
		% within rec11.dic 15 – Are the hours of studying increased or decreased?	100.0%	100.0%	100.0%

Table 3

Rec.1 5 – Have you felt depressed during online learning ?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	S.disagree/disagree	62	19.6	19.6	19.6
	Undecided	80	25.2	25.2	44.8
	Agree/S.agree	175	55.2	55.2	100.0
	Total	317	100.0	100.0	

Table 4

Rec.5 9 – Have you been anxious or had insomnia during online learning?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	S.disagree/disagree	89	28.1	28.1	28.1
	Undecided	82	25.9	25.9	53.9
	Agree/S.agree	146	46.1	46.1	100.0
	Total	317	100.0	100.0	

Table 5

How do you describe your mental state during the online study? Related study hours	Studying hours decreed unchanged N	Studying hours increased N	Test statistics	P value
It improved	29 (17.7)	48 (31.4)	chi(2)=15.61	<0.001
Remained the same	65 (39.6)	32 (20.9)		
Got worse	70 (42.7)	73 (47.7)		
Are you adequately concentrating on your studies, Likert rating mean (SD)	3.16 (1.10)	3.51 (1.1)	t(315)=2.91	0.004
The perceived psychological impact of the quarantine, mean (SD)	30.90 (7.71)	31.99 (8.50)	t(315)=1.21	0.228

Discussion

Our study aims to identify the effect of online learning on the psychological state of medical students at IMSIU during COVID-19. The results indicate that, in general their mental condition, worsened during the COVID-19 quarantine. During the online learning period, many students felt depressed, hopeless, and emotionally detached from family, friends, etc. The findings were similar to previous studies which found that online learning has had a negative effect on students' mental states (17,18).

One of the findings was that almost half of the participants felt anxious and suffered from insomnia, while the other half disagreed or were not sure if they went through the same experience. This means there is no definitive proof that anxiety and insomnia increased during online learning during the duration of the quarantine. However, based on findings of a similar study, there was an increase in anxiety among females and a decrease among male students (19–21).

An interesting result was that some students experienced episodes of indecisiveness or poor concentration during their online learning, which made them concentrate more on their self-study/learning and spend more hours studying than normal. This may mean that students could benefit from this challenging situation. But it also means the situation affected their mental and psychological state.

These results are based on existing evidence of the effects of online learning during COVID-19 on the psychological and mental state of the students in our study group. One of the main effects was that the majority of the students felt depressed during the period of online learning and felt exhausted or emotionally unresponsive during quarantine. Also, participants felt a sense of being emotionally detached from family, friends, etc. The effect of the psychological state on their study was significant; they noticed a deterioration in their work performance, they felt they were falling behind in their studies, and they noticed a reduction in their awareness, confusion and had difficulty recalling recent information.

The experiment provides new insight into the relationship between the effectiveness of online learning and students' psychological and mental states and how it affects their studies. As we mentioned before, the effect of online learning on the psychological and mental state of the students leads to a decrease in their work performance. It also affects their concentration during online learning, which can lead a student to concentrate more on their self-learning and take more time to study (22–24). It is usual that the psychological state of university students, in general, and medical students, in particular, would have been affected because most medical courses before the pandemic were largely face-to-face and not online. Courses in the medical curricula contain a large proportion of study related to clinical and practical aspects, which require medical practice and training on patients. Medical students, in general, are not used to studying remotely. This face to face education and training was impossible during the

period of lockdown. This made many students feel anxious and, at times, stressed to the point of frustration and depression. Typically, they feared for their professional future, that they would not acquire the necessary medical skills or pass their final exams. They also feared the subsequent competition for postgraduate programme matching after graduation (25–27).

Further studies should consider other factors such as students' financial condition, diseases that could affect their mental and mental state, and their social status. Studies should also consider how online learning and mental state can interfere with academic achievement.

Limitations: As with most studies, the design of the current study is subject to limitations. The primary limitation is regarding the insufficient sample size for statistical measurement; the sample size for our online survey was relatively small compared to the usual survey-only studies, however, the online survey provides precise and additional clarifying details and complements the survey-based approaches of previous studies focusing on student mental health during this pandemic. The second limitation concerns the issues with sample and selection. An unequal variance between samples was found, meaning that fewer females participated in the survey compared to males, which can affect the study's statistical results.
Declarations:

Ethical consideration and consent to participate:
The Institute Review Board of Imam Mohammad Ibn Saud Islamic University (IMSIU) approved the study (Project number 114-2020; approval date, 8 December 2020). The paper was written based on the ethical principles of the Declaration of Helsinki. The introduction to the electronic questionnaire also included a clear explanation of the idea and purpose. Written informed consent was obtained from the study participants, after they had been informed that participation was voluntary and that the data would be treated confidentially and for research purposes only.

Availability of data and materials:
The data sets analysed during the current study are available from the corresponding author upon reasonable request. Due to data protection restrictions and participant confidentiality, we do not make participant data publicly available.

Competing interests:
The authors declare that there is no conflict of interest concerning the publication of this paper.

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Symmetrical Posterior Lower Limb Bruising in A Qatar 2022 FIFA World Cup Fan – A Case Report

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Abstract

Suspected spontaneous ecchymoses may indicate rare but serious underlying bleeding disorders. By undertaking a thorough clinical assessment and appropriately safety-netting patients, clinicians can reduce the need for unnecessary investigations and follow-up.

Objective: To report a case of symmetrical posterior lower limb bruising in a Qatari male football fan twelve-hours following his attendance at a Qatar 2022 FIFA World Cup match in Doha, Qatar.

Background: A 36-year-old previously fit and well Qatari male presented routinely to a primary health-care centre in Doha, Qatar, after waking with pain-less bruising to the posterior aspects of both thighs and calves. He attended a Qatar 2022 World Cup football match as a fan the evening before, and reported being completely well prior to this. He scored 0 on both the Bleeding Assessment Score and Wells' Criteria for DVT. Following a thorough history, examination and laboratory studies to ex-clude possible bleeding disorders, a diagnosis of simple purpura was made. The patient was reviewed a week later, and confirmed complete resolution.

Conclusions: Fit and well football fans presenting with bruising to the dorsum of the legs in a similar pattern can, following a thorough assessment, be diagnosed with simple purpura.

Key Words: Bruising, ecchymosis, football fan, soccer fan, Fan Seat Bruising

Introduction

The Qatar 2022 FIFA World Cup was an event watched by over three billion people worldwide and by over one and a half million fans in Qatar alone (3). The infrastructure and systems adopted in Qatar were state-of-the art to enable fans to enjoy a seamlessly connected and safe footballing experience. The organisers of the FIFA World Cup worked with the World Health Organisation and Qatar Ministry of Public Health to create a legacy for sport and health (4). For the majority of Qatar's resident population, this was their first experience of attending a football World Cup. The excitement caused by the drama on the field of play was enough to cause many to jump from their seats. We report on one case of a male fan developing spontaneous excessive bruising of the lower limbs twelve hours after attending a match.

In males, spontaneous bruising may indicate serious underlying X-linked bleeding disorders such as Haemophilia A (factor VIII deficiency) or Haemophilia B (factor IX deficiency) and requires further investigation. Though these conditions can occur in females, the incidence is six times rarer and less severe than in males. 90% of people with severe disease have been diagnosed by the age of one year old, so it is unusual to develop new symptoms as an adult. Features of mild disease include delayed clotting following injury or surgery and muscle haematomas.

Von Willebrand Disease (VWD) is the most common inherited coagulation disorder, with an incidence of 1%. It is autosomal dominant, so occurs in males and females equally, and does not show complete penetrance in families. It typically presents with mild mucocutaneous bleeding, including epistaxis, menorrhagia and prolonged bleeding and has a minimal impact upon quality of life.

A Bleeding Assessment Score (1) can also be used to determine the likelihood of an underlying inherited bleeding disorder, with normal scores being <4 in adult males, <6 in adult females, and <3 in children. It differentiates the location of bleeding and gives a ranking of the type of bleeding, from trivial all the way to where a surgical intervention or blood transfusion is required to stem spontaneous bleeding. If a patient scores higher than normal, further investigations may be indicated to determine the type of bleeding disorder they have. The causes of non-traumatic bruising and their commonly used investigations are listed in Table 1.

Here, we report a 36-year-old previously fit and well Qatari male who presented routinely to a primary healthcare centre in Doha, Qatar, after waking with painless bruising to the posterior aspects of both thighs and calves. We believe that the pattern presented by the case has not been previously reported in the medical literature.

Table 1: Non-traumatic causes of bruising and their commonly used investigations

Classification of Disorder	Specific Diagnosis	Investigation
Vascular	Senile Purpura	Complete Blood Count (CBC)
	Simple Purpura	
	Hereditary Haemorrhagic Telangiectasia	Genetic Testing
	Ehlers-Danlos Syndrome	Genetic Testing
	Osteogenesis Imperfecta	Genetic Testing
	Vitamin C Deficiency	Fasting Vitamin C, CBC
Platelet	Idiopathic Thrombocytopenic Purpura	CBC
	Henoch-Schoenlein Purpura	Urine dipstick
	Aplastic Anaemia	Blood Film
	Leukaemia or Myeloproliferative Disease	Blood Film
	Liver Disease	Liver Function Tests
	Chronic Kidney Disease	Renal Function Tests
Coagulation	Haemophilia A or B	Clotting Screen
	Vitamin K Deficiency	tTg IgA, Faecal Calprotectin
	Von Willebrand Disease	Thyroid Function Tests
	Amyloidosis	Biopsy
Drugs	Promote Collagen Degradation:	
	Corticosteroids (endogenous, oral or topical)	AM Cortisol, ACTH
	Inhibit Platelet Function:	
	Aspirin, NSAIDs, Clopidogrel and SSRIs	CBC
	Promote Thrombocytopenia:	
	Alcohol, Antibiotics, Carbamazepine and Quinine	CBC
	Prevent Coagulation:	
	Warfarin, Heparin, Apixaban, Rivaroxaban	Clotting Screen

Case Report

In November, 2022, a 36-year-old previously fit and well Qatari male reported waking in the morning to find bruising on the backs of both his legs that he had never had before. He booked an appointment and came directly to the health centre in Doha, Qatar. He felt well in himself and reported no pain, neither on pressing the bruising nor on bending his knees. He did not recall ever being injured on the backs of his legs and had been told by a family member that spontaneous bruising could be from a bleeding disorder.

He gave a history of walking ten kilometres yesterday to attend a FIFA World Cup match, as reported on his smart watch. This distance included the walk from the metro station to the stadium, and back again after the final whistle. He denied having taken any medications or being injured during the match. He reported wearing his usual thobe and sandals at the match. He denied taking any medications over the last few months. He said his health was good, and he had no previous medical or surgical history, which was confirmed by his primary healthcare record.

He denied any previous bruising or epistaxis. He denied a family history of bleeding disorders or bruising, including G6PD. He reported being a non-smoker and teetotal, and working in a sedentary office job. He exercised at the gym three times a week, including two days before attending the match as a spectator. His exercise routine involved running for five kilometres and using weights to do strength conditioning. He denied ever having taken anabolic steroids, protein supplements, fat-shredders or other exercise-related medications. He had had no recent foreign travel. A systems review was normal, with no indications of sepsis or malignancy. On further questioning, he stated he had been boisterously supporting his football team by frequently jumping up from a seated position from his stadium seat.

He appeared well with neither sweating, pallor nor jaundice. His height was 175 cm and his weight was 82 kg. His pulse rate (66/min), respiratory rate (15/min), temperature (36.6°C), oxygen saturations on air (99%) and blood pressure (123/73 mmHg) were normal. Oral examination revealed neither ulceration nor bleeding gums. There was no evidence of epistaxis intra-nasally or in the pharynx. Auscultation of his chest revealed no additional heart sounds. Visual inspection of his skin surface revealed no other bruising and did not display any laxity. Palpation of his abdomen revealed no hepatosplenomegaly. There was a full range of movement of both knees, without pain and no evidence of hemarthrosis. Visual examination of the bruising indicated a linear purple pattern of superficial dermal changes in keeping with recent rubbing trauma, and was demarcated superficially in the dermis along the lower border of the long head of the biceps femoris, overlying the popliteal fossa and superior border of the gastrocnemius (Figure 1). The bruising was non-tender and of the same temperature as the surrounding skin. There was neither calf-swelling, oedema nor evidence of thrombophlebitis. There was no calf-tenderness. Pulses in the lower limbs were all palpable and of normal character.
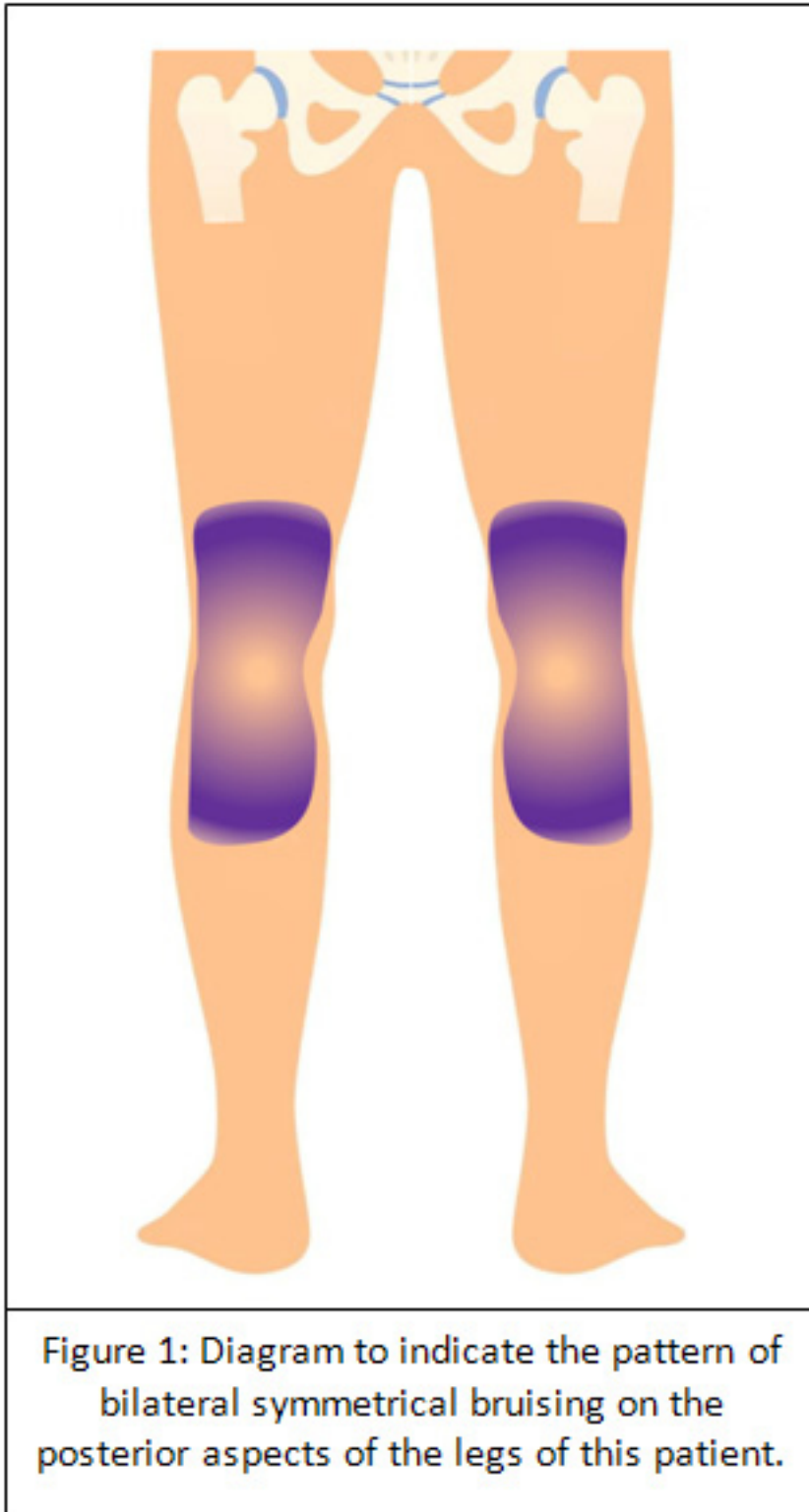
A Wells' Criteria for Deep vein thrombosis (4) was undertaken and a score of 0 was recorded. A Bleeding Assessment Score was also 0. A urine dipstick test to investigate for non-visible haematuria showed no abnormality. The patient's complete blood count and clotting screen were normal.

The patient was reassured that the pattern of bruising was in keeping with repeated excited standing and jumping whilst rubbing against the lip of a retractable plastic seat, a condition called simple purpura. The patient agreed and was reassured. He was advised to apply ice to the area twice a day, avoid strenuous exercise until the bruising had cleared and to return to the clinic if the bruising enlarged, spread elsewhere, became painful or recurred. A follow-up telephone consultation was arranged a week later. The patient confirmed that the bruising had fully resolved and that no further bruising had appeared following his attendance at another match, where he had been more careful during celebrations.

Discussion

The bruising pattern for this patient showed sequential colour changes and was painless, in keeping with simple purpura. Simple purpura is a common condition that results in recurrent bruising caused by the rupture of fragile capillaries following minor injury – it requires no investigations or treatments. After excluding bleeding disorders, there are a number of other diagnoses to consider as causes of spontaneous bruising. Exercise induced purpura occurs following strenuous exercise in the lower limbs in susceptible individuals and spares the area under socks (5). Exercise induced vasculitis tends to occur in older individuals, and presents with itching, pain or burning sensations overlying the purpuric lesions. Morel-Lavallee lesions occur following shearing force injuries, and show a persistent swelling and bruising overlying the area of bruising.

A Pubmed Search was undertaken to review similar patterns of injury using the search terms "soccer or football" and "spectator, spectators, fan or fans" and "injury, bruising or ecchymosis". Of 44 results, none of the titles or abstracts were relevant to the case study. The presentation of this injury is novel and therefore may assist other clinicians when presented with a similar pattern of fan seat bruising.

Figure 1: Diagram to indicate the pattern of bilateral symmetrical bruising on the posterior aspects of the legs of this patient.

Conclusions

This case reiterates the importance of taking a detailed history of presenting complaint to determine the cause of bruising which a patient reports to be spontaneous. Spontaneous bruising can be caused by non-traumatic conditions, including haemophilia and Von Willebrand Disease, and investigations can be useful to exclude these. Fan seat bruising has not been reported in the literature and this may be a novel pattern of injury. If other cases are discovered, consideration should be made to redesigning seats at stadiums to reduce the risk to fans with bleeding disorders.

Declaration
The authors declare that they have no conflicts of interest in publishing this paper and have not received any funding to do so.

Consent
The patient provided explicit written consent for the publishing of his case.

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Medical students' syndrome among medical students in Riyadh, Saudi Arabia

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Abstract

Background: Medical students' syndrome (MSS) refers to health complaints resulting from medical expertise rather than genuine pathology. It is a hypochondriasis or illness anxiety disorder in medical students that occurs while studying a medical condition whena medical student repeatedly develops fears and symptoms of illness relating to the diseases that they are looking at at the time, and as a consequence, it affects their performance.

Objective: To assess the prevalence of medical students' syndrome and measure the impact of the syndrome on the GPA among medical students in Riyadh, Saudi Arabia.

Method: The current cross-sectional study was conducted over six months on Riyadh's medical students. Data was collected by using an online self-reported questionnaire. The questionnaire included two sections; the sociodemographic and mental health sections. MSD-5 and HAI-18 tools were used to assess mental health and the medical students' syndrome.

Results: Four hundred and thirteen (413) medical students completed the study questionnaire. About half (50.8 %) were female, and 96.6 % were single. According to the Medical Students' Disease Distress scale (MSD-5), 88.9 % of the students had at least one mental health disorder. Anxiety was the major mental disorder found in 83.9 % of the medical students, followed by depression (73.6 %). According to the Health Anxiety Inventory tool (HAI-18) short-tool, the prevalence of medical students' syndrome (MSS) among medical students was 22.3 %. Marital status is a significant factor affecting the prevalence of MSS; being married significantly increases MSS among medical students (53.8 % vs. 21.3 %, P=0.018). There is a significant negative correlation between the score of HAI-18 and the student's Grade Point Average (GPA) (r=-0.111, P=0.024).

Conclusion: Medical students are more vulnerable to mental conditions like medical students' syndrome, which has negatively impacted their academic achievement. Since students face stress and pressure in their college life, medical students' mental and psychological health should be the top priority to overcome and prevent the occurrence of MSS among students.

Key words: medical student syndrome, Riyadh, Saudi Arabia

Introduction

It is widely believed that many medical students repeatedly develop fears and symptoms of illness relating to the diseases they are studying at the time [1,2]. Several different terms have addressed this disorder, but it has most popularly been referred to as medical students' disease (MSD), health-related anxiety, or hypochondriacal concerns [3–6]. MSS or MSD refers to health complaints resulting from medical expertise rather than genuine pathology [7]. MSS is a hypochondriasis or illness anxiety disorder in medical students that occurs in studying a medical condition [4]. Hypochondriasis is a medical condition and a part of somatoform disorders. Somatoform disorders are a group of psychiatric illnesses characterized by physical symptoms with no identifiable cause, and patients believe that a disease or more causes these symptoms. Hypochondriasis is characterized by a prolonged, strong fear of a serious disease or a conviction that they already have it when they don't. Medical evaluation and reassurance of their good health doesn't relieve or convince patients that they don't have the disease. They usually misinterpret their sensations or minor symptoms to fit their feared illness. This phenomenon is a kind of acute hypochondriasis and is more common among medical students than other college students [8]. Medical student syndrome has also been explored in a previous study by Woods et al. (1966). Their study indicated that 78.8 percent of the medical students surveyed had this syndrome during their studies. This finding was supported by Hodges (2004) [9]. For ten years, this subject has been partially investigated in several studies, and it seems that up to about 70% of medical students suffer from this phenomenon(4). Past studies from Pakistan have reported prevalence rates ranging from 44% to 70% [10–13]. Some studies reported higher anxiety levels among females than males [14]. Research has indicated that medical school causes students to experience much psychological pressure due to work required, the stress of examinations, the anxiety associated with new clinical experiences, and the competitive environment. This stress is thought to affect symptom detection by enhancing physical sensations through autonomic activation, making individuals more aware of their physical state, particularly enhancing pain. It is thought that this knowledge affects symptom perception via the expectations and illness beliefs ('schemata') that arise from it, leading to 'selective attention to specific bodily sensations and areas. The knowledge is also thought to affect symptom interpretation by causing medical students to discover how slim the line can be between health and illness and to reconceptualize previously neglected symptoms within the context of newly obtained knowledge. Previous researchers have suggested that this unique combination of stress and clinical knowledge causes medical students, after noticing some harmless bodily dysfunction, to attach unjustified importance and fear to what they have perceived and that this importance is normally either modeled after a patient they have seen or a clinical story they have heard [1,15–19]. According to Ferguson (1996), MSS ''points to the important role factual medical knowledge plays in interpreting physiological signs and symptoms''. To this view, some medical students tend to interpret vague bodily symptoms in terms of the latest disease they have learned about. This tendency would become stronger as medical knowledge grows [7]. Medical Student Syndrome (MSS) is one of the major reasons for stress among medical students throughout their undergraduate program and it affects their performance. The students focused on and correlated their vague symptoms with the studied disease. If the students were studying brain tumors, they assumed that their headaches might be one of the signs of tumors [4,20,21]. Coincidental physiological or psychological symptoms that do not necessarily point to an illness and in the past were regarded as ''normal'' may now be perceived as significant in the context of the knowledge concerning the pathologies to be studied [4]. This stress, on the one hand, and obtaining medical knowledge, on the other hand, causes medical students to relate previously neglected symptoms to the newly obtained knowledge [22]. Since success in medical school is highly correlated with personality and emotional factors, perhaps as much as intellectual ability, it is desirable to elucidate any area of potential stress [6]. Several studies have been done worldwide which divide the "Medical Student Syndrome" into two components. The first one is a cognitive component which includes the thoughts of a student that they have the disease being studied, and the second is a distress component, which includes anxiety due to the cognitive component. Comparing these two components shows that the cognitive component is present among all students and is progressing from medical education to the senior level. In contrast, the distress component is more among younger students. It is insignificant among older students because, with time, the students gain more knowledge and increase in maturity level [23–25]. To prevent the occurrence of MSS among medical students, medical students' mental and psychological health should become a priority, given the pressures they face in their university life. Thus, this study aimed to examine the prevalence of MSS complaints in a reasonably large sample of medical students [7] and to measure the impact of medical students' syndrome on the GPA among medical students in Riyadh, Saudi Arabia.

Methodology

The current cross-sectional study was conducted over six months. Data was collected by using an online self-reported questionnaire. The number of participants applying to the study was 413, with a 95% confidence level according to the Raosoft web tool. Inclusion criteria were any medical student who studies at Riyadh's medical colleges. Preparatory-year students and interns were excluded from the study. A pilot study was done on 15 individuals to support the questionnaire assessment and obtain the questions' validity, which helped avoid linguistics and comprehension issues. Participation consent was taken from each participant, personal information was secured, and data was utilized only for scientific purposes.

Many variables were assessed in this study's questionnaire, which consists of two sections. The first section concerns sociodemographic variables such as gender, marital status, year of study, GPA, and place of study. According to students' marital status, they were categorized as "single, married, divorced and widowed," while the year of study was grouped as "1, 2, 3, 4, 5" [26]. The place of study was classified into "IMSIU, KS, KSU-HS, PNU, and Other." Participants were asked about a parent's job and whether it is related to medicine [27]. The second section included two tools to assess medical students' mental health. Medical students' disease distress scale (MSD-5) was used [3], which included 23 questions. Participants were asked if they were feeling down, depressed or hopeless, as well as , if they have little interest in doing things or feel more irritated. In addition, they were asked if they slept less than usual and still had energy if they felt nervous and anxious and if they had suicidal thoughts. Participants responded to these questions on a scale that ranged from not at all to nearly every day, to what extent it applied to them. The Health Anxiety Inventory tool (HAI-18), which consists of 18 questions, was also used in this section to measure health anxiety [28]. HAI-18 questions include "I do not worry about my health, I occasionally worry about my health, I spend much of my time worrying about my health, I spend most of my time worrying about my health." "If I hear about an illness, I never think I have it myself; If I hear about an illness, I sometimes think I have it myself; if I hear about an illness, I often think I have it myself; if I hear about an illness, I always think I have it myself" was asked to help in the medical students' syndrome assessment. Participants were asked if they may have serious medical conditions such as heart disease, cancer, multiple sclerosis, etc. Then they would answer some questions such as "If I had a serious illness, I would still be able to enjoy things in my life quite a lot; if I had a serious illness, I would still be able to enjoy things in my life a little, If I had a serious illness, I would be almost completely unable to enjoy things in my life, If I had a serious illness, I would be completely unable to enjoy my life at all." Participants chose the correct answer that applied to them.

MS Excel was used for data entry, cleaning, and coding, while data analysis was done by using Statistical Package for the Social Science (SPSS) with data analysis experts' help. Frequency and percent were used to describe categorical variables such as gender, marital status, year of study, and GPA. Mean, and standard deviation was used to describe continuous variables as the tools' total scores. Medical students' disease distress scale consisted of 23 questions to assess the 13 mental disorders (Having two or more symptoms of each disorder indicate the diagnosis of this disorder). For HAI short version used in this study, the tool consisted of 18 questions with different answers for each question. However, all responses were coded from 0-3, where 0 means low concern for health while 3 shows high health concerns. This provides a resulting score ranging between 0 and 54. Illness anxiety disorder was diagnosed in a student who had a score over 18. Chi test and t-test were used to assess the relationship between having MSS and the participants' demographic factors. In contrast, the Pearson correlation test was used to determine the correlation between the student's GPA as an indicator of academic performance and the prevalence and severity of MSS. All statements were considered significant when the p-value was lower than 0.05.

Results

Four hundred and thirteen (413) medical students completed the study questionnaire. About half (50.8 %) were female, and 96.6 % were single. Moreover, 48.9 % of the participants were in 3rd year, while 16.7 % were in 1st year. About 40 % of the medical students reported studying at IMSIU, while 18.9 % were at KSU-HS and 18.6 % were at KSU. Considering the students' GPA, 55.7 % of the participants reported having a GPA of more than 4.5, while 17.4 % had a GPA of 4.25-4.5, 13.6 % less than 4, and 13.3 % of 4-4.25. Moreover, 41.4 % of the students reported having a monthly income of more than 5000 SR, while 30 % had between 1000-5000 SR, and 28.6 % had an income lower than 1000 SR. Furthermore, 77.5 % of the students reported that their parents' job is unrelated to medicine (Table 1).

According to the Medical students' disease distress scale (MSD-5), 88.9 % of the students had at least one mental disorder. Anxiety was the major mental disorder which is found in 83.9 % of the medical students, followed by depression (73.6 %), personality functioning (60.8 %), and mania (59.9 %) (Figure 1).

According to the Health Anxiety Inventory tool (HAI-18) short-tool, the prevalence of medical students' syndrome (MSS) among medical students was 22.3 % (Figure 2). The mean score of the main section of the sample was 12.3 (SD=7.32), the negative consequences were 2.8 (SD=2.5), and the total score of 15.13 (SD=8.86). Considering the demographic factors affecting the prevalence of MSS, we found that the prevalence of MSS among females is higher than reported in males (26.2 % vs. 18.2 %). However, this difference is not significant (P=0.052). Marital status is an important factor affecting the prevalence of MSS; being married significantly increases MSS among medical students (53.8 % vs. 21.3 %, P=0.018). Moreover, we found that year of study of the students affected the prevalence of MSS significantly (P=0.045); MSS prevalence was highest among students in the 4th (31.7 %), 1st (26.1 %), and 3rd year (22.8 %). On the other hand, the University of the students, their economic level, and whether their parents' job is related to medicine have no significant impact on the prevalence of MSS among medical students (Table 2).

Figure 1: The prevalence of some mental disorders as found using MSD-5

Disorder	Percentage
Substance Use	21.80%
Personality Functioning	60.80%
Dissociation	40.10%
Repetitive Thoughts and Behavior	53.10%
Memory	39.00%
Sleep Problems	51.00%
Psychosis	22.30%
Suicidal Ideation	25.10%
Somatic Symptoms	54.20%
Anxiety	83.90%
Mania	59.90%
Anger	55.00%
Depression	73.60%
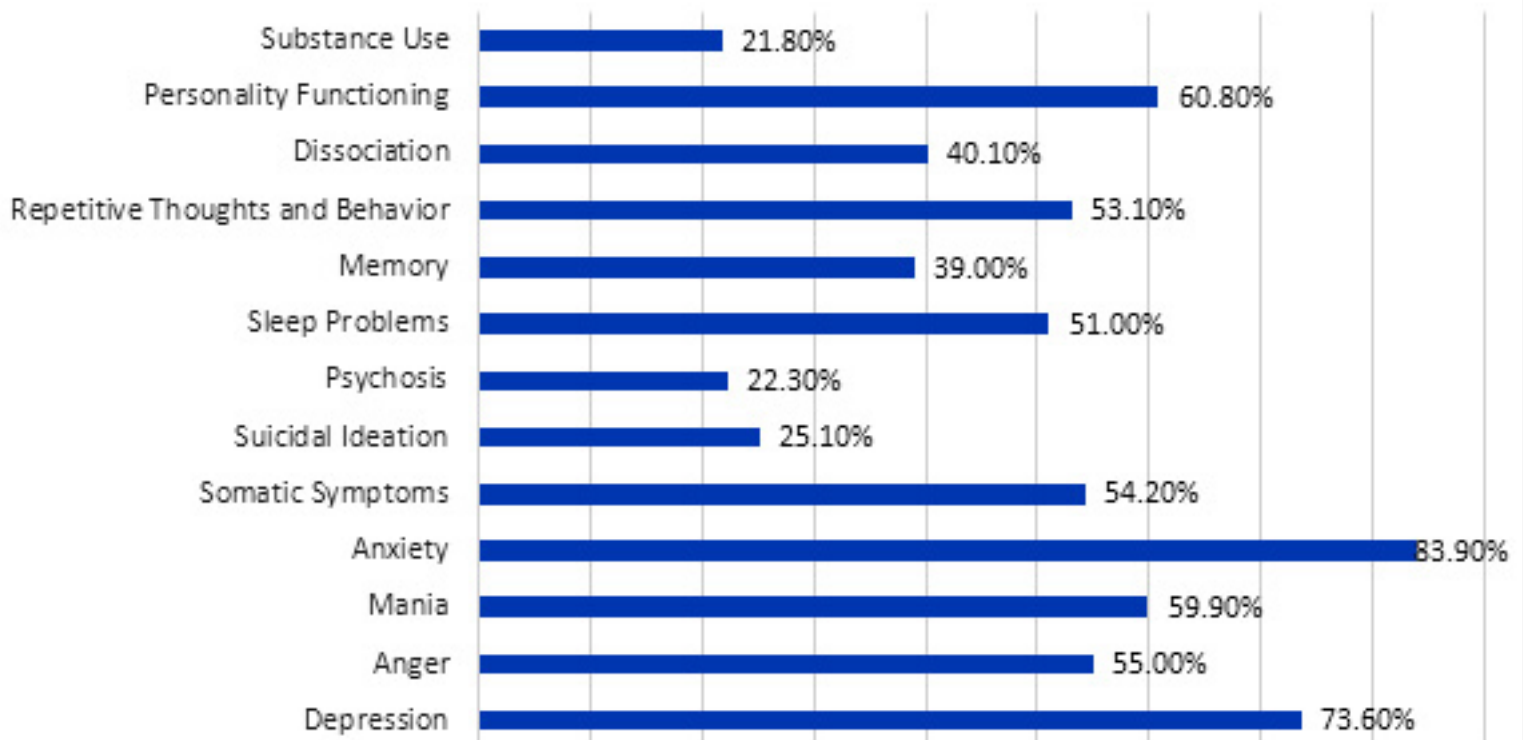
Figure 2: The distribution of students according to Health anxiety inventory score

- No Illness anxiety disorder (Score < 18) — 77.70%
- Illness anxiety disorder (score >18) — 22.30%
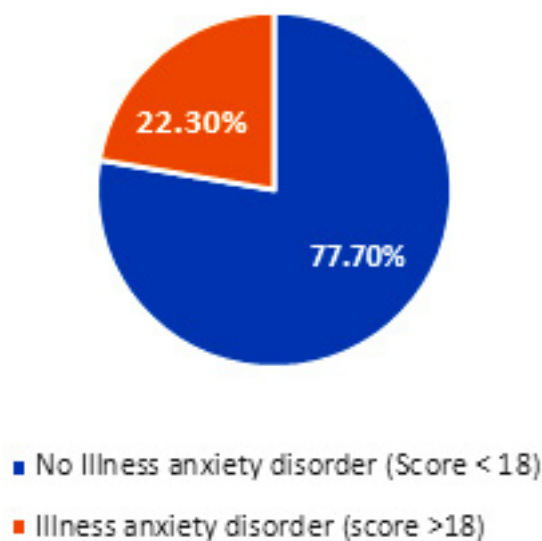
Table 1: Demographic factors of the participants (N=413)		Count	Column N %
Gender	Male	203	49.2%
	Female	210	50.8%
Marital status	Single	399	96.6%
	Married	13	3.1%
	Divorced	1	0.2%
Year of Study	1st year	69	16.7%
	2nd year	51	12.3%
	3rd year	202	48.9%
	4th year	60	14.5%
	5th year	31	7.5%
University	IMSIU	166	40.2%
	KSU	77	18.6%
	KSU-HS	78	18.9%
	MENU	74	17.9%
	Other	18	4.4%
GPA	<4	56	13.6%
	4-4.25	55	13.3%
	4.25-4.5	72	17.4%
	> 4.5	230	55.7%
Economic level	< 1000 SR	118	28.6%
	1000-5000 SR	124	30.0%
	> 5000 SR	171	41.4%
Parent's job	Non-related to medicine	320	77.5%
	Related to medicine	93	22.5%

Table 2: The relation between demographic factors and health anxiety inventory score

		No Illness anxiety disorder (Score < 18)		Illness anxiety disorder (score >18)		P-value
		Count	Row N %	Count	Row N %	
Gender	Male	166	81.8%	37	18.2%	0.052
	Female	155	73.8%	55	26.2%	
Marital status	Single	314	78.7%	85	21.3%	0.018*
	Married	6	46.2%	7	53.8%	
	Divorced	1	100.0%	0	0.0%	
Year of Study	1st year	51	73.9%	18	26.1%	0.045*
	2nd year	45	88.2%	6	11.8%	
	3rd year	156	77.2%	46	22.8%	
	4th year	41	68.3%	19	31.7%	
	5th year	28	90.3%	3	9.7%	
University	IMSIU	126	75.9%	40	24.1%	0.828
	KSU	62	80.5%	15	19.5%	
	KSU-HS	60	76.9%	18	23.1%	
	PNU	60	81.1%	14	18.9%	
	Other	13	72.2%	5	27.8%	
GPA	<4	42	75.0%	14	25.0%	0.031*
	4-4.25	36	65.5%	19	34.5%	
	4.25-4.5	53	73.6%	19	26.4%	
	> 4.5	190	82.6%	40	17.4%	
Economic level	< 1000 SR	91	77.1%	27	22.9%	0.878
	1000-5000 SR	95	76.6%	29	23.4%	
	> 5000 SR	135	78.9%	36	21.1%	
Parent's job	Non-related to medicine	252	78.8%	68	21.3%	0.353
	Related to medicine	69	74.2%	24	25.8%	

* Significant at a P value of lower than 0.05.

Table 3: Correlations between GPA of the students, HAI-18 score, and MSD score

		GPA	HAI-18 score	MSD score
GPA	Pearson Correlation	1	-.116*	-.181**
	Sig. (2-tailed)		.018	.000
	N	413	413	413
HAI-18 score	Pearson Correlation	-.116*	1	.499**
	Sig. (2-tailed)	.018		.000
	N	413	413	413
MSD score	Pearson Correlation	-.181**	.499**	1
	Sig. (2-tailed)	.000	.000	
	N	413	413	413

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Considering the impact of MSS on the student's GPA, we found a significant negative correlation between the score of HAI-18 and the student's GPA (r=-0.111, P=0.024) (Table 3). Having MSS was associated significantly with lower GPAs of the students, where the prevalence of MSS among students with a GPA of more than 4.5 was 17.4 % compared with 34.5 % of those with a GPA of 4-4.25 (P=0.031) (Table 2). Moreover, we found a significant negative correlation between GPA score and MSD-5 score (r=-0.181, P=0.000). Furthermore, there is a significant positive correlation between the score of HAI-18 and MSD-5 (r=0.499, P=0.000) (Table 3)

Discussion

This study aimed to tackle a significant, neglected problem observed among medical students in many countries [9]. Hypochondriasis is a psychiatric medical condition represented by a group of somatoform disorders where patients are convinced that they have serious medical conditions or are very worried about getting these conditions based on their misinterpretation of symptoms for at least six months [29]. In the current study, illness anxiety disorder was identified in 22.3 % of the medical students in Riyadh region, Saudi Arabia depending on the results of HAI-18. Another survey by Ezmeirly H et al. among medical students in Western Saudi Arabia reported a prevalence of 17 % [30]. Moreover, Al-Turki Y et al. said that 3.4 % of the medical students at King Saud University were diagnosed with hypochondriasis using DSM - IV criteria [8].

Moreover, our result was relatively higher than reported by other studies, including a study conducted at Mashhad University of medical science which reported a prevalence of hypochondriasis among medical students of 16 % [31]. A survey conducted by Zahid et al. among Pakistani medical students reported a prevalence of 11.9 % [24] and a study of Kellner et al. among American medical students reported a prevalence of 8.3 % [32]. Earlier studies conducted by Hunter et al. [1], Moss-Morris and Petrie [3], Woods et al. [6], Hodges [33], and Collier [2] supported that medical students are at higher risk for developing MSS and other anxiety disorders. On the other hand, other studies failed to report sufficient evidence of increased health-related anxiety among medical students compared to non-medical students [32,34–36].

In conjunction with the results of HAI-18, we used the medical students' disease distress scale (MSD-5) to assess the prevalence of 13 different mental aspects. Anxiety and depression were the main identified mental disorders in this study, presenting in 83.9 % and 73.6 %. Similar results were reported in some previous studies, including the study of Mehanna Z and Richa Z. They reported that the prevalence of anxiety and depression among medical students was 69 % and 27.63 % [37]. Moreover, another study conducted by Inam S and Saqib A showed that the prevalence of depression and anxiety among medical students was 60 % using the anxiety and depression scale [11], while the study of Rab F et al. showed that

the prevalence of anxiety and depression among medical students in Pakistan was 43.7 % and 19.5 % respectively [38]. Furthermore, another study conducted by Khan M et al. showed that the prevalence of anxiety and depression among medical students was 70 % [13], while the study of Alvi T et al. showed that anxiety was present in 133 (47.7 %) students and depression in 98 (35.1%) students [14].

In the current study, we found that the prevalence of MSS was different among students of different years of study, whereas those in the 5th year showed the lowest prevalence of MSS (9.7 %). In a previous study, the authors showed that the medical student's disease distress component was significantly higher among younger students [24]. Moreover, another study among medical students of Taif University reported a statistically significant difference in health anxiety between students of preclinical and clinical years (21 % vs. 14 %) [39]. However, other studies showed no significant association between anxiety and the stage of training. However, these reported that health anxiety reduced as students advanced in medical training [24,39,40]. Moreover, in the current study, we found that gender was not associated significantly with the increased prevalence of MSS among medical students, with a slightly higher prevalence among female students, which is reported in some previous studies [30,40]. Moreover, having a medical professional in their family has no impact on the prevalence of MSS among medical students in this study which is in disagreement with the results of another study which showed that a lower prevalence of health anxiety is seen among students having a medical professional in their family [41–43].

The secondary goal of this study was to assess the impact of having MSS on the student's academic performance as represented by GPA. The results of our research showed that MSS had a significantly negative impact on students' academic performance. This is similar to other studies showing a significant correlation between anxiety, stress, and poor academic performance of medical students [44–46]. The same results were reported among non-medical students indicating that the impact of anxiety is generalized among all students [47–49].

In conclusion, medical students are more vulnerable to mental conditions like medical students' syndrome, which significantly negatively impacts their academic achievement. Therefore, there is a need to counsel medical students about the symptoms of MSS, highlight coping techniques, and support them by discussing different strategies to alleviate the stress level.

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The application of integrated MRI CSF flowmetry in the diagnosis and treatment of CSF dynamic changes in hydrocephalus patients: a systematic review

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Abstract

Background: CSF has contributed to the growth of brain development during the time of evolution and later protects against external trauma. Idiopathic normal pressure hydrocephalus (iNPH) is known as an aberration of intracranial hydrodynamics resulting in the accumulation of CSF endo-ventricular. The use of phase-contrast (PC) MRI is proven effective in assessing the communication of arachnoid cyst and subarachnoid CSF spaces. The CSF flow MRI has been found to show efficacy in differentiation between the communicating and non-communicating hydrocephalus for localizing obstruction levels in obstructive hydrocephalus and later providing important information concerning the preoperative evaluation of NPH, along with the differential diagnosis and the prediction of the related advantages from surgery and post-operative follow-up. Hence, the present study aimed for analyzing the role of MRI CSF flowmetry in the evaluation of patients with suspected hydrocephalus.

Method: The role of MRI CSF flowmetry in the evaluation of patients with suspected hydrocephalus was undertaken by conducting a systematic literature review. The current review was reported as required reporting features for systematic reviews and meta-analysis statements (PRISMA). The systematic literature review included a total of 22 studies that analyzed the various applications of MRI CSF flowmetry in the medical field, mainly focusing on the use of MRI CSF flowmetry in the evaluation of patients with suspected hydrocephalus.

Results: The result mainly included the identification of the CSF flow by integrating the PC MRI technique and the aqueduct-CSF flow rate was detected accurately showing as statistically significant in diagnosis of NPH. Evaluating the peak velocities and aqueductal stroke volume (ASV) showed a significant increase among hydrocephalus patients.

Conclusion: The condition of hydrocephalus makes the ventricular size increase and eventually puts pressure on the brain due to excess accumulation of fluid while blocking the CSF flow after it exits ventricles. Currently, many imaging techniques are available for the detection of hydrocephalus that study the CSF flow dynamics and its related parameters. Among them, the MRI technique is the most reliable, rapid, and most importantly, a non-invasive method for the quantitative measurement of CSF flow rate and intracranial pulsations.

Keywords: Intracranial pressure, Magnetic resonance imaging (MRI), MRI CSF Flowmetry, Neurological disorder, CSF dynamics

Introduction

The cerebrospinal fluid is formed initially within choroid plexus in ventricles with 500 mL flow rate every day. The CSF flows at downward direction around the spinal cord and above cerebral convexities when it enters into the SAS. The resorption method for CSF was dependent upon the tracer studies conducted during previous decades through the use of large molecules. The microscopic flow of CSF is explained in terms of the functioning of the lymphatic system in different body parts (Iliff et al., 2012). CSF has contributed to the growth of brain development during the time of evolution and later provides protection against external trauma (Fan et al., 2012). The flow of CSF is observed into and from motion through aqueduct of Sylvius and the foramen magnum. During the condition of systole, the flow of CSF continues from the aqueduct and foramen magnum within the caudal direction and later back in diastole. Hence, this flow is considered to be pulsative which can be measured phase-contrast MRI (Raybaud, 2004).

Normal-pressure hydrocephalus (NPH) is still considered to possess no appropriate cause of occurrence to date. Different theories of normal-pressure hydrocephalus (NPH) are available in which one theory implicates the reduction in CSF absorption and the other one is dependent upon the changes within periventricular ischemic resulting in slowing down the discharge of CSF from extracellular spaces while in turn resulting into evolving ventricular enlargement due to effect of back pressure. The infants suffer from progressive macrocephaly and the childhood phase presents the patient having symptoms of increased intracranial tension in case of normal-pressure hydrocephalus (NPH); NPH being categorized as communicating and non-communicating/obstructive hydrocephalus.

Idiopathic normal pressure hydrocephalus (iNPH) has been known as an aberration of intracranial hydrodynamics resulting in the accumulation of CSF endo-ventricular (Jacobsson et al., 2018). In this condition, the brain shows compression against the calvaria while boosting arterial pulsation with progressive vascular damage atrophy along with reducing the ventricular squeezing, known to be the force-moving CSF (Bradley, 2015). iNPH is managed by CSF stroke volume (SV) known to be the predictor of CSF shunting outcome (Abbey et al., 2009; Marmarou et al., 2005).

Most of the cases of normal pressure hydrocephalus (NPH) have been known as idiopathic. Rising cases of NPH have been found to be increasing mostly among the elderly population. Different types of MRI features such as ventriculometry, periventricular hyperintensity, crowding of gyri at the vertex and several other symptoms have represented the occurrence of NPH. The evaluation of CSF dynamics among the patients suffering from hydrocephalus was considered an important aspect. Phase-contrast MRI (PC-MRI) is considered as the common MRI technique for the evaluation of CSF flow dynamics in real-time. The utilization of these MRI techniques of CSF flow is combined with cardiac cycle and CSF flow dynamics which is later evaluated by integrating different parameters. The evaluation of CSF flow dynamics using cine magnitude imaging has been found in the initial phase of discovery (Post et al., 1986). Hence, the phase-contrast MRI has been found effective in determining the CSF flow velocity which is considered to be quantitative along with its combination to qualitative assessment.

Void of CSF flow is representative of hyperdynamic CSF flow showing similarity with flow voids observed within the arteries after conducting MR imaging. Correlation of CSF flow void after obtaining conventional spin-echo images was observed with the response towards ventriculoperitoneal shunting. The modern techniques of MR imaging involving the fast/turbo spin-echo have been known to be intrinsically flow-compensated that does not consist of the same flow void as observed during the initial phases of MR imaging. The above characteristics have resulted in developing advanced phase-contrast (PC) MR imaging techniques for the estimation of CSF flow for selecting appropriate symptomatic patients for undergoing ventriculoperitoneal shunting for NPH.

Different types of tests were undertaken for the diagnosis of NPH involving the invasive methods, that resulted in serious complications. Hence, the application of flow-sensitive cardiac gated phase-contrast MR imaging techniques are integrated which is capable of providing significant care for the non-invasive study of CSF flow dynamics (Siraj, 2011). The CSF flow MRI has been found to show efficacy in differentiation between the communicating and noncommunicating hydrocephalus for localizing the level of obstruction in obstructive hydrocephalus and later providing important information concerning the preoperative evaluation of NPH, along with the differential diagnosis and the prediction of the related advantages from surgery and post-operative follow-up (Ng et al., 2009). Therefore, the utilization of different imaging techniques has been integrated for accessing the visualization of physiological processes and structural details along with diagnostic tests and prognostic tools utilized in assessing the patients suffering from NPH (Halperin et al., 2015).

The application of PC-MRI has been widely used with clinical perspectives that range from NPH evaluation along with follow up, surgical decision and post-surgery and post shunting status, Chairi malformation, syringomyelic cyst, posterior cystic malformation, etc. NPH was previously considered as an idiopathic entity which is now being increasingly identified as a chronic communicating hydrocephalus providing effectiveness to the patients belonging to the group from VP shunting. The incidence of NPH was estimated as 5.5 per 100,000 and prevalence is 21.9 per 100,000 (Brean and Eide, 2008).

Aims and Objectives

The present study aims for analyzing the role of MRI CSF flowmetry in the evaluation of patients with suspected hydrocephalus. The following objectives and research questions have been framed as per the major aim of the study:

1 Objectives of the study:
The following objectives have been obtained for conducting the systematic literature review within the study:
● To determine the role of MRI CSF flowmetry in diagnosis and treatment in intracranial CSF Dynamics of hydrocephalus
● To assess the integration of MRI CSF flowmetry for diagnosis and treatment in intracranial CSF Dynamics of hydrocephalus
● To determine the changes in intracranial CSF Dynamics of hydrocephalus patients in comparison to the mechanism of normal CSF circulation
● To evaluate the possible outcome for the comparative analysis of changes in intracranial CSF Dynamics of hydrocephalus patients with the mechanism of normal CSF circulation

Materials and Methods

The current review was integrated towards the preferable features for systematic reviews and meta-analysis statements (PRISMA).

1 PRISMA methodology:
The impact of changes in intracranial CSF Dynamics of hydrocephalus on the patients' health has been studied in the present study. The mechanism of normal CSF circulation has been analyzed. The diagnosis and related treatments for intracranial CSF Dynamics of hydrocephalus patients have been determined. The role of MRI CSF flowmetry in diagnosis and treatment in intracranial CSF Dynamics of hydrocephalus have been determined in the present study. The integration of MRI CSF flowmetry for diagnosis and treatment in intracranial CSF Dynamics of hydrocephalus has been assessed in the present study. The changes in intracranial CSF Dynamics of hydrocephalus patients compared with the mechanism of normal CSF circulation have been clearly represented. The relative outcome for the comparative analysis of changes in intracranial CSF Dynamics of hydrocephalus patients with the mechanism of normal CSF circulation has been determined. PRISMA analysis was carried out for identification, screening, and selection of studies for supporting systematic literature review.

2 Search Strategy
Utilization of electronic databases was checked for research papers using the keywords "Cerebrospinal fluid (CSF)", "Normal-pressure hydrocephalus (NPH)", "Intracranial pressure", "Magnetic resonance imaging (MRI)", "MRI CSF Flowmetry", "Neurological disorder", "CSF dynamics", etc. Various databases involving Google Scholar, Pub Med, Scopus and Elsevier were screened,

and studies with the integration of framework and models were taken into consideration for this study. Also, the search in the databases was conducted in a period of 10 years, 2011-2021. A total 19,046 articles constituting the articles were screened.

3 Eligibility criteria:
Following is the criteria for study inclusion and exclusion:
● Criteria for study inclusion: The study represents the information regarding the applications of MRI CSF flowmetry in the medical field. The application of MRI CSF flowmetry in the evaluation of patients with suspected hydrocephalus has been taken into consideration. The studies showing the extent of successful integration of CSF circulation in suspected hydrocephalus patients were included in this study. The inclusion of the obtained differences observed in normal individuals from the studies has been included. The detection of CSF changes were accurately compared to other existing techniques for hydrocephalus.
● Criteria for study exclusion: Studies with the absence of any application of MRI CSF flowmetry were excluded from this study. The patients with no suspicion of hydrocephalus have been excluded from the study. The studies showing no efficacy rate of integrating the use of CSF circulation for suspected hydrocephalus patients were excluded from the study. The studies not representing any changes related to CSF flowmetry have been excluded from the study.
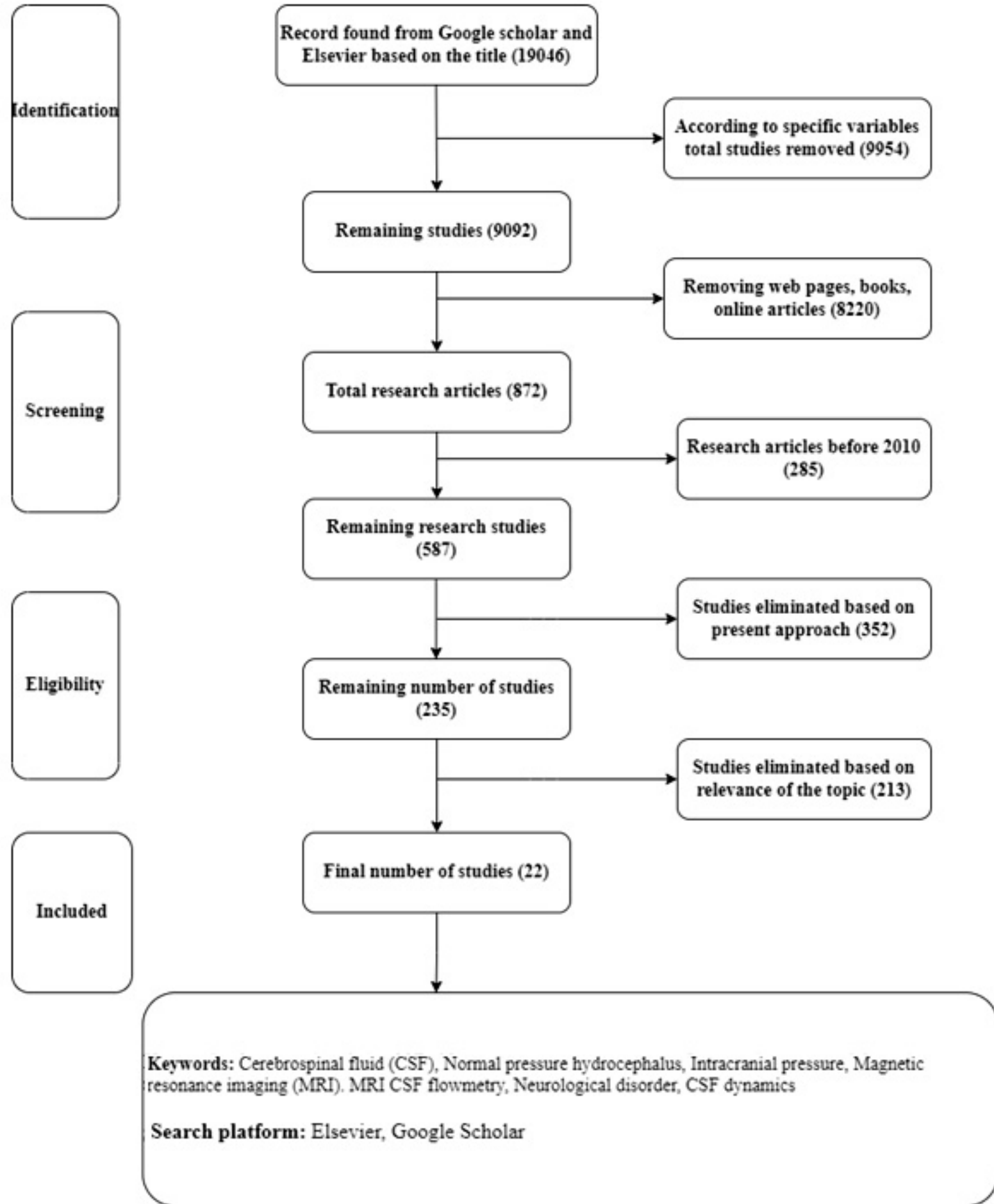
4 Study selection:
Studies showing relevancy were selected by adopting the search strategy in two steps. Firstly, the articles with appropriate topics were independently involved with the process of screening using important keywords concerned with the study, and important information regarding the same was utilised. The available titles and abstracts were recognized and examined in terms revealing the justification of the included studies present in the paper. The second step involved the investigation of the full-text articles appropriately by reviewing them in an independent manner. The utilization of Google Scholar (https://scholar. google.com/), and Elsevier (https://www.elsevier.com/en-in) was observed for citing the papers so that relevant articles with key findings could be included in the study in subsequent primary research. After study selection, if there were any disagreements it was mutually discussed, and a consensus was made before the inclusion of the study in this review. The review included a final total of 22 studies

5 Data extraction:
Studies justifying the inclusion criteria were used for processing the related articles for data extraction. The primary focus of the review was determining the role of MRI CSF flowmetry in diagnosis and treatment in intracranial CSF Dynamics of hydrocephalus. The secondary outcome included the integration of MRI CSF flowmetry for diagnosis and treatment in intracranial CSF Dynamics of hydrocephalus. It included the data on the following study characteristics - the name of the first

Figure 1: PRISMA model


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Identification

    Record found from Google scholar and
    Elsevier based on the title (19046)
                    │
                    ├──────────────→  According to specific variables
                    │                 total studies removed (9954)
                    ▼
           Remaining studies (9092)
                    │
                    ├──────────────→  Removing web pages, books,
                    │                 online articles (8220)

Screening           ▼
           Total research articles (872)
                    │
                    ├──────────────→  Research articles before 2010
                    │                 (285)
                    ▼
           Remaining research studies
                    (587)
                    │
                    ├──────────────→  Studies eliminated based on
                    │                 present approach (352)

Eligibility         ▼
           Remaining number of studies
                    (235)
                    │
                    ├──────────────→  Studies eliminated based on
                    │                 relevance of the topic (213)
                    ▼
           Final number of studies (22)

Included            │
                    ▼
    Keywords: Cerebrospinal fluid (CSF), Normal pressure hydrocephalus, Intracranial pressure, Magnetic
    resonance imaging (MRI). MRI CSF flowmetry, Neurological disorder, CSF dynamics

    Search platform: Elsevier, Google Scholar
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author, year of publication, the population, and the sample size used in the study, the study analyzed the role of MRI CSF flowmetry in diagnosis and treatment in intracranial CSF Dynamics of hydrocephalus, MRI CSF flowmetry was used for diagnosis and treatment in intracranial CSF Dynamics of hydrocephalus, changes in intracranial CSF Dynamics of hydrocephalus patients in comparison to the mechanism of normal CSF circulation, possible outcome for the comparative analysis of changes in intracranial CSF Dynamics of hydrocephalus patients with the mechanism of normal CSF circulation, a summary of the analyzed result, and the significance involved.

8 Data analysis:

The present study analyzed the data along with the interpretation of the results of the selected studies. The data analysis includes is difficult due to the availability of a sheer volume of information. The synthesis of findings from multiple qualitative studies was undertaken and a collection of major findings were included for analyzing the major outcome of the systematic literature review. The quantitative studies of similar quality and methodology were analyzed, compared, and aggregated.

Results and Discussion

The present systematic literature review included a total of 22 studies and analyzed the various applications of MRI CSF flowmetry in the medical field. In the present review, we explored the use of MRI CSF flowmetry in the evaluation of patients with suspected hydrocephalus. The extent to which MRI CSF is advantageous in the detection of CSF circulation in suspected hydrocephalus patients and the differences observed in normal individuals have been explored in the review. In order to justify the role of MRI CSF flowmetry in the evaluation of patients with suspected hydrocephalus, various studies have been screened out showing the application of MRI flowmetry in detecting CSF changes accurately as compared to other existing techniques.

Normal-pressure hydrocephalus (NPH) is considered a nebulous entity having no definite cause. Many tests have been conducted till now for the diagnosis of idiopathic NPH (iNPH) such as invasive methods that have resulted in serious complications and this is the reason, non-invasive techniques are required for increasing the specificity and sensitivity of imaging techniques used routinely. Youssef, Magdy, and Abdul-Rahman (2021) conducted a study to evaluate the role of MRI-CSF flowmetry, a noninvasive method in the diagnosis of iNPH in patients with clinically suspected hydrocephalus. The results of the study showed that 76% of the patients were diagnosed with NPH with phase-contrast (PC) MRI and 26% with hypo dynamic flow of CSF across the aqueduct in the study. The results suggest that PC MRI CSF flowmetry is a technique having high specificity and sensitivity in the diagnosis of NPH and differentiates from atrophic dilatation being a non-invasive method. Additionally, this method adds more accuracy to conventional MRI techniques by providing valuable information and reducing rates of complications as well as

predicting responsiveness to shunt surgery. This result correlates with a study conducted by Al-Zain et al. (2008) wherein the results showed that the PC MRI technique helped in identifying the CSF flow and the patients were classified into iNPH and brain atrophy. An aqueduct-CSF flow rate was accurately detected by PC MRI technique which is statistically significant in the diagnosis of iNPH.

Pulsatile CSF flow rate diagrams are used for the inlet and outlet boundary conditions (BCs) in context to changes in CSF volume in the ventricular system. BC evaluation is suggested to investigate intracranial compliance in hydrocephalus patients. It is quite challenging in biomechanical simulations to evaluate BCs in terms of natural BCs such as load or pressure and essential BCs in non-slip-boundary conditions in hydrocephalus modelling. CINE-PC MRI technique helps in BCs investigation in improving the computer simulation of CSF dynamics in patients with hydrocephalus and was investigated by Gholampour and Fatouraee, (2021). The results showed that the CINE-PC MRI technique assessed the differences between the inlet/outlet BCs quite accurately in normal individuals and hydrocephalus patients. A similar study has been conducted by Akay et al. (2015) wherein the CINE-PC MR imaging technique was used to evaluate CSF flow dynamics across the aqueduct in patients with idiopathic intracranial hypertension (IIH) patients. The results of the study showed differences in the mean rate and flow of CSF across the aqueduct which is higher in patients with IIH as compared to controls suggesting that CSF flow analysis using the CINE-PC MR imaging technique is a marker for IIH patients. This result correlated with another study conducted by Yılmaz et al. (2019) to evaluate CSF flow dynamics in communicating hydrocephalus and IIH using the MRI technique. In hydrocephalus, the width of aqueductus sylvii (AS) or prepontine cistern (PPC) was found to be significantly higher along with other metrics in CSF flow dynamics having the standardized sum of diastolic and systolic flow durations which were found to be lower. Additionally, with the MRI technique, peak velocities and aqueductal stroke volume (ASV) were significantly increased in the case of hydrocephalus.

Owler et al. (2004) conducted a study wherein O-water positron emission tomography with MR and CSF infusion studies was applied for studying the changes in cerebral blood flow (CBF) with changes in pressure of CSF among patients with NPH. O-water PET with MRI imaging approach helps in studying the dynamic characteristics of NPH in terms of the cerebral vasculature. A computerized CSF infusion study and O-water PET scanning with MR co-registration are used for measuring cerebral pressure autoregulation in NPH patients.

Determination of pulsatile aqueductal CSF flow velocity and stroke volume using the CINE-PC MRI technique would aid in the assessment of intracranial pulsations in iNPH. Jaeger et al. 2016 conducted a study for the diagnosis of iNPH wherein Mean ICP pulse wave amplitude (MWA) and non-invasive cine PC-MRI was done for the quantitative aqueductal CSF flow rate as it is the gold standard for

measuring intracranial pulsations. The results of the study showed the interplay of pulsations derived from MRI measurements and continuous ICP measurements to understand the CSF MRI flow dynamics.

In patients with NPH, the standard treatment is a ventriculoperitoneal (VP) shunt placement. However, not all patients are eligible and respond effectively to shunt surgery. Patients who are in the early stage of NPH seem to respond better to VP shunt as compared to patients who are in the later stage of NPH due to changes in the CSF flow dynamics. Over the years, many techniques have detected elevated CSF flow in aqueducts of clinical NPH patients and recently, CSF flow in NPH patients could be observed more accurately across the aqueduct by the CINE-PC MR imaging technique. Considering this fact, Witthiwej et al. (2012) conducted a study to evaluate patients with clinical NPH whether they are eligible and responsive towards shunt replacement. The results of the study suggested that cine-PC MRI could be a potential tool to study CSF flow dynamics for predicting the outcome of VP shunt placement in NPH patients. In the year 2015, Bradley also conducted a similar study to evaluate whether CSF flow dynamics need to be studied in patients presenting with clinical NPH. This is because hyperdynamic CSF flow has been observed across the aqueduct in patients with NPH having ventricular enlargement without cerebral atrophy. The study of CSF flow dynamics helps to predict the patients who would respond better to VP shunting as compared to individuals with decreased or normal CSF flow. NPH patients have been found to have larger intracranial volumes as compared to normal individuals and so, the study of CSF flow dynamics is important testing done by PC-MR imaging technique to evaluate a symptomatic NPH patient for VP shunting.

iNPH is a disorder of incontinence, gait impairment, and dementia and specific testing includes assessment of patients in terms of testing of CSF hydrodynamics. In iNPH patients, shunt surgery can improve the condition and this differential diagnosis is possible with imaging techniques like MRI technique. With PC-MRI, the evaluation of CSF flow dynamics provides relevant information about the diagnosis of iNPH superior to CT scan. High-resolution and high-speed MRI techniques could better identify the aqueductal stenosis and hyperdynamic aqueductal CSF flow which is associated with shunt-responsive iNPH (Williams and Relkin, 2013). This result correlates with a study conducted by Kartal and Algin (2014) wherein they highlighted the fact that MRI is not only beneficial in the diagnosis of CSF-related disorders like hydrocephalus, but also helps in the planning and management of the condition post-surgery and in the follow-up of the patients. In complex conditions, the PC-MRI technique helps to prevent false results in the case of the 3D-SPACE technique. In the case of non-communicating hydrocephalus, the MRI technique gives the most significant results as it helps to discriminate between chronic and acute forms of hydrocephalus such as periventricular hyperintensities which is consistent with the condition of acute interstitial oedema. The obstructed sites are detected accurately specific to the condition with the MRI technique.

Currently, PC-MRI is being used to measure the CSF volume that is flowing through the aqueduct in either direction over one cardiac cycle. When there is an elevation in the aqueductal CSF stroke volume (ACSV), there is an excellent chance for the patients with NPH towards shunt responsiveness. Bradley Jr (2016) shed light on the fact that MRI performed on an individual suspected with NPH shows ventricular dilation which is out of proportion to any sulcal enlargement which is a common pattern in hydrocephalus instead of atrophy. CSF flow void which indicates hyperdynamic CSF flow observed as flow voids could be visualized in arteries with MRI technique. Furthermore, the PC-MRI technique was developed that evaluated CSF flow for the selection of symptomatic patients who are responsive to VP shunt replacement in NPH. PC-MRI provides better resolution of the aqueduct as it is quite small in a few minutes. Lakhera et al. (2020) also conducted a study to evaluate the flow alterations of CSF in patients with meningitis using the PC-MRI technique. Quantitative CSF analysis was done at the cerebral aqueduct level by applying cardiac-gated PC-MRI. The results of the study showed wide variations in the CSF flow parameters noted in the case of meningitis patients irrespective of ventricular dilatation. Additionally, stroke volume and peak velocity also showed a significant difference in the case of patients with meningitis, and milder alterations were observed in the case of viral meningitis due to tuberculous and bacterial etiologies. This suggests that PC-MRI is highly sensitive to alterations in CSF flow dynamics which could improve the segregation of patients into non-viral and viral etiologies in meningitis supporting appropriate treatment.

Abdelhameed, Darweesh, and Bedair (2017) conducted a study to evaluate hydrocephalus in pediatric patients using MRI CSF flowmetry such as PC-MRI which is a non-invasive, rapid, and simple technique. Cine PC-MRI images detect the flow of CSF in a dynamic, more pleasing, and acceptable manner clearly depicting the obstruction that is present along the CSF pathway and in conditions where the obstruction is common such as AS and foramen of Monro. The results of the study showed that PC-MRI shows high sensitivity to even small flows of CSF and so it can be used in the evaluation of CSF both quantitatively and qualitatively and could also be applied in conjunction with the conventional technique of MRI in the assessment of hydrocephalus. This study correlates with another one conducted by Öztürk, Sığırcı, and Ünlü (2016) wherein cine-PC MRI technique was used to determine the differences in the parameters of aqueductal CSF flow in childhood as per gender and age groups divided into infants, children, and adolescents. For the quantitative evaluation of CSF flow, transverse plane images were taken at the level of cerebral aqueduct using the PC-MRI angiography technique. Although the results showed no differences in terms of gender and age in the area of the aqueduct, differences were observed in terms of cranial direction volume, peak velocity, and caudal direction among the three groups. This indicates that the PC-MRI technique could be used for determining the CSF flow parameters such as volume, velocity, and aqueduct area in a healthy pediatric population.

Abdalla and Zghair (2019) conducted a study using the PC-MRI technique that could be beneficial in the assessment of NPH differentiating it from involutional atrophy. PC-MRI flowmetry technique provided distinct differences in CSF parameters such as peak systolic velocity, mean systolic velocity, and systolic stroke volume between the patients and the control group. This indicates that PC-MRI is a useful tool for clinicians to differentiate between the two overlapping conditions, age-related brain atrophy and NPH in a non-invasive manner, especially among the elderly population. This non-invasive imaging technique has the potential to exclude patients with similar symptoms that may result in dementia. Another study conducted by Ringstad (2018) explored the characteristics of CSF flow dynamics in patients with iNPH condition whose cause is unknown but characterized typically by urinary incontinence, gait disorder, and dementia. MRI technique helps in the measurement of pulsatile intracranial CSF flow and compares it with intracranial pressure (ICP) pulsatility in patients with iNPH.

El Falaky, Metwally, and Abdelalim (2012) stated the fact that MRI CSF flowmetry, a noninvasive method is helpful in establishing the diagnosis of NPH and predicts that whether after the shunting procedure, the condition of the patient will improve or not. The results of the study showed that after the patients with NPH underwent MRI CSF flowmetry and lumbar tap for the confirmation followed by shunt insertion, immense improvement was noted in all the cases. There was improvement observed in terms of cognitive functioning and gait with improved bladder control. This indicates that MRI CSF flowmetry is a safe and reliable investigation for the diagnosis of NPH. Medica (2017) also conducted a similar study using cine-PC MRI to measure aqueductal stroke volume (ACSV) for the selection of patients with NPH who would be suitable candidates for the VP shunt surgery. ACSV measurements scanned by PC-MRI helped to select the patients suitable for shunt surgery more appropriately. The results of the study showed that the PC-MR imaging technique is beneficial in detecting the ACSV measurements which in turn is useful in stratifying patients with NPH after the shunt surgery which may be improved or not improved. In patients with high ACSV values, it is wise to apply a CSF diversion in the form of shunt surgery to prevent atrophy and ischemia. Similarly, a drop in the values of ACSV indicates that patients have benefitted from the shunt surgery detected by MRI CSF flowmetry, a non-invasive technique.

Metafratzi et al. (2020) conducted a study to evaluate that spontaneous intracranial hypotension (SIH) could be detected using MR CSF flow dynamics that present intense contrast enhancement in dura mater, diffuse smooth thickening, and increase in the size of pituitary gland along with downward brain displacement. Engorgement of the cavernous sinuses has also been reported in SIH detected by the MR imaging technique. Additionally, the PC-MRI technique which studied the CSF flow dynamics also revealed that there is a decrease in the diastolic and systolic CSF flow volume at the aqueduct level in SIH when it subsided. This indicates that CSF flow dynamics have an important role in SIH pathogenesis as revealed by PC-MRI and CSF dynamics normalized as SIH subsided. PC-MRI studies provide clinical information about VSF flow and help in the diagnosis of patients with suspected SIH conditions.

Yamada et al. (2020) conducted a study to evaluate the complex movements of CSF in patients with iNPH along with shear stress on a 4D flow MRI. The parameters in CSF movements such as shear stress, stroke volume, and reversed-flow rate were calculated along with relationships that were assessed between the morphological measurements and flow-related parameters. The results of the study showed that the flow-related parameters at the level of the cerebral aqueduct were found to be higher in patients with iNPH along with higher shear stress in context to ventral aspect at the level of the cerebral aqueduct. This indicates that 4D flow MRI is a useful imaging technique for detecting CSF flow-related parameters in the diagnosis of iNPH and could also elucidate the ventricular enlargement mechanism in iNPH. CSF stroke volume was found to be higher in iNPH patients with high shear stress at the cerebral aqueduct and was found to be associated significantly with the foramen of Magendie diameter.

Conclusion

From the above discussion, it is evident that hydrocephalus is a condition wherein there is abnormal fluid accumulation in the cavities or ventricles that are deep-seated in the brain. This condition makes the ventricular size increase and eventually puts pressure on the brain due to excess accumulation of fluid. In hydrocephalus, CSF flow is blocked after it exits ventricles. This is the reason, it is crucial to study the CSF flow dynamics to detect the condition in suspected individuals. Moreover, it is a serious condition with unknown cause and hydrocephalus also shares symptoms with other conditions such as aqueductal stenosis (AS), brain atrophy and other such disorders. Therefore, it is important to detect the hydrocephalus condition to have early diagnosis, treatment and proper management of the patients suspected with such conditions, especially among the paediatric population and also to differentiate it from other conditions with overlapping symptoms. Currently, many imaging techniques are available for the detection of hydrocephalus that studies the CSF flow dynamics and its related parameters. Among them, MRI technique is the most reliable, rapid and most importantly, a non-invasive method for the quantitative measurement of CSF flow rate and intracranial pulsations. MRI is not only beneficial in the diagnosis of CSF-related disorders like hydrocephalus, but also helps in the planning and management of the condition post-surgery as it predicts the condition of the patient and their responsiveness towards shunt surgery. Additionally, with the MRI technique, peak velocities and aqueductal stroke volume (ASV) could be detected significantly in case of patients with hydrocephalus. Apart from PC-MRI, cine-PC MRI and 4D MRI techniques

evaluate the complex CSF movements such as shear stress, stroke volume, and reversed-flow rate in the case of iNPH. PC-MRI technique gives higher specificity and sensitivity towards CSF flow dynamics as it can detect even a small change in the CSF movement. Therefore, it can be said that MR imaging technique detects the CSF flow dynamics more accurately compared to other existing techniques not only in the diagnosis of hydrocephalus condition but also in differentiating it from other disorders sharing the same symptomatology and predicting responsiveness to shunt surgery in NPH.

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Conflict of interest

The authors have no conflicts of interest to disclose

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