Prevalence of Anxiety and Depression among postgraduate trainees in Qassim, Saudi Arabia

Population and Community Studies

Editorial

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This is the third issue this years with papers from the MENA region dealing with topics of importance for healthcare profession.

Alrashhedi et al., did a cross-section study looking at prevalence of Anxiety and Depression among postgraduate trainees in Qassim, Saudi Arabia. Depression Anxiety and Stress Scale (DASS-21) was used to measure the outcome variables. Logistic regression was used to assess the risk factors of depression, anxiety and stress. The prevalence of depression, anxiety and stress were 49.6%, 57% and 39.5% respectively. The authors concluded that a higher prevalence of mental disorders among postgraduate trainees in Qassim region of Saudi Arabia. This calls for implementing screening and support programs for trainees to improve their mental health and thus their learning and quality of care being provided by them.

Ali Holal, et al., did a descriptive questionnaire-based cross-sectional study of family physicians in Jazan to identify primary healthcare (PHC) physicians' emergency management competence and the barriers they experience when dealing with emergency cases. The study included 450 PHC physicians, 342 (77.8%) were males, and 364 (82.7%) were Saudi. When compared to Arab Board of Family Medicine (ABFM) certification, physicians did better if they had Family Medicine (FM) Diploma (OR = 1.1486, p =

0.03704) or MBBS (OR = 1.1529, p = 0.00371). Compared to physicians who attended Basic Life Support (BLS) courses within the last 12 months, competence in clinical emergencies was far worse for those who did not do BLS (OR = 0.6710, p <0.001), or did it over two years ago (OR = 0.8796, p<0.001). The authors concluded that BLS and ATLS courses improve perceived competence among PHC physicians. There is a potential gap in defibrillation training among PHC-based family physicians in the southwestern area of Saudi Arabia. Therefore, BLS training should be an integral part of family physician core competence in handling emergency cases. More educational training should be devoted to defibrillation skills in clinical practice.

Timorkhan and Ibraheem reviewed studies focused on digital device usage, near work, and outdoor time in relation to myopia onset and progression in children during COVID-19 pandemic. And studies focused on the relation between screen time, asthenopia and dry eyes in children during COVID-19. Increased digital screen time, near work, and limited outdoor activities were found to be associated with the onset and progression of myopia during the COVID-19 pandemic period. Screen time was positively associated with asthenopia and dry eye in children during COVID-19. The authors concluded that the COVID-19 pandemic has led to dramatic changes in many aspects of daily life. Online learning has become the mainstream public learning mode during the pandemic. Several studies indicate accelerated myopic progression during the COVID-19 pandemic in children and the increase has been found to be related to excessive use of digital screen devices and the decrease of outdoor activities duration. Also prolonged screen time, and online-course time can significantly increase asthenopia and dry eye risk. Several studies recommended to decrease screen time and to increase outdoor activities.

Mathew et al., reported a case of multiple myeloma during the Covid 19 pandemic. They presented a 54-year-old gentleman whose initial

presentation was a pathological rib fracture. However, a dig into his past medical history revealed gout (now asymptomatic) and abnormal laboratory findings that helped us to subsequently diagnose as Multiple Myeloma. The importance of simple investigations like ESR when managing patients with nonspecific symptoms in primary care, listening and looking for signals that suggest an alarming aetiology, following up of investigations and the continuity of care assured by the electronic medical record is highlighted by this case report.

Aldekhail et al., did a cross-sectional study enrolled 197 PHC physicians and residents from FMA Both Data were collected through an online questionnaire with variables on physicians' knowledge about amblyopia based on the Canadian Pediatric Society Recommendations for Vision Screening at Infant and Well Child Visits. The data was analyzed using SPSS version 21. The majority were Saudi 120 (60.9%). Most of the 189 (96%) knew the definition of amblyopia. But the majority of 138 (70%) were not diagnosed with a case of amblyopia before. The authors stated that the study highlighted a good knowledge level regarding amblyopia among level primary health care physicians and family medicine residence residents. However, Strategies to improve vision screening are necessary. Early intervention is crucial to prevent treatable causes of vision loss in children.

Elnahas et al., did a descriptive cross-sectional study aimed to assess the knowledge and practice of food safety awareness among Egyptian healthy adults attending family medicine outpatient clinics, Cairo University, the study involved 305 participants, Food safety knowledge and practice were evaluated by Food Safety reliable, and valid questionnaire. Only (0.3%) of participants had sufficient knowledge and (19.3%) had sufficient practice, there was statistically significant difference between the studied participants regarding practice grade and education with (78%) of participants with sufficient practice was moderate or highly educated. They concluded from this study

that the general community has insufficient food safety knowledge and practices; as a result, it is required to hold training programs in the form of workshops or to incorporate courses in the ministry of health's curriculum.

Khan, et al., did a costing study was conducted as part of randomized controlled trial on promoting safe birthing, among 60,000 pregnancies in Punjab. This costing study aimed to estimate the costs incurred by women for utilisation of skilled birth attendance. 640 women were recruited from six public health clusters in two districts of Pakistan. Health services capital cost for enhancing utilization of skilled birth attendance was Rs: 801 (US$ 8) per LHW and the recurrent per pregnant woman was Rs. 4.8 (US$ 0.05). Client cost of skilled birth utilization for normal delivery ranged from 3564(US$ 35.64) at public facility vs 5276 (US$ 52.76) at private facility, while for caesarean delivery it ranged from 10383 (US$ 103.83) at public facility to 14339 (US$ 143.39) at private facility. Cost of normal delivery was found to be correlated with category of birth attendant. The authors concluded that the birth planning intervention was found to be cost-effective in enhancing skilled birth attendance rate as compared to the control arm.

El-Gamal et al., did a cross sectional study; a non-probability convenient sampling method was used to select 1073 subjects through online Google survey the aim to study magnitude of use, determinants and awareness of CAM therapy use among the population in Western region of Saudi Arabia. Almost half of the study population used CAM (51.6%), particularly those who live in the villages of Makkah city. The authors concluded that use of CAM is a common health practice among Saudi population. Majority of the participants had equivocal awareness about its effects. More health education programs by specialized health care authorities on the use and benefits of CAM are needed. Doctor-patient communication regarding CAM use is important. Increasing awareness of Saudi population about instructions and restrictions when using CAM is greatly needed.

Bakri, and El-Setouhy, did a cross-sectional questionnaire-based observational investigation using a simple random sampling scheme. The sampling frame was all PHC physicians practicing in Jazan Province. We used the Fear-of-COVID and Pittsburgh Sleep Quality Index (PSQI) questionnaires. Poisson Regression modelling techniques were used to analyse the adjusted effect of sociodemographic factors on Fear-of-COVID and Pittsburgh Sleep Quality scores. Their study aimed to assess sleep disturbance and its association with coronaphobia among primary health care (PHC) physician in primary health care centers (PHCCs). A total of 385 physicians participated in the study. The authors concluded that Coronaphobia is common and has detrimental effect of sleep quality among PHC physicians. Coronaphobia has negative impact on sleep quality. Higher burden of depressive symptoms worsens physicians' sleep quality. They recommended that support for PHC physicians' psychological and physical well-being is paramount during the current COVID-19 crisis.

Almutairi, and Jahan, did a cross-sectional study including 288 physicians and nurses working at PHCCs in Buraidah city in Qassim region. A semi-structured self-administered questionnaire was used to estimate the frequency, timing, causes, reactions, and consequences of workplace violence in addition to participants` demographic and occupational data. Among 288 study participants, 64.2 % were nurses and 63.7% were females. The reasons of violent event included misunderstanding, unmet service demand, overcrowding, and long waiting time. No action was taken as a reaction to violent event by 56.3% of the victims while reporting to supervisors was mentioned by 34.8% of the respondents. The authors concluded that a considerable proportion of physicians and nurses in PHCCs were exposed to violence at workplace; mainly verbal type. More than half of the violent incidents were not reported. Implementation of appointment system at PHC settings and increasing awareness of patients regarding their rights and responsibilities is recommended.

Khormi, et al., did a cross-sectional study to evaluate characteristics and factors associated with tobacco use among 409 undergraduate male students in Jazan University. A self-administrated questionnaire was used for data collection. It consists of 26 questions in 3 domains, covering demographic and socioeconomic characteristics of participants, tobacco use history, and factors associated with waterpipe use. A total of 409 university students took part in this study. About three-quarters of students (73.8%) reported having a friend who smokes waterpipe and 37.7% had a sibling who smokes waterpipe, while 15.2% and 2.4% of participants had fathers and mothers who smoke waterpipe, respectively. The authors concluded that the main factors associated with waterpipe smoking are age, monthly income, and having a father, siblings or friends who smoke waterpipe. Furthermore, students who smoke cigarettes or tobacco or have many friends who smoke waterpipe are significantly more likely to engage in waterpipe smoking.

Helvaci, et al., looked at acute chest syndrome and pulmonary hypertension in sickle cell diseases. All patients with the SCD were included. The study included 222 males and 212 females with similar mean ages (30.8 versus 30.3 years, p>0.05, respectively). Pulmonary hypertension (PHT) (12.6% versus 11.7), and deep venous thrombosis and/or varices and/or telangiectasias (9.0% versus 6.6%), significantly (p>0.05 for all). Mean ages of ACS and PHT were 30.3 and 34.0 years (p<0.05), respectively. The authors concluded that a lthough smoking, alcohol, disseminated teeth losses, ileus, cirrhosis, leg ulcers, digital clubbing, CHD, CRD, COPD, and stroke-like atherosclerotic events were higher in males, and the male sex alone is a risk factor for atherosclerosis, ACS and PHT were similar in both genders, and mean age of PHT is much higher than ACS, significantly. In other words, PHT may have a hardened RBC-induced chronic, whereas ACS an acute thromboembolic backgrounds in the SCD.

Prevalence of Anxiety and Depression among postgraduate trainees in Qassim, Saudi Arabia

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Abstract

Background: Trainee doctors in postgraduate programs go through many challenges and stressor events in their life which may affect their mental health.

Objective: This study aimed to measure the prevalence and risk factor of depression, anxiety and stress among trainees of Saudi Board programs in Qassim region.

Materials & Methods: A cross-sectional study was conducted among 119 postgraduate trainees enrolled in Saudi Board Program in Qassim region. Depression Anxiety and Stress Scale (DASS-21) was used to measure the outcome variables. Logistic regression was used to assess the risk factors of depression, anxiety and stress.

Results: A quarter (25%) of the respondents were female, and half (51%) were married. The prevalence of depression, anxiety and stress were 49.6%, 57% and 39.5% respectively. We found that failing the promotion exam adjusted odds ratio (AOR) 4.43(95% CI: 1.45-13.50), being in Internal medicine AOR 3.94 (95% CI: 1.22 - 12.66) and other specialties AOR 3.56 (95% CI: 1.22-10.39) were significant risk factors of depression. Risk factors for anxiety included; failing promotion exam AOR 4.46 (1.18-16.86) and being in internal medicine AOR 8.95(95% CI: 2.39-30.84) and other specialties AOR 5.78 (95% CI: 1.88-18.72). On the other hand, being unmarried was protective of anxiety AOR 0.23(95% CI: 0.08-0.60). The only significant factor associated with stress was not passing part one exam AOR 5.06 (95% CI: 1.70 - 15.1).

Conclusions: We found a high prevalence of mental disorders among postgraduate trainees in Qassim region of Saudi Arabia. This calls for implementing screening and support programs for trainees to improve their mental health and thus their learning and quality of care being provided by them.

Key words: Anxiety, Depression, Stress, Trainees, Postgraduate, Saudi Arabia

Introduction

Anxiety and depression are common mental disorders(1) and they mostly occur together(2). Depressive disorders are mental disorder manifested as depressed mood, and loss of interest as the main criteria. Anxiety disorders are mental disorders characterized by feelings of anxiety and fear(1). Depression is one of the three common causes of disability and is anticipated to be the top most worldwide by 2030(3). Depression affects 4.4% of people around the world, in other words, 300 million people suffer from it(1). Anxiety affects 3.6% of the global population(4). Prevalence of depression in Saudi Arabia is 4.5% and anxiety is 4.3 % in the general population according to WHO(4).

There are many risk factors for developing mental disorder; one of them is stressors in life(1,4). It is well known that trainee doctors in postgraduate programs have to go through many challenges and stressful events in their life. The aim of training is to produce physicians who can treat patients and help to improve the health of community. Unfortunately, research suggests the current training may have negative effects on trainee's mental health and may lead to anxiety and depression(5). Research done in 2014 in the USA, on physicians shows that 48% of doctors had burnout symptoms which is double that of the general working population(6).

A number of studies have been conducted among postgraduate trainees to measure the burden of AD. A study done in Ontario family medicine program showed 12% of residents had anxiety, 20% had depression(7). In Tunisia, among medical residents 43% and 30% had anxiety and depression respectively(8).

There are few studies which have been conducted in KSA to measure the burden of anxiety and depression burden among family medicine residents. A study done on physicians in Jeddah KSA, showed 46 % had general anxiety disorder(9). A study from Riyadh reported that 34% of Family Medicine residents had social anxiety(10). Another study done in western KSA among medical residents showed that 75% of residents have depression(11).

It is evident from literature that residents have a high prevalence of anxiety and depression. It is well known that physicians who have health problems will be less effective in their life and work(12). Measuring the burden of depression and anxiety during training is important for informing efforts to prevent, treat, and identify causes among residents. No study to the best of our knowledge has been published which assessed anxiety and depression and associated risk factors among postgraduate residents in Qassim region of KSA. This study is therefore aimed at measuring prevalence and risk factors of anxiety and depression among trainees in Saudi Board programs in Qassim region.

Methodology

A cross sectional study was conducted among post graduate trainees currently enrolled in any of the Saudi Board program in Qassim region during October 2021. Qassim region is located in the central part of Saudi Arabia. There are 8 postgraduate programs accredited by Saudi Commission for Health Specialties in the region providing training for Saudi Board fellowship.

There are about 221 postgraduate trainees in the Qassim region. We used universal sampling and invited all the postgraduate trainees in Qassim region. Those currently working as post graduate trainees in any of the Saudi Board program were eligible to participate. Those who were in the region for electives were excluded from the study.

The data was collected online using structured questionnaire in English. The questionnaire had two sections. The first section was about socio-demographics and professional information. The second part was validated depression and anxiety stress scale (DASS21) (13). Each answer in the scale was given a score from 0-3 where 0 indicated not having the symptoms at all and 3 representing that the participant has the symptoms most of the time. A pilot study was done on 10 interns to assess the understanding of questionnaire by the respondents.

Data was analyzed using ''Statistical Package for Social Sciences'' (SPSS) V21 (Chicago). Descriptive and inferential analysis of the data was done and presented in tables and figures. Chi-square and t-test were used for comparison of categorical and continuous variables respectively. Logistic regression analysis was used to find the factors associated with anxiety and depression among residents. Adjusted odds ratio (AOR) along with their associated 95% confidence intervals (CI) were calculated. P-value <0.05 was considered significant.

This study was reviewed and approved by Qassim Regional Bioethics Committee. Informed consent was obtained from all the participants. Personal identifiers such as name and ID numbers were not collected.

Results

Of the 221 trainees invited, 119 respondents completed the questionnaire (response rate 53.8%) and were included in the analysis. Three quarters (75) were male and more than half of the respondents were married (51%). The majority (91%) were from training centers based in Buraidah. Thirty four percent were Family medicine residents followed by internal medicine (35%) and Pediatrics (20%). (Table 1),

Table 1: Socio-demographic characteristics of postgraduate trainees Qassim, KSA		
Characteristic	N	%
Gender		
Male	90	75.6
Female	29	24.3
Marital		
Married	61	51.2
Unmarried	57	48.8
Place of training		
Buraidah	106	90.6
Uniazh	11	9.4
Specialty (n=117)		
Family medicine	40	34
Pediatrics	23	19.7
Surgery	9	7.7
Internal medicine	29	24.8
Obstetrics/Gynecology	15	12.8
Orthopedics	1	0.9

Table 2 presents the results of multivariate logistic regression analysis. Anxiety was the most prevalent disorder (57%), followed by depression (49.6%). The prevalence of stress was found to be 39.5%. (Figure 1).

Table 2: Predictors of Depression, Anxiety and Stress among postgraduate trainees in Qassim, Saudi Arabia			
Characteristic	Depression Adjusted OR (95% CI)	Anxiety Adjusted OR (95% CI)	Stress Adjusted OR (95% CI)
Gender			
Male	--	--	1
Female			0.32 (0.10 − 1.02)
Marital			
Married	1	1	1
Unmarried	0.49 (0.20 - 1.16)	0.23(0.08-0.60)	0.46 (0.19 − 1.12)
Part exam			
Passed	1	1	1
Not passed	0.38(0.11-1.32)	0.35 (0.09 - 1.35)	5.06 (1.70 -15.1)
Passed promotion exam in first attempt			
Yes	1	1	
No	4.43(1.45-13.50)	4.46 (1.18-16.86)	--
Place of residence			
Buraidah	1	1	--
Other cities	1.89 (0.68-5.26)	0.66 (0.25 - 1.94)	
Specialty			
Family Medicine	1	1	1
Internal Medicine	3.94 (1.22 -12.66)	8.95(2.39-30.84)	1.95 (0.59 − 6.45)
Others	3.56 (1.22-10.39)	5.78(1.88-18.72)	2.36 (0.80 − 7.0)
Level			
Junior	1	1	1
Senior	0.55 (0.19-1.61)	0.621(0.197-1.960)	2.07 (0.78 − 5.47)

Figure 1: Prevalence of Depression, Anxiety and Stress among postgraduate trainees in Qassim, KSA
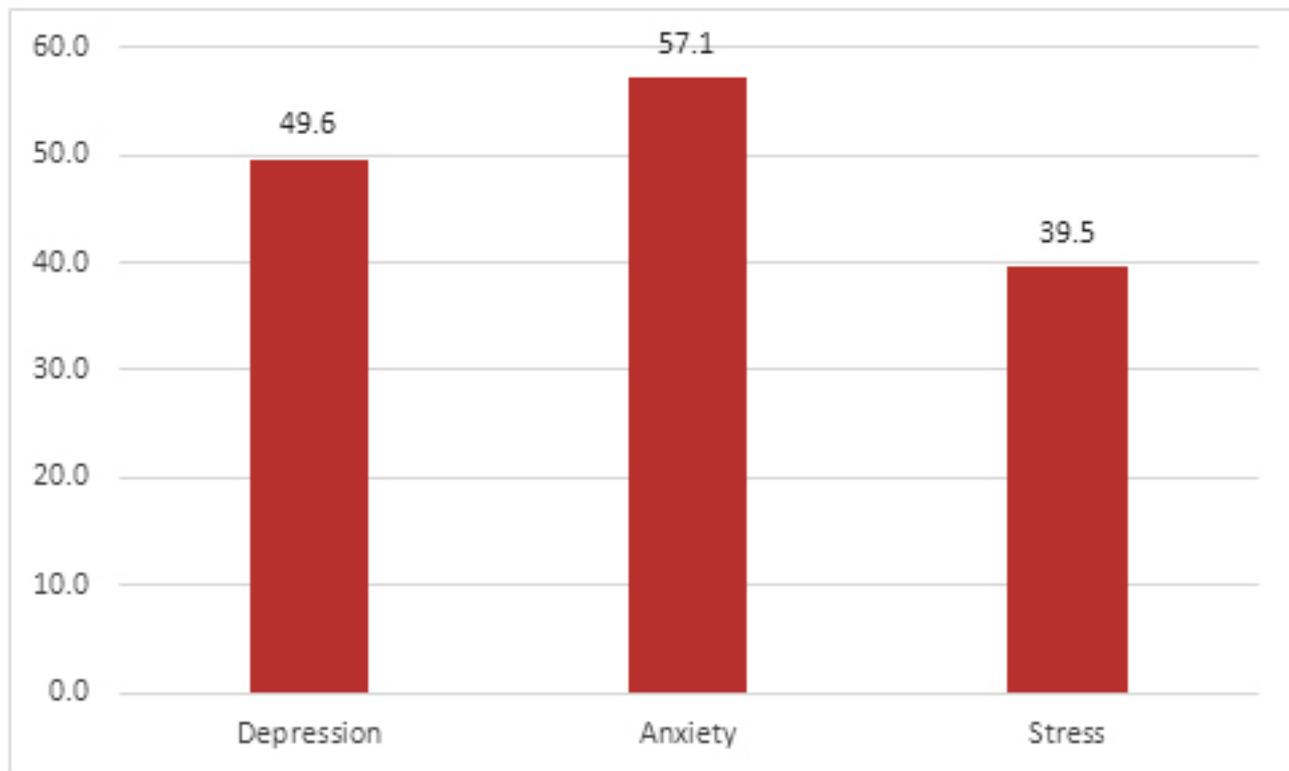
In the multivariate analysis, we found that, not passing the promotion exam in the first attempt was associated with more than four times higher risk of depression, AOR 4.43(95% CI: 1.45-13.50). Compared to Family Medicine, Internal medicine and other specialties were at higher risk of depression AOR 3.94 (95% CI: 1.22 - 12.66) and AOR 3.56 (95% CI: 1.22-10.39) respectively. Similar to depression, the risk factors for anxiety were; not passing promotion exam in first attempt AOR 4.46 (1.18-16.86) and being in internal medicine AOR 8.95(95% CI: 2.39-30.84) and other specialties AOR 5.78 (95% CI: 1.88-18.72). On the other hand, being unmarried was found to be associated with lower risk of anxiety AOR 0.23(95% CI: 0.08-0.60). The only significant factor associated with stress was not passing part one exam AOR 5.06 (95% CI: 1.70 - 15.1). Other factors such as; gender, place of residence and level of training were not found to be significantly associated with any of the outcomes.

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Discussion

Depression, anxiety and stress have bad outcomes for the physicians and patients in terms of health of the physician, and safety and effectiveness of patient diagnosis and treatment. Higher prevalence of anxiety has been reported among different communities; however, very limited evidence is available on the mental health issues among physicians in Saudi Arabia. This study therefore adds to the scarce literature on this topic. Our study revealed 56 % of the residents had anxiety and 48 % of them had depression.

There is evidence that physicians have higher prevalence of anxiety and depression than the general population(11). The mental health of Saudi physicians participating in our study showed a higher percentage of depression (48%) than other countries such as USA, Canada and Japan (11%, 14%, 8.8%) respectively(12,14,15). Similarly, there was higher prevalence of anxiety (56%) in our sample as compared to previous studies from different countries. In Pakistan, using AKUADS, 39% of family practitioners had anxiety disorders(16). In China, using Zung Self-Rating Anxiety Scale (SAS), an estimated 25% of physicians

were found to have anxiety symptoms(17). On other hand we found a high prevalence of stress (40%), which is higher than stress rates in medical college students in Saudi Arabia (38%)(18). Our estimate is comparable to the estimates from a developing country which showed 48% of the physicians in a tertiary care hospital had stress(19).

These differences across the studies may be attributed to different factors such as different study setting, design and the tools used to assess the outcomes. Nonetheless, these findings of our study are alarming and need attention of program management and health authorities to address this high rate of mental issues among postgraduate trainees.

In addition to the common risk factors prevalent in the communities, the physicians have some other work-related factors such as workload, stressor, shift duties, and work hours. We found higher prevalence of depression in internal medicine (72%) compared to other specialties which show a similar result to study done in western regions(9). We also found that 75 % of internal medicine trainees have anxiety which shows a higher percentage to a previous

study in Tunisia (74.1%), which showed the higher the work hours per week the higher the percentage(8). The difference in percentage according to specialty could be related to different workloads and number of on calls. The higher the work load and on calls the higher the prevalence(11). Workload on health care providers in Saudi Arabia is increasing due to growing and ageing population along with expansion of health care services for universal health coverage. This however, is not parallel to increase in numbers of health care providers, causing additional burden on them. This may result in poor quality of services and mental and physical health issues among the providers. This calls for appropriate human resource management by the Ministries of Health.

We found that unmarried residents had less rate of anxiety, which agrees with research done on physicians in China in 2014 by social medicine and health organization(17). Mental health issues have negative effects on care provided to patients and performance of physician. We found that depression, anxiety and stress were associated with negative results of exams. Similar were the results in a study done in King Abdul-Aziz University in Jeddah on medical students(20).

There are certain limitations which should be considered while interpreting the results of our study. Firstly, there are chances of reporting bias as trainees may not report their actual mental status given the widespread stigma associated with such disorders. However, we assume this to minimally affect our results because we used an anonymised survey approach and data was collected through self-administered questionnaire. Secondly, response rate was low (53%), so was the sample size. Due to this, our sample may not have sufficient power for the association we explored. Furthermore, there is also possibility of health workers effect where trainees with severe mental illnesses are least likely to participate. Nonetheless our research provides an insight into the mental health of postgraduate trainees in Qassim region in Saudi Arabia.

Conclusion

Trainee physicians have a high prevalence of depression and anxiety. We recommend each department should have regular screening and counselling and support programs for their trainees to address mental health issues of trainees. Furthermore, departments should also review the trainees' schedules and discuss with them regarding proper scheduling. Regulatory bodies, such as Saudi Commission for Health Specialties and Ministry of Health should also monitor and provide support to the institutions for safety and health of their trainees.

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Knowledge of Amblyopia among Primary Health Care Physicians and Family Medicine Residents: A Cross-Sectional Study in the Qassim Region of Saudi Arabia

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Abstract

Background: Amblyopia is a serious visual impairment resulting from abnormal visual stimulation during early childhood. Early detection of childhood visual abnormalities will reduce adult visual impairment. This study aimed to assess the knowledge of Amblyopia among primary Health Care (PHC) physicians and Family Medicine Residents (FMA) in Qassim Region.

Methods: A cross-sectional study enrolled 197 PHC physicians and residents from FMA. Data were collected through an online questionnaire with variables on physicians' knowledge about amblyopia based on the Canadian Pediatric Society Recommendations for Vision Screening at Infant and Well Child Visits. The data was analyzed using SPSS version 21.

Results: The respondent's average age was 35 (SD ± 8.00). Males were 103(52.3%); the majority were Saudi 120 (60.9%). Most of them, 189 (96%) knew the definition of amblyopia. But the majority of physicians, 138 (70%) had not seen or diagnosed any case of amblyopia before . The overall knowledge of the family medicine residents and PHC physicians regarding amblyopia's prevalence rate, causes, examination, and treatment was good at 178 (90.4%). However, their knowledge of referral criteria for amblyopia cases still needed more updating. No statistical relationship was identified between the participant's demographic characteristics and their level of knowledge.

Conclusions: This study highlighted a good knowledge level regarding amblyopia among primary health care physicians and family medicine residents. However, strategies to improve vision screening are necessary. Early intervention is crucial to prevent treatable causes of vision loss in children.

Keywords: Amblyopia; vision screening; Primary health Care; Qassim; Saudi Arabia

Introduction

Amblyopia often called "lazy eye", is a decrease in visual acuity resulting from abnormal visual development in infancy and early childhood (1). The vision loss ranges from mild (worse than 20/25) to severe (legal blindness, 20/200 or worse) (2). Although generally unilateral, amblyopia may affect both eyes. No apparent cause for the decreased vision can be detected on physical examination: the cornea, lens, retina, and optic disc are normal (3).

Worldwide, amblyopia affects approximately 3 % of the population and leads to a lifetime risk of visual loss of at least 1.2% (4). The prevalence of amblyopia in Saudi Arabia varies by region: 2.6% in Riyadh (5) 3.9% in Qassim province (6) 1.3 % in Jeddah (7) and 1.9 % in Abha (8). Although the prevalence of amblyopia is low still its associated serious complication is vision loss (9,10).

Early recognition of amblyogenic risk factors such as strabismus, refractive errors and anatomic obstructions can facilitate early treatment and increase the chance for recovery of visual acuity (11). Screening programs for detecting visual abnormalities in children and young adults are very important. Yet the school health program in Saudi Arabia has routine vision screening examinations for school-age children. Any child with visual acuity in either eye of 20/40 or worse at age three to five years, or 20/30 or worse at age six years or older, or a two-line difference in acuity between eyes, should be referred to an ophthalmologist for further evaluation and definitive therapy (12).

Amblyopia treatment is started at the time of diagnosis and depends on the etiology. Treatment options for children with strabismus include patching and atropine drops. Children with refractive errors should be prescribed corrective lenses. Corneal lesions, cataracts, and ptosis require surgery. The success of therapy is highly dependent on treatment compliance. Patients and their parents should be educated about the need for regular follow-up and the risk of permanent vision loss (13).

The role of the Family medicine and Primary health care (PHC) physicians is fundamental in the early detection of Ambylopia. They are the cornerstone in public health and preventive medicine. Awareness of Family medicine and PHC physicians about amblyopia and following the visual screening guidelines especially for children will reduce the prevalence of amblyopia and its complications. In this study, we assessed the knowledge and practices of the PHC physicians and Family Medicine Residents towards amblyopia.

Materials and Methods

Study design, setting, and population
This cross-sectional study was carried out between 12th October 2020 to 31st September 2020 in Qassim Region, Saudi Arabia. Qassim is located in the central part of Saudi Arabia with an estimated population of 1.5 million in 2020. About 37 Primary Health Care Centers (PHCCs) were selected from a total of 40 PHCCs founded at the Buraydah health sector in Qassim Region, Saudi Arabia. Sample Size

This study was conducted among both PHC physicians and Family Medicine Academy Residents. Targeted sample size was 247 PHC physicians and FMA residents. A total of 174 PHC physicians who are working at selected PHCCs at Buraydah health sector at the time of the study were involved. Also, all FMA Residents (73) from R1 to R4 were targeted. The study Respondents were 197 out of 247 including 55 FMA residents and 142 PHC physicians.

Sampling procedure
Convenience sampling was applied for the selection of facilities and participants. 40 PHCCs were approached for participant recruitment as well as the Qassim FMA. After explaining the purpose of the study and getting approval from the administration, participants' contact numbers were obtained from the participating facilities. A total of 197 participants were invited to participate and the link of the questionnaire was sent on their WhatsApp number.

Data collection procedure and instrument
Data was collected online using Google Form. The link of the questionnaire was sent to the participants' mobile numbers. After the initial invitation, a reminder message was sent one week after the first invitation. A semi-structured questionnaire was developed after a review of the literature, especially American and Canadian guidelines for Amblyopia diagnosis and management [14].

The questionnaire contains contained 22 items divided into two sections. Questions in the first section collected information about participants'' age, gender, nationality, Last Qualification, place of work, and years of experience and the second section collected information about the participants' knowledge regarding the amblyopic diagnosis, treatment, and perception. A pilot study was done before starting the data collection to assess the accuracy of the survey questions.

Analyses were carried out using SPSS version 21.0. Frequencies and proportions of responses were calculated. The response for assessing the participants' knowledge was shown as good or poor knowledge using statistical analysis for the nineteen knowledge questions. The knowledge questions' answers were scored as follow; score "1" was given to the correct answer, and "0" score was given for those incorrectly answered. Participants with a total knowledge score of 0–9 were categorized as "poor" knowledge and that of 10–20 as "good" knowledge.

Categorical variables were reported as frequency (n), percentage, and continuous variables as mean ± standard deviation (SD) and range. Significant differences in the frequencies and percentages of categorical variables were analyzed by using the Chi-square test. A P-value of <0.05 was considered statistically significant.

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Qassim Regional Bioethics Committee (Approval #:1441-1064995). Informed consent was obtained from all subjects involved in the study.

Results

Out of 247 PHC physicians and FMA residents invited, a total of 197 participants responded to this online survey giving a response rate of 79.8%. Characteristics of the study population are summarized in Table 1. A total of 197 physicians responded to the questionnaire. Of them 104 (52%) were male. The mean age of the participants was 35 (SD±8) years, ranging from 22 to 63 years. More than half of the respondents were Saudi 120 (61%). The last qualification of PHC physicians was ranked as follows; Consultants 17 (9%), Specialists 50 (25%), General practitioner (GP) 50 (25%), diploma 14 (7%), and the Residents 66 (34 %). The residents were found to be 16 (24%) from R4, 20 (31%) R3, 12(18%) R2 and 18 (27%) R1. The average experience years for respondents was 9 (SD±7.7) years, ranging from less than one year to 35 years.

Participants' knowledge about amblyopia
In this study, most PHC physicians and family medicine residents 178 (90.4%) had a good level of knowledge regarding amblyopia (Figure 1). The study revealed that most of the participants 189 (96%) knew what amblyopia is, but the majority 138 (70%) had never seen or diagnosed a case of amblyopia during their practices. More than half of the respondents 110 (56%) knew the vision screening guidelines. The majority of the 174 (88%) knew that amblyopia is a treatable condition. Table 2.

Figure 1: Level of Knowledge of the PHC physicians and family medicine residents about Amblyopia, Qassim Region, (n=197).
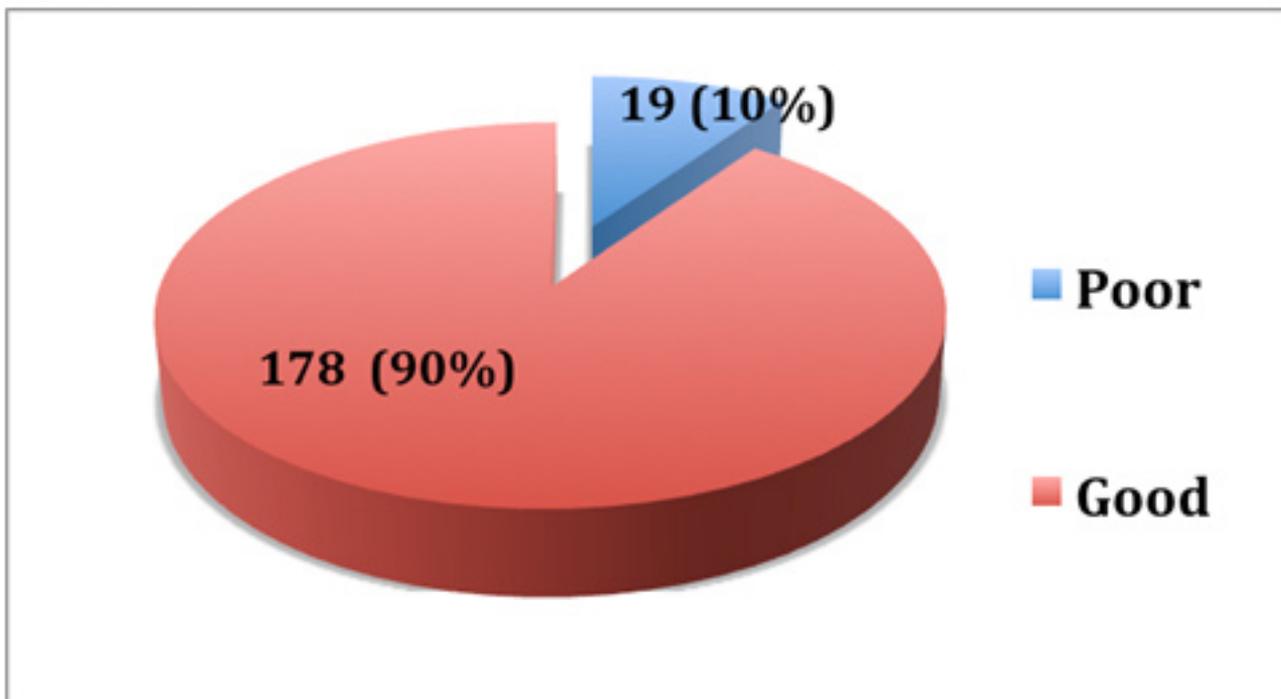
Table1: Participants' socio-demographic, Qassim Region, (n=179).

Characteristics	Frequency (n)	Percentage (%)
Age group		
25-35 years	117	59.4
36-45 years	56	28.4
46-55 years	17	8.6
>55 years	7	3. 6
Gender		
Male	103	52.3
Female	94	47.7
Nationality		
Saudi	120	60.9
Non-Saudi	77	39.1
Last Qualification		
Consultant	17	8.6
Specialist	50	25.4
Diploma	14	7.1
General Practitioner (GP)	50	25.4
Resident	66	33.3
Level of residents		
R1	18	9.1
R2	12	6.1
R3	20	10.2
R4	16	8.1
Years of Experience		
>1 year	31	15.7
1-5 years	53	26.9
6-10 years	37	18.8
11-20 years	65	33.0
>20 years	11	5.6
Place of Work/ Rotation		
PHCC	162	82.2
Hospital	35	17.8

Table 2: Participants'' knowledge about amblyopia, Qassim Region (n=197).

Questions	Yes N (%)	No N (%)
Do you know what Amblyopia is?	189(95.9)	8 (4.1)
Have you diagnosed a case of Amblyopia before?	59(29.9)	138(70.1)
Do you know the vision screening guidelines?	87(44.2)	110(55.8)
Is it a treatable condition?	174(88.3)	23(11.7)

Table 3 shows the physician's responses to the questions designed to assess the knowledge of physicians regarding amblyopia; these questions were derived from the American Academy of Family physicians' guidelines. In this study, the majority of participants 177 (89.8%) knew the correct answer about the definition of amblyopia, which is "a decrease in best-corrected visual acuity resulting from abnormal vision development in infancy and early childhood".

Table 3: Physicians' knowledge regarding amblyopia based on American Academy of Family physicians' guidelines, (n=197).

Questions	Yes N (%)
According to the American Academy of Family physicians, Amblyopia(lazy eye) is one of the following definitions?	
Blindness in early infancy Delayed	27(13.7)
development of the eye	54(27.4)
Presence of refractive error not corrected	94(47.7)
*Decrease in best-corrected visual acuity resulting from abnormal vision development in infancy and early childhood	177(89.8)
Knowledge about the prevalence of Amblyopia n=197	
*2-4%	109(55.3%)
8-10%	74(37%)
15-20%	14(7.1%)
25-30%	0
The Causes of Amblyopia	
*Refractive errors	155(78.7)
*Strabismus/squint	152(77.2)
*Cataract	57(28.9)
Common Presentation of a child with Amblyopia	
Ocular pain	23(11.7)
Tearing	34(17.3)
Nystagmus	68(34.5)
*Usually, asymptomatic	165(83.8)
The best for the diagnosis of Amblyopia	
By red reflex	37(18.8)
*By checking the vision By slit	117(59.4)
lamp examination	26(13.2)
By fundoscopic examination	17(8.6)
What is the kind of modality that is usually used for Amblyopia treatment?	
*Patching the good eye	170(86.3)
Patching the affected eye	21(10.7)
Patching is not effective in treating Amblyopia	21(10.7)
Regarding the time of treatment:	
It cannot be treated after the age of one year	10(5.1)
There is no time limit for treatment, it can be treated anytime	16(8.1)
Treatment at the age of 2 years is the best time for treatment	15(7.6)
*It should be treated as early as possible before the age of 7 years	156(79.2)
*The correct option for each main question	

More than half of the physicians 109 (55.3%) knew the global prevalence rate of amblyopia 2- 4%. However, the knowledge of the physicians regarding the causes of amblyopia was varying; the majority knew refractive errors 155 (78.7%) and strabismus/squint 152 (77.2%) were the causes of amblyopia, but a few of them 57 (28.9%) knew that cataract is one of amblyopia's causes. The physicians were asked about the common presentation of amblyopia in children. Most of the 165 (83.8) correctly answered the question which was "the usual presentation of amblyopia in children is the asymptomatic presentation". Half of the respondents 117(59.4%) knew the best way for amblyopia diagnosis is by checking the vision. Also, the majority of 170 (86.3) knew that patching the good eye is the best kind of modality that is usually used for Amblyopia treatment. Approximately 156 (79.2%) of the participants knew the suitable time for amblyopia treatment, was that it should be treated as early as possible before the age of 7 years.

Participants' knowledge about amblyopia based on the Canadian Pediatric Society Recommendations for Vision Screening at Infant and Well Child Visits.

Table 4 shows the physicians' knowledge based on the Canadian Paediatric Society Recommendations for Vision Screening at Infant and Well Child Visits about amblyopia. It also summarized physicians' knowledge about the different methods used for vision testing. In the eye examination of a 3 months old baby, the commonest method used for eyes' visual inspection is the "red reflex examination". Our study found 125 (63%) physicians correctly knew that red reflex examination was the best method for visual inspection of 3 months old baby. However, some physicians gave a wrong answer for eye examination such as Fixation and following the target 37 (19%), cover-uncover test 29 (14.7%), and Visual acuity testing 6 (3.0%).

Half of the participants 105 (53.3%) knew the best tool for checking the vision of a child aged from 6 to 12 years, is by "Fixation and following a target" compared to the other tools for vision checking such as 44 (22.3%) Slit lamb examination, 35 (17.8%) Fundus examination, and 13(6.6%) E-chart (Snellen chart). (Table 4)

Exactly 123 (62.4%) of the study participants correctly knew that optotypes or E- charts (Snellen chart) are the commonest methods for checking the vision of a 3 to 5-year-old child. But the bulk of physicians knew other different methods which were wrongly used for examination of amblyopia cases such as red reflex, 20 (10.2%), Slit lamp 31(15.7%), and fundoscopic examination 23(11.7%).

In Table 4, the attitude of the respondents was examined by giving them a case scenario of a child aged 6 to 8 years for vision screening, and the participants were asked what do you prefer to do? About 76 (38.6%) of them preferred to examine whenever complaints occur, 36(18.3%) will do the red reflex test, 57(28.9%) will refer to the ophthalmologist, and 28(14.2%) will do only history and patient reassurance. The majority 177 (89.8%) of physicians knew correctly the referral criteria for a case of 3 months old baby. Table 4.

According to the Canadian Pediatric Society Recommendations, the referral conditions of an infant aged 6 to 12 months to an ophthalmologist are; "Infant with chronic tearing and discharge, Infant with nystagmus, and Infant with strabismus" In this study, we found most of the physicians 168 (85.3%), knew these referral criteria for such a case. Table 4

Table 4: Assessment of Physicians' Knowledge based on the Canadian Pediatric Society Recommendations for Vision Screening at Infant and Well Child Visits. (N=197).

Questions	Yes N (%)
In case you have a newborn to 3 months baby –which of the following can be done to examine the eye?	
*Red reflex examination	125(63.5)
Visual acuity testing	6(3.0)
Cover-uncover test	29(14.7)
Fixation and following the target	37(18.8)
In case you have a baby of 6 months to 12 months of age– what tool from the following is the best to check the vision?	
Fundus examination	35(17.8)
Slit lamp examination	44 (22.3)
E-chart (Snellen chart)	13(6.6)
*Fixation and following a target	105(53.3)
In case you have a child 3 to 5 years of age– how can you check the vision?	
Only red reflex	20(10.2)
By slit lamb examination By	31(15.7)
fundoscopic examination	23(11.7)
*By optotypes/ E-chart (Snellen chart)	123(62.4)
In the case of a child aged 6 to 8 years–what from the following is preferred to do?	
Should do red reflex	36(18.3)
Routine referral to an ophthalmologist	57(28.9)
*Examine whenever complaints occur	76(38.6)
No need to do any test only history and reassurance	28(14.2)
According to referral criteria, when it should be urgent to refer a newborn 3 months of age to the ophthalmologist?	
An infant with risk of retinopathy of prematurity	3 (1.5 %)
Having abnormal red reflex	11 (5.6 %)
Presence of corneaopadty	6 (3.0 %)
*All of the above	177(89.8 %)
According to referral criteria, when should you refer an infant aged 6 -12 months to the ophthalmologist?	
An infant with chronic tearing, discharge	10(5.1 %)
Infant with nystagmus	6(3.0 %)
Infant with strabismus	13(6.6 %)
*All of the above	168(85.3 %)
*The correct option for each main question	

No statistical association was found between the amblyopia level of awareness and participants' demographic data. (Table 5).

Table 5: Comparison Between the level of awareness about amblyopia and participants' demographic characteristics, (N=197).

Variable		Awareness level		P-value
		Poor N (%)	Good N (%)	
Gender	Male	7 (7.4)	87 (92.6)	0.23
	Female	12 (11.7)	91 (88.3)	
Nationality	Saudi	13 (10.8)	107 (89.2)	0.33
	Non-Saudi	6 (7.8)	71 (92.2)	
Age group	25-35 Years	15 (12.8)	102 (87.2)	0.21
	36-45 Years	3 (5.4)	53 (94.6)	
	46-55 Years	0 (0)	17 (1)	
	> 55 Years	1 (1)	6 (85.7)	
Last Qualification	Family Medicine Consultants	0	17 (1)	0.52
	Family Medicine Diploma	1 (7.14)	13 (92.8)	
	Family Medicine Residents	7 (10.6)	59 (89.3)	
	Family Medicine Specialists	4 (8)	46 (92)	
	GP	7 (14)	43 (86)	
Place of work	PHCCs	18 (11.1)	144 (88.8)	0.11
	Hospital	1 (2.9)	34 (97.1)	
Years of Experiences group	≤1 Year	4 (20)	16 (80)	0.06
	1-5 Years	9 (14)	55 (85.9)	
	6-10 Years	4 (10.8)	33 (89.1)	
	11-20 Years	1 (1.5)	64 (98.4)	
	> 20 Years	1 (9)	10 (90)	

Discussion

Amblyopia is a condition that permanently affects the vision of children if not treated early, and it could later impact their health and quality of life (15). Early detection and treatment of amblyopia can improve the chances of a successful visual outcome (16). Good physicians' knowledge and Parents' awareness about amblyopia and its risk factors could play a crucial role in the early management of the disease, which requires the involvement of both eye care professionals and the parents of the affected children. This study was conducted to assess the knowledge of PHC physicians and family medicine residents towards amblyopia in Qassim Region because of their major role in detecting and managing amblyopia.

This was a cross-sectional study that described the knowledge of PHC Physicians and FMA residents in Qassim region regarding amblyopia in children. The baseline knowledge scores showed that many questions were asked about the key issues related to amblyopia and vision screening. We focused on knowledge of physicians and residents based on the Canadian Paediatric Society Recommendations for Vision Screening at Infant and Well Child Visits guidelines and the American Academy of Family physicians' guidelines (14).

In this study, the overall knowledge of physicians and residents about amblyopia was good (90%). This is the reverse of a study done in Alabama that reflected poor knowledge of physicians (17).

The study focused on assessing the knowledge about amblyopia and vision screening in well-child visits in primary health care. We found 55% of participants didn't know about vision screening guidelines, and the majority of them (70 %) had not diagnosed any case of amblyopia before.

Our study revealed that more than half of the physicians knew the global prevalence rate of

amblyopia, 2-4%. However, in previous studies, the prevalence rate of amblyopia was very high. In Aldebasi's study done in Qassim province, Saudi Arabia, the prevalence of amblyopia was 3.9% (6) and in the Alsaqr et al study done in Riyadh, it was 14% (18). In a study done in Uyoun Aljwa,

Saudi Arabia it was 12.5% (19), and in a study done in India, it was 25.5 % (20). This high prevalence rate of detection in Saudi Arabia needs further investigation.

Our survey showed that most physicians correctly knew the definition of amblyopia which is a decrease in best-corrected visual acuity resulting from abnormal vision development in infancy and early childhood according to the American Academy of Family Physicians. Although the majority of physicians knew it can be caused by refractive error, strabismus, or squint, few had knew that cataract is one of the other causes of amblyopia. This is inconsistent with a previous study done in Riyadh that showed inadequate knowledge in parents (21).

Regarding the common presentation of children with amblyopia, the majority of participants knew that the presentation of amblyopia is usually asymptomatic. However, in a previous study done in Qassim region, the common presentation of amblyopia was refractive error especially anisometropia which means a difference in visual acuity (refractive error) between eyes leads to visual blurring of one eye and visual cortex suppression of the chronically blurred image (22).

In this survey, we assess the knowledge of the participants against Canadian paediatric society guidelines for vision screening and referral, especially in younger children. It found that less than two-thirds of physicians knew the visual acuity testing at age 3 months was by red reflex examination, which is inconsistent with a previous study in which the paediatricians do not follow the American Academy of Paediatrics guidelines (23). Research conducted in Ontario shows only 8 % of family medicine physicians do not assess red reflex, although it is critical that primary care physicians assess red reflex to avoid delay in diagnosis of retinoblastoma of which 59% is detected before age 5 years (24).

Furthermore, in assessing the physicians' knowledge regarding referral criteria to ophthalmologists for a baby aged 6 to 12 months most physicians knew that chronic tearing, discharge, nystagmus, strabismus, are the risk factors of retinopathy of prematurity and having abnormal red reflex, and the presence of cornea opacity are the conditions that need an urgent referral. This is opposite to a previous study in which one-fifth of physicians do not test acuity until age 5 years (25). In addition, half of the physicians knew the vision assessment tools for a baby aged 6 to 12 months. The majority of the physicians knew the treatment options correctly, as it is patching the good eye. This matches the findings written in the literature review (BMJ), where in mild to moderate amblyopia the first treatment line is patching, also in refractory (non-compliant) patients (26).

In this survey, more than two-thirds of the physicians knew the time of treating amblyopia cases, as it should be treated as early as possible before the age of 7 years. A previous study showed that amblyopia is more responsive to treatment among children younger than 7 years of age. Although the average treatment response is smaller in

children 7 to less than 13 years old (27). Another study showed there is an emotional impact of amblyopia treatment in preschool children, and that is not easy to implement and is commonly associated with some distress (28). Our study revealed that the attitude of the majority of the physicians towards a suspect case of amblyopia is that it should be referred to an ophthalmologist. Few said we will diagnose and manage at the level of PHC. A previous local study found anisometropia (especially anisohyperopia) is another potent stimulus for amblyopia that can be prevented by prescribing glasses in a timely fashion during the critical period of visual development; also, paediatric patients ought to be examined by paediatric ophthalmologists and optometrists who have a better approach to managing refractive errors and following the guidelines (29). In this study, we didn't find a statistical relationship between the physicians' demographic characteristics and the level of knowledge regarding amblyopia.

Conclusion

Early detection and treatment of amblyopia can improve the chances of a successful visual outcome. This study highlighted a good level of knowledge regarding amblyopia among both primary health care physicians and family medicine residence residents. No statistical relationship was detected between the amblyopia level of knowledge and participants' demographic data. Strategies for screening programs are highly needed.

Study limitations
Online surveys have their own set of obstacles and limitations, including small sample size and poor participation. In addition, multiple-choice questions have fixed selected responses that may fail to reflect clinical practice. In addition to the study area, the study was only conducted in Buraydah city at Qassim Region during the COVID-19 pandemic. This may affect the generalizability of the study findings. In light of those limitations, this study does not reflect the full range of knowledge in Saudi Arabia. Nevertheless, this is the only cross-sectional study that has attempted to assess knowledge of primary care physicians in Qassim region. The findings can serve as preliminary data to identify knowledge gaps that can help physicians to assess and detect amblyopia.

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Acute chest syndrome and pulmonary hypertension in sickle cell diseases

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Abstract

Background: Sickle cell diseases (SCD) are severe inflammatory processes on vascular endothelium, particularly at the capillary level since the capillary system is the main distributor of hardened red blood cells (RBC) into tissues.

Methods: All patients with the SCD were included.

Results: The study included 222 males and 212 females with similar mean ages (30.8 versus 30.3 years, p>0.05, respectively). Smoking (23.8% versus 6.1%, p<0.001), alcohol (4.9% versus 0.4%, p<0.001), disseminated teeth losses (5.4% versus 1.4%, p<0.001), ileus (7.2% versus 1.4%, p<0.001), cirrhosis (8.1% versus 1.8%, p<0.001), leg ulcers (19.8% versus 7.0%, p<0.001), digital clubbing (14.8% versus 6.6%, p<0.001), coronary heart disease (CHD) (18.0% versus 13.2%, p<0.05), chronic renal disease (CRD) (9.9% versus 6.1%, p<0.05), chronic obstructive pulmonary disease (COPD) (25.2% versus 7.0%, p<0.001), and stroke (12.1% versus 7.5%, p<0.05) were higher in males but not acute chest syndrome (ACS) (2.7% versus 3.7%), pulmonary hypertension (PHT) (12.6% versus 11.7), and deep venous thrombosis and/or varices and/or telangiectasias (9.0% versus 6.6%), significantly (p>0.05 for all). Mean ages of ACS and PHT were 30.3 and 34.0 years (p<0.05), respectively.

Conclusion: Although smoking, alcohol, disseminated teeth losses, ileus, cirrhosis, leg ulcers, digital clubbing, CHD, CRD, COPD, and stroke-like atherosclerotic events were higher in males, and the male sex alone is a risk factor for atherosclerosis, ACS and PHT were similar in both genders, and mean age of PHT is much higher than ACS, significantly. In other words, PHT may have a hardened RBC-induced chronic, whereas ACS an acute thromboembolic background, in the SCD.

Key words: Sickle cell diseases, acute chest syndrome, pulmonary hypertension, thromboembolism, chronic endothelial damage, atherosclerosis, metabolic syndrome

Introduction

Chronic endothelial damage may be the major underlying cause of aging and death by causing end-organ insufficiencies in human beings (1). Much higher blood pressures (BP) of the afferent vasculature may be the major accelerating factor by causing recurrent injuries on vascular endothelial cells. Probably, whole afferent vasculature including capillaries are mainly involved in the process. Thus the term venosclerosis is not as famous as atherosclerosis in the medical literature. Due to the chronic endothelial damage, inflammation, edema, and fibrosis, vascular walls thicken, their lumens narrow, and they lose their elastic nature, which eventually reduces blood supply to the terminal organs, and increases systolic and decreases diastolic BP further. Some of the well-known accelerating factors of the inflammatory process are physical inactivity, sedentary lifestyle, excess weight, animal-rich diet, smoking, alcohol, chronic inflammations, prolonged infections, and cancers for the development of terminal consequences including obesity, hypertension (HT), diabetes mellitus (DM), cirrhosis, peripheric artery disease (PAD), chronic obstructive pulmonary disease (COPD), coronary heart disease (CHD), chronic renal disease (CRD), mesenteric ischemia, osteoporosis, stroke, dementia, other end-organ insufficiencies, early aging, and premature death (2, 3). Although early withdrawal of the accelerating factors can delay terminal consequences, after development of HT, DM, cirrhosis, COPD, CRD, CHD, PAD, mesenteric ischemia, osteoporosis, stroke, dementia, other end-organ insufficiencies, and aging, endothelial changes cannot be reversed completely due to their fibrotic nature. The accelerating factors and terminal consequences are researched under the titles of metabolic syndrome, aging syndrome, or accelerated endothelial damage syndrome in the medical literature, extensively (4-6). On the other hand, sickle cell diseases (SCD) are chronic inflammatory processes on vascular endothelium, initiated at birth and terminated with accelerated atherosclerosis induced end-organ failure in both genders (7, 8). Hemoglobin S causes loss of elastic and biconcave disc shaped structures of red blood cells (RBC). Probably loss of elasticity instead of shape is the major problem since sickling is rare in peripheral blood samples of the patients with associated thalassemia minor, and human survival is not affected in hereditary spherocytosis or elliptocytosis. Loss of elasticity is present during the whole lifespan, but exaggerated with inflammation, infection, and various stresses of the body. The hardened RBC induced chronic endothelial damage, inflammation, and fibrosis terminate with disseminated tissue hypoxia all over the body (9). As a difference from other causes of chronic endothelial damage, the SCD may keep vascular endothelium particularly at the capillary level (10, 11), since the capillary system is the main distributor of the hardened cells into the tissues. The hardened RBC induced chronic endothelial damage builds up an advanced atherosclerosis in early years of life. Vascular narrowing and occlusions induced tissue ischemia and infarctions are the final consequences of the SCD, so the mean life expectancy is decreased by 25 to 30 years in such patients (8). We tried to understand the underlying background of acute chest syndrome (ACS) in the SCD.

Material and Methods

The study was performed in Medical Faculty of the Mustafa Kemal University between March 2007 and June 2016. All patients with the SCD were included. The SCD were diagnosed with the hemoglobin electrophoresis performed via high performance liquid chromatography (HPLC). Medical histories including smoking, alcohol, painful crises per year, transfused units of RBC in their lives, leg ulcers, stroke, surgical operations, deep venous thrombosis (DVT), epilepsy, and priapism were learnt. Patients with a history of one pack-year were accepted as smokers, and one drink-year were accepted as drinkers. A complete physical examination was performed by the Same Internist, and patients with disseminated teeth losses (<20 teeth present) were detected. Cases with acute painful crisis or any other inflammatory event were treated at first, and the laboratory tests and clinical measurements were performed on the silent phase. Check up procedures including serum iron, iron binding capacity, ferritin, creatinine, liver function tests, markers of hepatitis viruses A, B, and C, a posterior-anterior chest x-ray film, an electrocardiogram, a Doppler echocardiogram both to evaluate cardiac walls and valves and to measure systolic BP of pulmonary artery, an abdominal ultrasonography, a venous Doppler ultrasonography of the lower limbs, a computed tomography (CT) of brain, and a magnetic resonance imaging (MRI) of hips were performed. Other bones for avascular necrosis were scanned according to the patients' complaints. So avascular necrosis of bones was diagnosed via MRI (12). Associated thalassemia minor was detected with serum iron, iron binding capacity, ferritin, and hemoglobin electrophoresis performed via HPLC since the SCD with associated thalassemia minor shows a milder clinical presentation than the sickle cell anemia (SCA) alone (13). Systolic BP of the pulmonary artery of ≥40 mmHg is accepted as PHT (14). The criterion for diagnosis of COPD is post-bronchodilator forced expiratory volume in one second/forced vital capacity of <70% (15). ACS is diagnosed clinically with the presence of new infiltrates on chest x-ray film, fever, cough, sputum production, dyspnea, or hypoxia (16). An x-ray film of abdomen in upright position was taken just in patients with abdominal distention or discomfort, vomiting, obstipation, or lack of bowel movement, and ileus was diagnosed with gaseous distention of isolated segments of bowel, vomiting, obstipation, cramps, and with the absence of peristaltic activity. CRD is diagnosed with a persistent serum creatinine level of ≥1.3 mg/dL in males and ≥1.2 mg/dL in females. Cirrhosis is diagnosed with physical examination findings, laboratory parameters, and ultrasonographic evaluation. Digital clubbing is diagnosed with the ratio of distal phalangeal diameter to interphalangeal diameter which is >1.0, and with the presence of Schamroth's sign (17, 18). An exercise electrocardiogram is performed in cases with an abnormal electrocardiogram and/or angina pectoris. Coronary angiography is taken for the exercise electrocardiogram positive cases. So CHD was diagnosed either angiographically or with the Doppler echocardiographic findings as the movement disorders in the cardiac walls. Rheumatic heart disease is diagnosed with the echocardiographic findings, too. Stroke is

diagnosed by the CT of brain. Sickle cell retinopathy is diagnosed with ophthalmologic examination in patients with visual complaints. Eventually, mean age, associated thalassemia minor, smoking, alcohol, painful crises per year, transfused units of RBC in their lives, disseminated teeth losses, COPD, ileus, cirrhosis, leg ulcers, digital clubbing, CHD, CRD, stroke, PHT, autosplenectomy, DVT and/or varices and/or telangiectasias, rheumatic heart disease, avascular necrosis of bones, sickle cell retinopathy, epilepsy, ACS, mortality, and mean age of mortality were detected in both genders. Mann-Whitney U test, Independent-Samples t test, and comparison of proportions were used as the methods of statistical analyses.

Results

The study included 434 patients with the SCD (222 males and 212 females). Mean ages of the patients were similar in males and females (30.8 versus 30.3 years, p>0.05, respectively). Prevalence of associated thalassemia minor was similar in both genders, too (72.5% versus 67.9%, p>0.05, respectively). Smoking (23.8% versus 6.1%) and alcohol (4.9% versus 0.4%) were higher in males, significantly (p<0.001 for both) (Table 1). Similarly, transfused units of RBC in their lives (48.1 versus 28.5, p=0.000), disseminated teeth losses (5.4% versus 1.4%, p<0.001), ileus (7.2% versus 1.4%, p<0.001), cirrhosis (8.1% versus 1.8%, p<0.001), leg ulcers (19.8% versus 7.0%, p<0.001), digital clubbing (14.8% versus 6.6%, p<0.001), CHD (18.0% versus 13.2%, p<0.05), CRD (9.9% versus 6.1%, p<0.05), COPD (25.2% versus 7.0%, p<0.001), and stroke (12.1% versus 7.5%, p<0.05) were all higher in males, significantly. On the other hand, prevalence of ACS (2.7% versus 3.7%, p>0.05), PHT (12.6% versus 11.7, p>0.05), and DVT and/or varices and/or telangiectasias were similar in both genders (9.0% versus 6.6%, p>0.05), significantly (Table 2). Beside that when we look at the mean ages of the consequences, they were 30.3 and 34.0 years (p<0.05) in the ACS and PHT, respectively (Table 3).

Table 1: Characteristic features of the study cases

Variables	Male patients with SCD*	p-value	Female patients with SCD
Prevalence	51.1% (222)	Ns†	48.8% (212)
Mean age (year)	30.8 ±10.0 (5-58)	Ns	30.3 ±9.9 (8-59)
Associated thalassemia minors	72.5% (161)	Ns	67.9% (144)
Smoking	23.8% (53)	<0.001	6.1% (13)
Alcoholism	4.9% (11)	<0.001	0.4% (1)

*Sickle cell diseases   †Nonsignificant (p>0.05)

Table 2: Associated pathologies of the study cases

Variables	Male patients with SCD*	p-value	Female patients with SCD
Painful crises per year	5.0 ±7.1 (0-36)	Ns†	4.9 ±8.6 (0-52)
Transfused units of RBC‡	48.1 ± 61.8 (0-434)	0.000	28.5 ± 35.8 (0-206)
Disseminated teeth losses (<20 teeth present)	5.4% (12)	<0.001	1.4% (3)
COPD§	25.2% (56)	<0.001	7.0% (15)
Ileus	7.2% (16)	<0.001	1.4% (3)
Cirrhosis	8.1% (18)	<0.001	1.8% (4)
Leg ulcers	19.8% (44)	<0.001	7.0% (15)
Digital clubbing	14.8% (33)	<0.001	6.6% (14)
CHD¶	18.0% (40)	<0.05	13.2% (28)
CRD**	9.9% (22)	<0.05	6.1% (13)
Stroke	12.1% (27)	<0.05	7.5% (16)
PHT***	12.6% (28)	Ns	11.7% (25)
Autosplenectomy	50.4% (112)	Ns	53.3% (113)
DVT**** and/or varices and/or telangiectasias	9.0% (20)	Ns	6.6% (14)
Rheumatic heart disease	6.7% (15)	Ns	5.6% (12)
Avascular necrosis of bones	24.3% (54)	Ns	25.4% (54)
Sickle cell retinopathy	0.9% (2)	Ns	0.9% (2)
Epilepsy	2.7% (6)	Ns	2.3% (5)
ACS*****	2.7% (6)	Ns	3.7% (8)
Mortality	7.6% (17)	Ns	6.6% (14)
Mean age of mortality (year)	30.2 ±8.4 (19-50)	Ns	33.3 ±9.2 (19-47)

*Sickle cell diseases   †Nonsignificant (p>0.05)   ‡Red blood cells   §Chronic obstructive pulmonary disease
¶Coronary heart disease   **Chronic renal disease   ***Pulmonary hypertension   ****Deep venous thrombosis
*****Acute chest syndrome

Table 3: Mean ages of the consequences of the sickle cell diseases

Variables	Mean age (year)
Ileus	29.8 ± 9.8 (18-53)
Hepatomegaly	30.2 ± 9.5 (5-59)
ACS*	30.3 ± 10.0 (5-59)
Sickle cell retinopathy	31.5 ± 10.8 (21-46)
Rheumatic heart disease	31.9 ± 8.4 (20-49)
Autosplenectomy	32.5 ± 9.5 (15-59)
Disseminated teeth losses (<20 teeth present)	32.6 ± 12.7 (11-58)
Avascular necrosis of bones	32.8 ± 9.8 (13-58)
Epilepsy	33.2 ± 11.6 (18-54)
Priapism	33.4 ± 7.9 (18-51)
Left lobe hypertrophy of the liver	33.4 ± 10.7 (19-56)
Stroke	33.5 ± 11.9 (9-58)
COPD†	33.6 ± 9.2 (13-58)
PHT‡	34.0 ± 10.0 (18-56)
Leg ulcers	35.3 ± 8.8 (17-58)
Digital clubbing	35.4 ± 10.7 (18-56)
CHD§	35.7 ± 10.8 (17-59)
DVT¶ and/or varices and/or telangiectasias	37.0 ± 8.4 (17-50)
Cirrhosis	37.0 ± 11.5 (19-56)
CRD**	39.4 ± 9.7 (19-59)

*Acute chest syndrome   †Chronic obstructive pulmonary disease   ‡Pulmonary hypertension   §Coronary heart disease
¶Deep venous thrombosis   **Chronic renal disease

Discussion

ACS is a significant cause of mortality in the SCD (19). It occurs most often as a single episode, and a past history is associated with a high mortality rate (19). Similarly, all 14 cases with the ACS had just a single episode, and two of them were fatal in spite of the rigorous RBC and ventilation support and antibiotic therapy in the present study. The remaining 12 patients are still alive without a recurrence at the end of the ten-year follow up period. ACS is the most common between the ages of 2 to 4 years, and its incidence decreases with age (20). As a difference from atherosclerotic consequences, the incidence of ACS did not show an increase with aging in the present study, too, and the mean ages of the ACS and SCD were 30.3 and 30.5 years (p>0.05), respectively. The decreased incidence with aging may be due to the high mortality rate during the first episode and/or an acquired immunity against various antigens, and/or decreased strength of immune response. Probably, ACS shows an inborn severity of the SCD, and the incidence of ACS is higher in severe cases such as cases with the SCA or higher white blood cells (WBC) counts (19, 20). According to our experiences, the increased metabolic rate during infections accelerates sickling, thrombocytosis, leukocytosis, and vascular endothelial damage, and terminates with end-organ insufficiencies. ACS may also be a collapse of the lungs during such infections, and the exaggerated immune response against the abnormal RBC-induced diffuse

endothelial damage may be important in the high mortality rate. A preliminary result from the Multi-Institutional Study of Hydroxyurea in the SCD indicating a significant reduction of episodes of ACS with hydroxyurea therapy suggests that a considerable number of episodes are exaggerated with the increased numbers of WBC and platelets (PLT) (21). Similarly, we strongly recommend hydroxyurea therapy for all patients with the SCD that may also be a cause of the low incidence of ACS among our follow up cases (2.7% in males and 3.7% in females). Additionally, ACS did not show an infectious etiology in 66% of cases (19, 20), and 12 of 27 cases with ACS had evidence of fat embolism in the other study (22). Beside that some authors indicated that antibiotics do not shorten the clinical course (16, 23). On the other hand, RBC support must be given early in the course of ACS since it also has prophylactic benefit. RBC support has the obvious benefits of decreasing sickle cell concentration directly, and suppressing bone marrow for the production of abnormal RBC and excessive WBC and PLT. So they prevent further sickling and the exaggerated immune response induced endothelial damage, not in the lungs alone, instead all over the body. According to our observations, simple and repeated transfusions are superior to RBC exchange (24, 25). First of all, preparation of one or two units of RBC suspensions in each time rather than preparation of six units or higher provides time for clinicians to prepare more units by preventing sudden death of such high-risk patients. Secondly, transfusions of one or two units of RBC suspensions at each time decreases the severity of pain, and relaxes anxiety of the

patients and their surroundings, since RBC transfusions probably have the strongest analgesic effects during the severe painful crises. Actually, the decreased severity of pain by transfusions may also indicate the decreased inflammation all over the body. Thirdly, transfusions of lesser units of RBC suspensions each time by means of the simple transfusions will decrease transfusion-related complications, including infections, iron overload, and blood group mismatch in the future. Fourthly, transfusion of RBC suspensions in the secondary health centers may prevent some deaths developing during the transport to the tertiary centers for the exchange. Finally, cost of the simple and repeated transfusions on insurance system is much lower than the exchange which needs trained staff and additional devices.

PHT is a condition of increased BP within the arteries of the lungs. Shortness of breath, fatigue, chest pain, palpitation, swelling of legs and ankles, and cyanosis are common symptoms of PHT. Actually, it is not a diagnosis itself, instead solely a hemodynamic state characterized by resting mean pulmonary artery pressure of ≥25 mmHg. An increase in pulmonary artery systolic pressure, estimated noninvasively by the echocardiography, helps to identify patients with PHT (26). The cause is often unknown. The underlying mechanism typically involves inflammation, fibrosis, and subsequent remodelling of the arteries. PHT affects about 1% of the world population, and its prevalence may reach 10% above the age of 65 years (27). Onset is typically seen between 20 and 60 years of age (28). The most common causes are left heart diseases and chronic inflammatory lung pathologies, particularly CHD and COPD (28, 29). The cause of PHT in COPD is generally assumed to be hypoxic pulmonary vasoconstriction leading to permanent medial hypertrophy (30). But the pulmonary vascular remodeling in the COPD may have a much more complex mechanism than just being the medial hypertrophy secondary to the long-lasting hypoxic vasoconstriction alone (30). In fact, all layers of the vessel wall appear to be involved with prominent intimal changes (30). The specific pathological picture could be explained by the combined effects of hypoxia, prolonged stretching of hyperinflated lungs-induced mechanical stress and inflammatory reaction, and the toxic effects of cigarette smoke (30). According to World Health Organization, there are five groups of PHT including pulmonary arterial hypertension, PHT secondary to left heart diseases, PHT secondary to lung diseases, chronic thromboembolic PHT, and PHT with unknown mechanisms (28). On the other hand, PHT is also a common consequence of the SCD (31), and its prevalence was detected between 20% and 40% in the SCD (32), whereas we detected the ratio as 12.2% in the present study. Although the higher prevalence of smoking, alcohol, disseminated teeth losses, ileus, cirrhosis, leg ulcers, digital clubbing, CRD, COPD, and stroke-like atherosclerotic events in male gender, and the male gender alone is a risk factor for the systemic atherosclerosis, the similar prevalence of PHT and ACS in both genders also supports their nonatherosclerotic nature in the SCD. Additionally, as a risk factor for pulmonary thromboembolic events, frequencies of DVT and/or

varices and/or telangiectasias were similar in males and females (9.0% versus 6.6%, p>0.05, respectively), parallel to ACS and PHT. Similarly, CHD is the other most common cause of PHT in society (33), and although the higher prevalence of CHD in males in the present study (18.0% versus 13.2%, p<0.05), PHT was not higher in them again. In another definition, PHT may have a hardened RBC-induced chronic, whereas ACS an acute thromboembolic background in the SCD (34, 35) since the mean age of ACS is much lower (30.3 and 34.0 years, p<0.05), and its mortality is much higher than the PHT (19, 20, 28).

COPD is the third leading cause of death with various causes all over the world (36, 37). Male gender, aging, smoking, and excess weight may be the major underlying etiologies. As also observed in the present study, regular alcohol consumption may also be important in the pulmonary and systemic inflammatory process. For example, COPD was one of the most common diagnoses in alcohol dependence (38). Furthermore, 30-day readmission rates were higher in the COPD patients with alcoholism (39). Probably an accelerated atherosclerotic process is the main structural background of functional changes, characteristic of the COPD. The inflammatory process of vascular endothelium is enhanced by release of various chemicals by inflammatory cells, and it terminates with an advanced atherosclerosis, fibrosis, and pulmonary losses. COPD may actually be the pulmonary consequence of the systemic atherosclerotic process. Since beside the accelerated atherosclerotic process of the pulmonary vasculature, there are several reports about coexistence of associated endothelial inflammation all over the body (40, 41). For example, there may be close relationships between COPD, CHD, PAD, and stroke (42). Furthermore, two-thirds of mortality cases were caused by cardiovascular diseases and lung cancers in the COPD, and the CHD was the most common cause in a multi-center study of 5.887 smokers (43). When the hospitalizations were researched, the most common causes were the cardiovascular diseases again (43). In another study, 27% of mortality cases were due to the cardiovascular diseases in the moderate and severe COPD (44). In another definition, COPD may be the pulmonary consequence of the systemic atherosclerotic process caused by the hardened RBC in the SCD (36).

Digital clubbing is characterized by the increased normal angle of 165° between nailbed and fold, increased convexity of the nail fold, and thickening of the whole distal finger (45). Although the exact cause and significance is unknown, the chronic tissue hypoxia is highly suspected (46). In the previous study, only 40% of clubbing cases turned out to have significant underlying diseases while 60% remained well over the subsequent years (18). But according to our experiences, digital clubbing is frequently associated with the pulmonary, cardiac, renal, or hepatic diseases or smoking, all of those are characterized with chronic tissue hypoxia (5). As an explanation for that hypothesis, lungs, heart, kidneys, and liver are closely related organs and their functions are affected in a short period of time. On the other hand, digital clubbing is also

common in patients with the SCD, and its prevalence was 10.8% in the present study. It probably shows chronic tissue hypoxia caused by disseminated endothelial damage, inflammation, edema, and fibrosis at the capillary level in the SCD. Beside the effects of SCD, smoking, alcohol, cirrhosis, CRD, CHD, and COPD; the higher prevalence of digital clubbing in males (14.8% versus 6.6%, p<0.001) may also show some additional role of male gender on the systemic atherosclerotic process.

Leg ulcers are seen in 10% to 20% of the SCD (47), and the ratio was 13.5%, here. Its prevalence increases with aging, male gender, and SCA (48). Similarly, its ratio was higher in males (19.8% versus 7.0%, p<0.001), and mean age of the leg ulcer cases was higher than the others (35.3 versus 29.8 years, p<0.000) in the present study. The leg ulcers have an intractable nature, and around 97% of them relapse in a period of one year (47). As evidence of their atherosclerotic nature, the leg ulcers occur in distal areas with less collateral blood flow in the body (47). The hardened RBC induced chronic endothelial damage, inflammation, edema, and fibrosis at the capillary level may be the major cause in the SCD (48). Prolonged exposure to the hardened bodies due to the pooling of blood in the lower extremities may also explain the leg but not arm ulcers in the SCD. The hardened RBC induced venous insufficiencies may also accelerate the process by pooling of causative bodies in the legs, and vice versa. Pooling of blood may also have some effects on development of venous ulcers, diabetic ulcers, Buerger's disease, digital clubbing, and onychomycosis in the lower extremities. Furthermore, probably pooling of blood is the cause of delayed wound and fracture healings in the lower extremities. Smoking and alcohol may also have some additional atherosclerotic effects on the ulcers in males. Hydroxyurea is the first drug that was approved by Food and Drug Administration in the SCD (49). It is an orally-administered, cheap, safe, and effective drug that blocks cell division by suppressing formation of deoxyribonucleotides which are the building blocks of DNA (11). Its main action may be the suppression of hyperproliferative WBC and PLT in the SCD (50). Although presence of a continuous damage of hardened RBC on vascular endothelium, severity of the destructive process is probably exaggerated by the patients' own immune systems. Similarly, lower WBC counts were associated with lower crises rates, and if a tissue infarct occurs, lower WBC counts may decrease severity of pain and tissue damage (51). According to our experience, prolonged resolution of leg ulcers with hydroxyurea may also suggest that the ulcers may be secondary to increased WBC and PLT counts induced exaggerated endothelial inflammation, edema, and fibrosis at the capillary level.

Cirrhosis was the 10th leading cause of death for men and the 12th for women in the United States in 2001 (6). Although the improvements of health services worldwide, the increased morbidity and mortality of cirrhosis may be explained by prolonged survival of the human being and increased prevalence of excess weight all over the world. For example, nonalcoholic fatty liver

disease (NAFLD) affects up to one third of the world population, and it has become the most common cause of chronic liver disease even in childhood nowadays (52). NAFLD is a marker of pathological fat deposition combined with a low-grade inflammation which results with hypercoagulability, endothelial dysfunction, and an accelerated atherosclerosis (52). Beside terminating with cirrhosis, NAFLD is associated with higher overall mortality rates as well as increased prevalence of cardiovascular diseases (53). Authors reported independent associations between NAFLD and impaired flow-mediated vasodilation and increased mean carotid artery intima-media thickness (CIMT) (54). NAFLD may be considered as one of the hepatic consequences of the metabolic syndrome and SCD (9, 55). Probably smoking also plays a role in the endothelial inflammatory process of the liver, since the systemic inflammatory effects of smoking on endothelial cells is well-known with Buerger's disease and COPD (56). Increased oxidative stresses, inactivation of antiproteases, and release of proinflammatory mediators may terminate with the systemic atherosclerosis in smokers. The atherosclerotic effects of alcohol is prominent in hepatic endothelium probably due to the highest concentrations of its metabolites there. Chronic infectious and inflammatory processes may also terminate with an accelerated atherosclerosis all over the body (57). For example, chronic hepatitis C virus (HCV) infection raised CIMT, and normalization of hepatic function with HCV clearance may be secondary to reversal of favourable lipids observed with the chronic infection (57, 58). As a result, beside COPD, ileus, leg ulcers, digital clubbing, CHD, CRD, and stroke, cirrhosis may also be found among the systemic atherosclerotic consequences of the SCD.

The increased frequency of CRD may be explained by aging of the human being and increased prevalence of excess weight all over the world, too (59, 60). Aging, physical inactivity, excess weight, smoking, alcohol, and inflammatory or infectious processes may be the major causes of the renal endothelial inflammation. The inflammatory process is enhanced by release of various chemicals by lymphocytes to repair the damaged renal tissues, especially endothelial cells of the renal arteriols. Due to the continuous irritation of the vascular endothelial cells, prominent changes develop in the architecture of the renal tissues with advanced atherosclerosis and tissue hypoxia and infarcts. Excess weight induced hyperglycemia, dyslipidemia, elevated BP, and insulin resistance may cause tissue inflammation and immune cell activation (61). For example, age (p= 0.04), high-sensitivity C-reactive protein (p= 0.01), mean arterial BP (p= 0.003), and DM (p= 0.02) had significant correlations with the CIMT (60). Increased renal tubular sodium reabsorption, impaired pressure natriuresis, volume expansion due to the activations of sympathetic nervous system and renin-angiotensin system, and physical compression of kidneys by visceral fat tissue may be some mechanisms of the increased BP with excess weight (62). Excess weight also causes renal vasodilation and glomerular hyperfiltration which initially serve as compensatory mechanisms to maintain sodium balance due to the increased tubular

reabsorption (62). However, along with the increased BP, these changes cause a hemodynamic burden on the kidneys in the long term that causes chronic endothelial damage (63). With prolonged weight excess, there are increased urinary protein excretion, loss of nephron function, and exacerbated HT. With the development of dyslipidemia and DM in cases with excess weight, CRD progresses much more easily (62). On the other hand, the systemic inflammatory effects of smoking on endothelial cells may also be important in the CRD (64). The inflammatory and atherosclerotic effects of smoking are much more prominent in the respiratory endothelium due to the highest concentrations of its metabolites there. Although some authors reported that alcohol was not related with the CRD (64), various metabolites of alcohol circulate even in the blood vessels of the kidneys and give harm to the renal vascular endothelium. Chronic inflammatory or infectious processes may also terminate with the accelerated atherosclerosis on the renal endothelium (57). Although CRD is mainly an advanced atherosclerotic process of the renal vasculature, there are close relationships between CRD and other consequences of the metabolic syndrome including CHD, COPD, PAD, cirrhosis, and stroke (65). For example, the most common cause of death was the cardiovascular diseases in the CRD again (66). In another definition, CRD may just be one of the several atherosclerotic consequences of the metabolic syndrome and SCD, too (67).

Stroke is an important cause of death, and an acute thromboembolic event on the atherosclerotic background is the most common cause. Male gender, aging, smoking, alcohol, and excess weight and its consequences may be the major triggering causes. Stroke is also a common complication of the SCD (68, 69). Similar to the leg ulcers, stroke is particularly higher in the SCA and cases with higher WBC counts (50, 70). Sickling induced endothelial damage, activations of WBC, PLT, and coagulation system, and hemolysis may terminate with chronic endothelial inflammation, edema, and fibrosis (71). Probably, stroke is a terminal event in the SCD, and it may not have a macrovascular origin, instead disseminated capillary inflammation, edema, and fibrosis may be much more important. Infections and other stresses may precipitate the stroke, since increased metabolic rate during such events may accelerate sickling. A significant reduction of stroke with hydroxyurea may also suggest that a significant proportion of cases develop secondary to the increased WBC and PLT induced exaggerated capillary inflammation, edema, and fibrosis (21).

The venous endothelium is also involved in the SCD (72). For example, varices are abnormally dilated veins with tortuous courses, and they usually occur in the lower extremities. Normally, leg muscles pump veins against gravity, and the veins have pairs of leaflets of valves to prevent blood from flowing backwards. When the leaflets are damaged, varices and/or telangiectasias develop. DVT may also cause varicose veins. Varicose veins are the most common in superficial veins of the legs, which are subject to higher pressure when standing up, thus physical examination must be performed in upright position. Although the younger mean ages of the patients of the present study (30.8 and 30.3 years in males and females, respectively), and significantly lower body mass index of the SCD patients in the literature (10), DVT and/or varices and/or telangiectasias of the lower limbs were higher in the study cases (9.0% versus 6.6% in males and females, p>0.05, respectively), indicating an additional venous involvement in the SCD. Similarly, priapism is the painful erection of penis that cannot return to its flaccid state within four hours in the absence of any stimulation (73). It is an emergency since damage to the blood vessels may terminate with a long-lasting fibrosis of the corpus cavernosa, a consecutive erectile dysfunction, and eventually a shortened, indurated, and non-erectile penis (73). It is seen with hematological and neurological disorders including SCD, spinal cord lesions (hanging victims), and glucose-6-phosphate dehydrogenase deficiency (74, 75). Ischemic (veno-occlusive), stuttering (recurrent ischemic), and nonischemic priapisms (arterial) are the three types of priapism (76). Ninety-five percent of clinically presented priapisms are the ischemic (veno-occlusive) disorders in which blood cannot return adequately from the penis as in the SCD, and they are very painful (73, 76). The other 5% are nonischemic (arterial) type usually caused by a blunt perineal trauma in which there is a short circuit of the vascular system (73). Treatment of arterial type is not as urgent as the veno-occlusive type due to the absence of risk of ischemia (73). RBC support is the treatment of choice in the acute phase in the SCD (77), whereas in the chronic phase, hydroxyurea should be the treatment of choice. According to our experiences, hydroxyurea is an effective drug for prevention of attacks and consequences of priapism if iniatiated in early years of life, but it may be difficult due to the excessive fibrosis around the capillary walls if initiated later in life.

As a conclusion, although smoking, alcohol, disseminated teeth losses, ileus, cirrhosis, leg ulcers, digital clubbing, CHD, CRD, COPD, and stroke-like atherosclerotic events were all higher in males, and the male sex alone is a risk factor for atherosclerosis, ACS and PHT were similar in both genders, and the mean age of PHT is much higher than the ACS, significantly. In other words, PHT may have a hardened RBC-induced chronic, whereas ACS an acute thromboembolic backgrounds in the SCD.

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Barriers Facing Primary Health Care Physicians in Jazan when Dealing with Emergency Cases

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Abstract

Background: Primary healthcare centres (PHCCs) provide curative and preventative healthcare services. Little is known about perceived competence in handling potential emergencies by family physicians at PHCCs.

Aim of Study: To identify primary healthcare (PHC) physicians' emergency management competence and the barriers they experience when dealing with emergency cases.

Method: A descriptive questionnaire-based cross-sectional study of family physicians in Jazan Governorate, in south west of Saudi Arabia. We used Poisson regression modelling to evaluate the effect of background factors on perceived competence in handling emergency cases among family physicians.

Results: The study included 450 PHC physicians; 342 (77.8%) were males, and 364 (82.7%) were Saudi. When compared to Arab Board of Family Medicine (ABFM) certification, physicians did better if they had Family Medicine (FM) Diploma (OR = 1.1486, p = 0.03704) or MBBS (OR = 1.1529, p = 0.00371). Compared to physicians who attended Basic Life Support (BLS) courses within the last 12 months, competence in clinical emergencies was far worse for those who did not do BLS (OR = 0.6710, p <0.001), or did it over two years ago (OR = 0.8796, p<0.001). Notably, there was no difference between those who did BLS last year or within two years' time frame. Attending the Advanced Trauma Life Support (ATLS) course was associated with better emergency knowledge and competence if completed within

one year than within two years (OR = 0.9071, p = 0.002), over two years (OR = 0.8694, p<0.001), or not done at all (OR = 0.9527, p = 0.01452). Advanced Cardiovascular Life Support (ACLS) course attendance was not associated with significant gains in terms of competence. Experience in Emergency Departments (ED) was associated with worse self-rating of competence in emergency cases (OR = 0.9527, p = 0.01452).

Conclusions: BLS and ATLS courses improve perceived competence among PHC physicians. There is a potential gap in defibrillation training among PHC-based family physicians in the southwestern area of Saudi Arabia. Therefore, BLS training should be an integral part of family physician core competence in handling emergency cases. More educational training should be devoted to defibrillation skills in clinical practice.

Key words: Primary Healthcare, Family physician, Emergency care, competence, barriers, Saudi Arabia.

Introduction

A medical emergency is "a sudden clinical incident that necessitates urgent and appropriate clinical management to treat its results and avoid its sequelae" [1]. Often, family physicians based in primary health care (PHC) centres encounter medical emergencies. Indeed, effective clinical management of emergencies in the PHC settings require availability of equipment, training, and well-structured protocols [2].

Healthcare services are prioritized in Saudi Arabia. There have been noticeable quantitative and qualitative strides in terms of healthcare services in Saudi Arabia over the last twenty years [3]. According to the World Health Organization, the Saudi health care system is ranked 26th among 190 global health care system [4]. PHC centres provide primary care service, both curative and preventive and they refer cases to public hospitals if they require more advanced care and refer those who require more complex care to central or specialized hospitals [3].

There is no information or data known about dealing with emergency cases in Jazan and the barriers that the physicians face while dealing with these emergency cases at PHC level. One recent survey tested 600 Riyadh-based family physicians in terms of interpretation of emergency X-Ray abilities [5]. The competence of family physicians was suboptimal and fell substantially below that of their radiology trainee colleagues.

The objective of this study was to identify PHC physicians' emergency management competence and the barriers they experience when dealing with emergency cases.

Methods

This study followed a cross-sectional questionnaire-based descriptive research design in Jazan City, Saudi Arabia. We surveyed all PHC centres under administration of Jazan Directorate for Health Services. The target population included all practicing family physicians in Jazan PHCCs.

All family physicians were contacted by phone. The purposes of the study were explained to them in detail and their approval to participate was obtained. A personalized link to the online questionnaire designed through Google Form was sent to those who approved participation to be filled out by each participant.

Data collection tool:
A self-administered questionnaire was constructed by the researchers based on thorough review of relevant literature and was utilized for data collection. It included the following sections:
1) Sociodemographic questionnaire: It was constructed by the researchers to collect data about PHC physicians, their training levels, experience, and attendance to life support courses.
2) Physicians' perceived competence score: Calculated by adding up the scores for self-perceived competence items

related to specific emergency skills as rated between (1) and (4) by the study participants. Twelve competence skills are included, i.e., cardiac compression, mouth-to-mouth resuscitation, bag & mask resuscitation, insertion of IV cannula, intubation, defibrillation, ECG Reading, nebulization & oxygen therapy, simple suture, nasogastric tube insertion, urinary catheter insertion, and using IV fluids. The maximum score is 48 for fully perceived competence skills.
3) Physicians' barriers form: to detect PHC physicians' needs in emergency care e.g., equipment, medications, and facilities.

The study questionnaires were submitted to PHC physicians through a Google Form online link. Data were filled in by participants and automatically collected into an Excel spreadsheet.

Data were analysed using the R-Statistical Software (version 3.4.1). Descriptive statistics (frequency and percentages for categorical variables in addition to means, standard deviations and range for quantitative variables) were calculated. Inferential statistics, e.g., Chi Square test ($\chi 2$) to assess the associations and/or differences between two categorical variables was applied. Univariate Poisson regression was applied to evaluate the unadjusted effect of demographic factors on perceived competence scores. The results were displayed in the form of odds ratios and the significance was displayed according to z-scores which were calculated using the Wald procedure with Z being the standard normal variate whose mean is zero and SD is 1. Multiple Poisson regression modelling was used to test the significance for the adjusted impact of demographic factors on physician competence to treat emergency cases. A p-value less than 0.05 was considered as statistically significant.

Results

Figures (1 & 2) show that there were no differences between PHC physicians in terms of perceived-competence in handling emergency cases according to their gender or nationality.

Figure (3) shows that physicians with Diploma in Family Medicine and general practitioners with MBBS had better competence in clinical emergencies than Arab Board-qualified physicians (OR = 1.1486, p = 0.037 for Diploma qualified) and (OR = 1.153, p = 0.004 for MBBS qualified).

Figure (4) shows that, compared to physicians who completed BLS within the last 12 months, competence in clinical emergencies was far less for those who did not do BLS (OR = 0.6710, p < 0.0001), or did it over two years ago (OR = 0.8796, p = 5.30X10-05). However, there was no difference between those who did BLS last year or within a two years' time frame. Moreover, Figure (5) shows that, when adjusted to the effect of other variables, ACLS course attendance was not associated with significant gains in terms of competence.
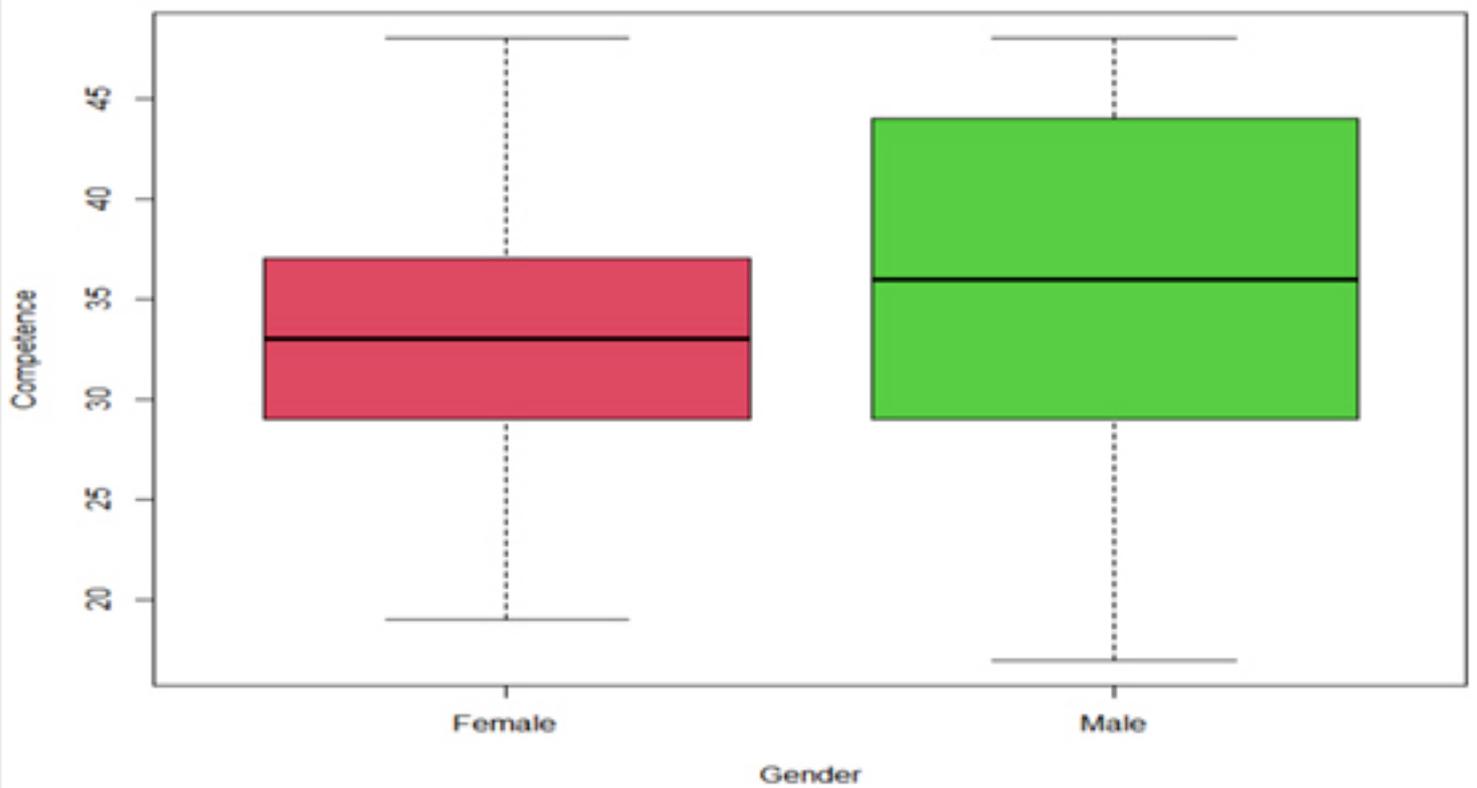
Figure 1. Physicians' emergency management competence according to their gender
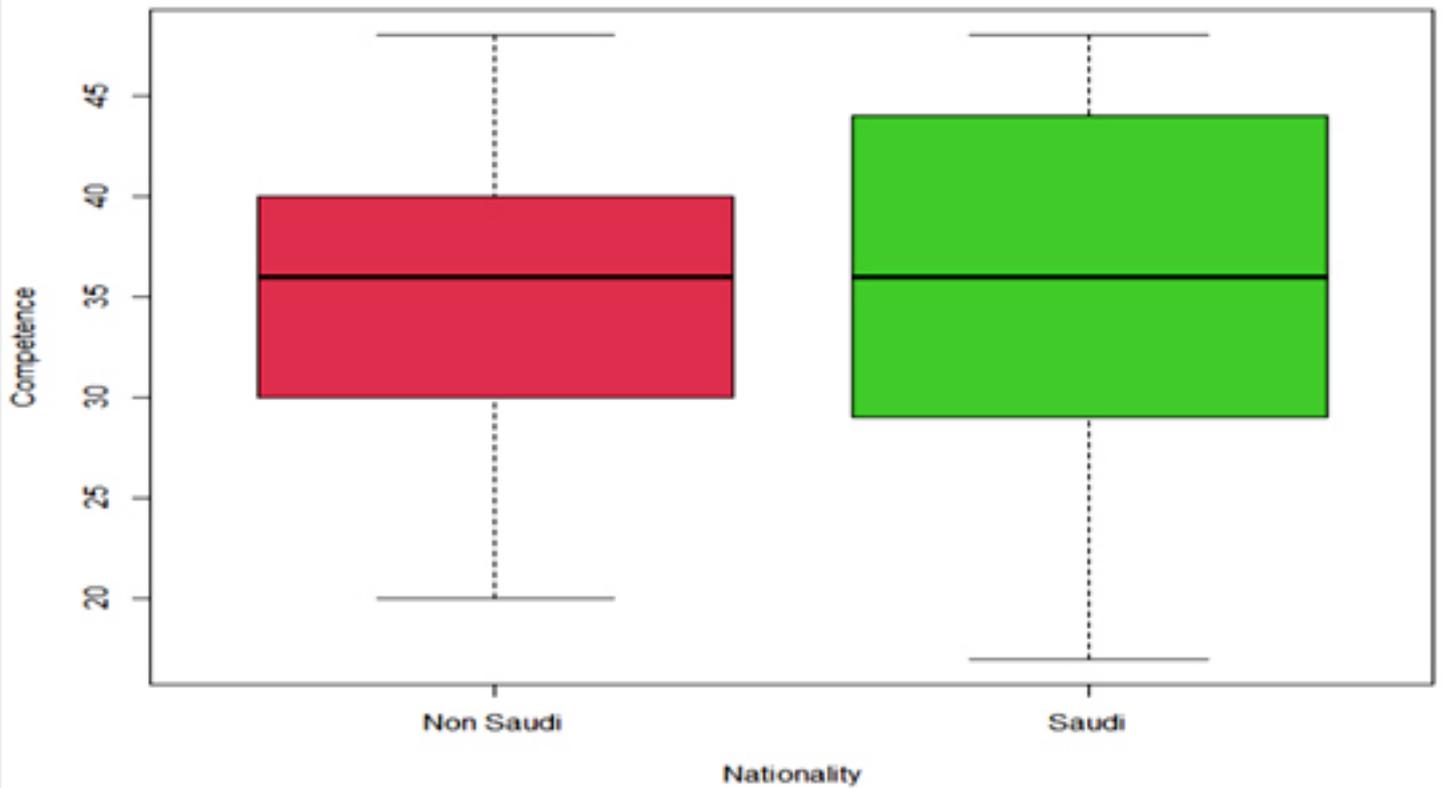
Figure 2. Physicians' emergency management competence according to their nationality
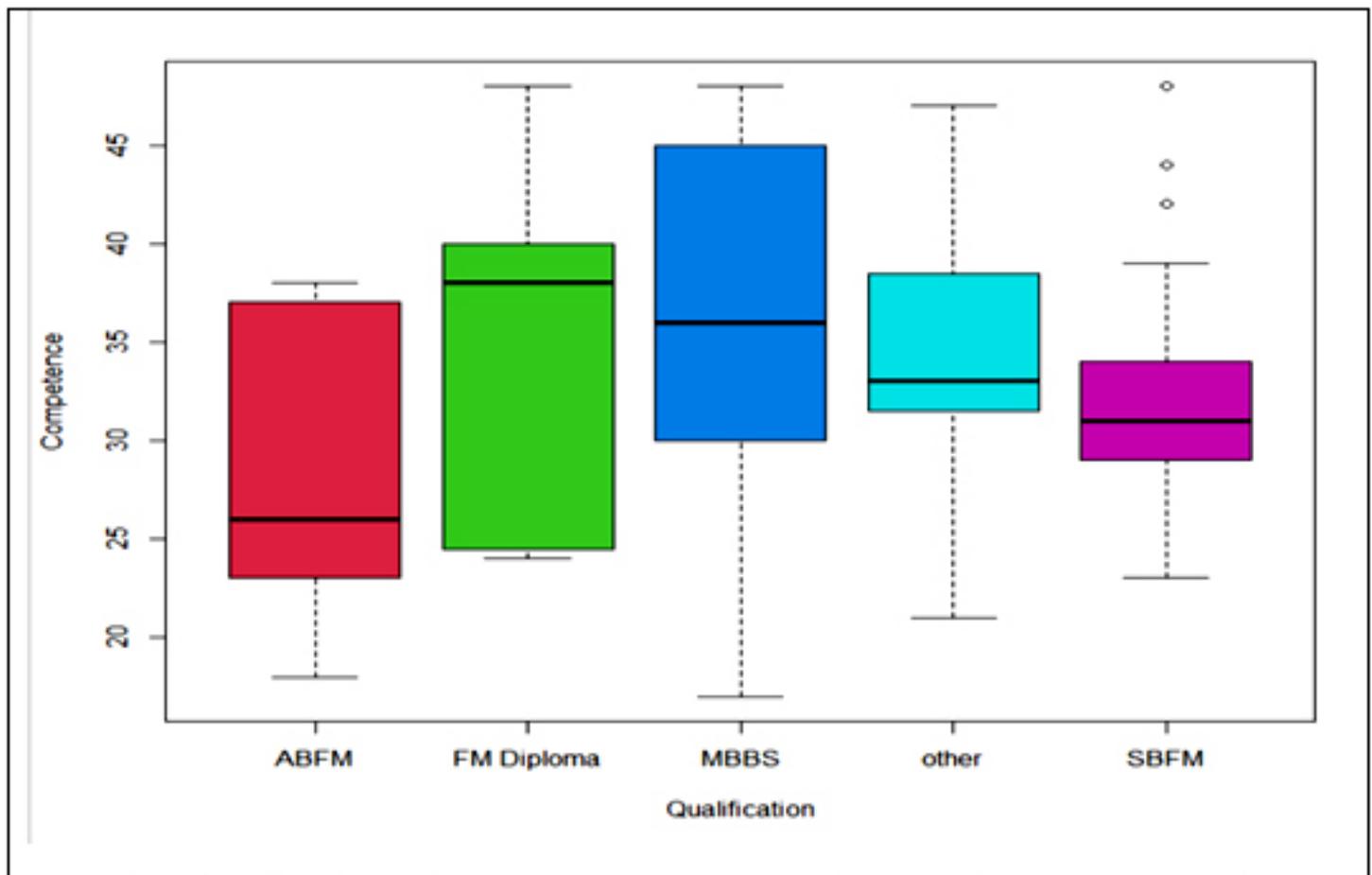
Figure 3. Physicians' emergency management competence according to their qualification
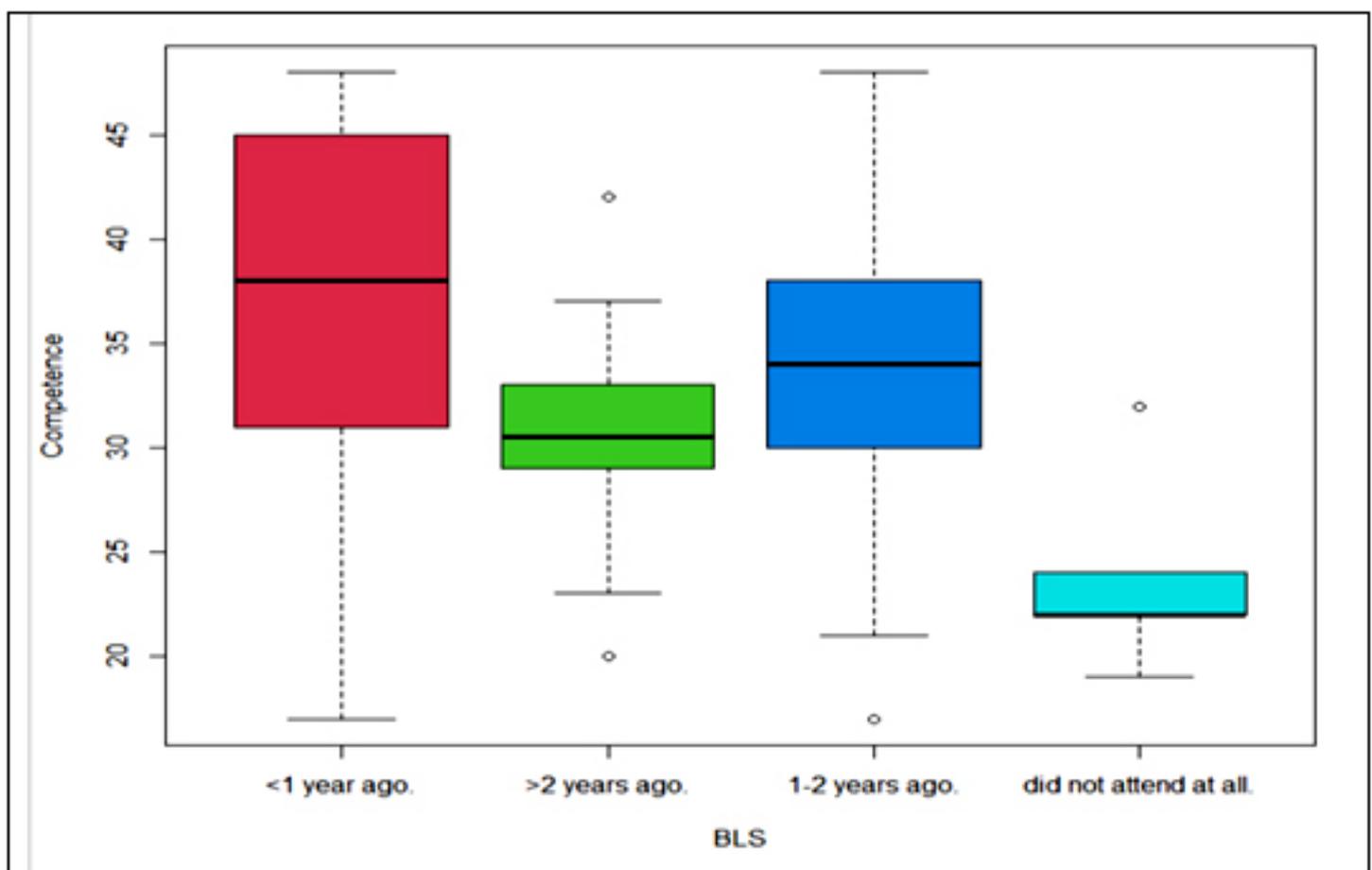
Figure 4. Physicians' emergency management competence according to their attendance of basic life support (BLS) course
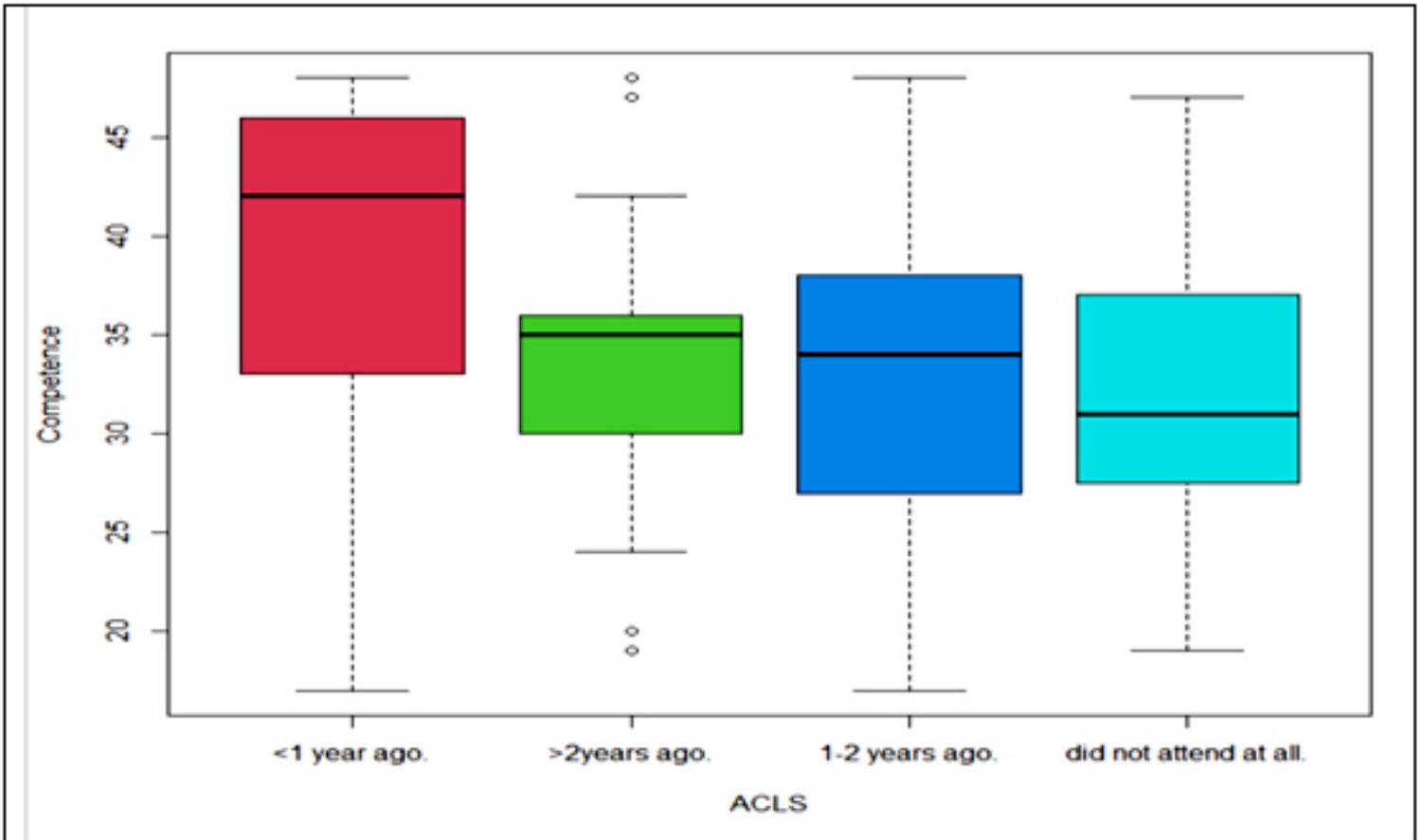
Figure 5. Physicians' emergency management competence according to their attendance of advanced cardiovascular life support (ACLS) course
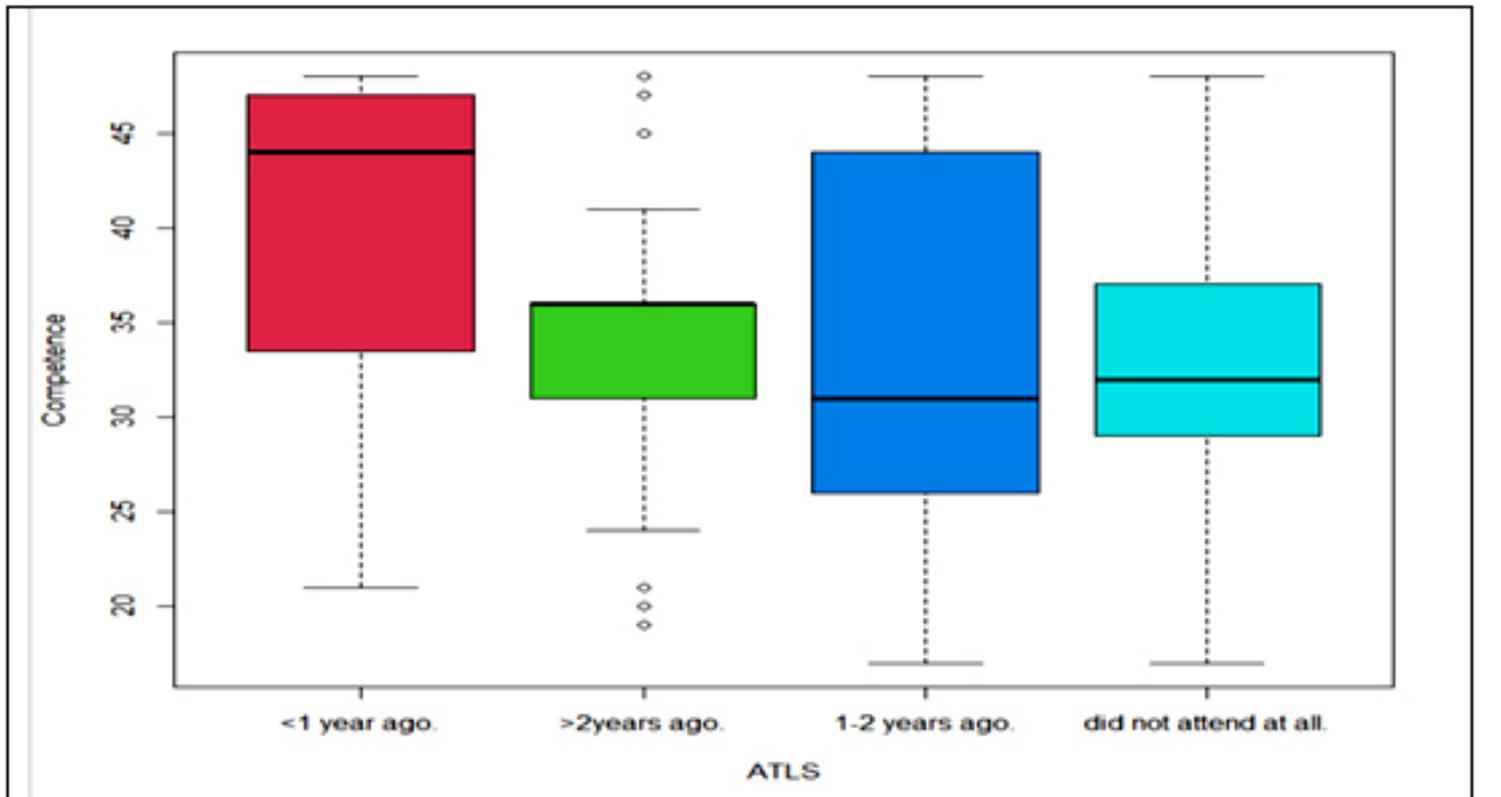
Figure 6. Physicians' emergency management competence according to their attendance of advanced trauma life support (ATLS) course

Figure 7. Physicians' emergency management competence according to their experience at emergency departments
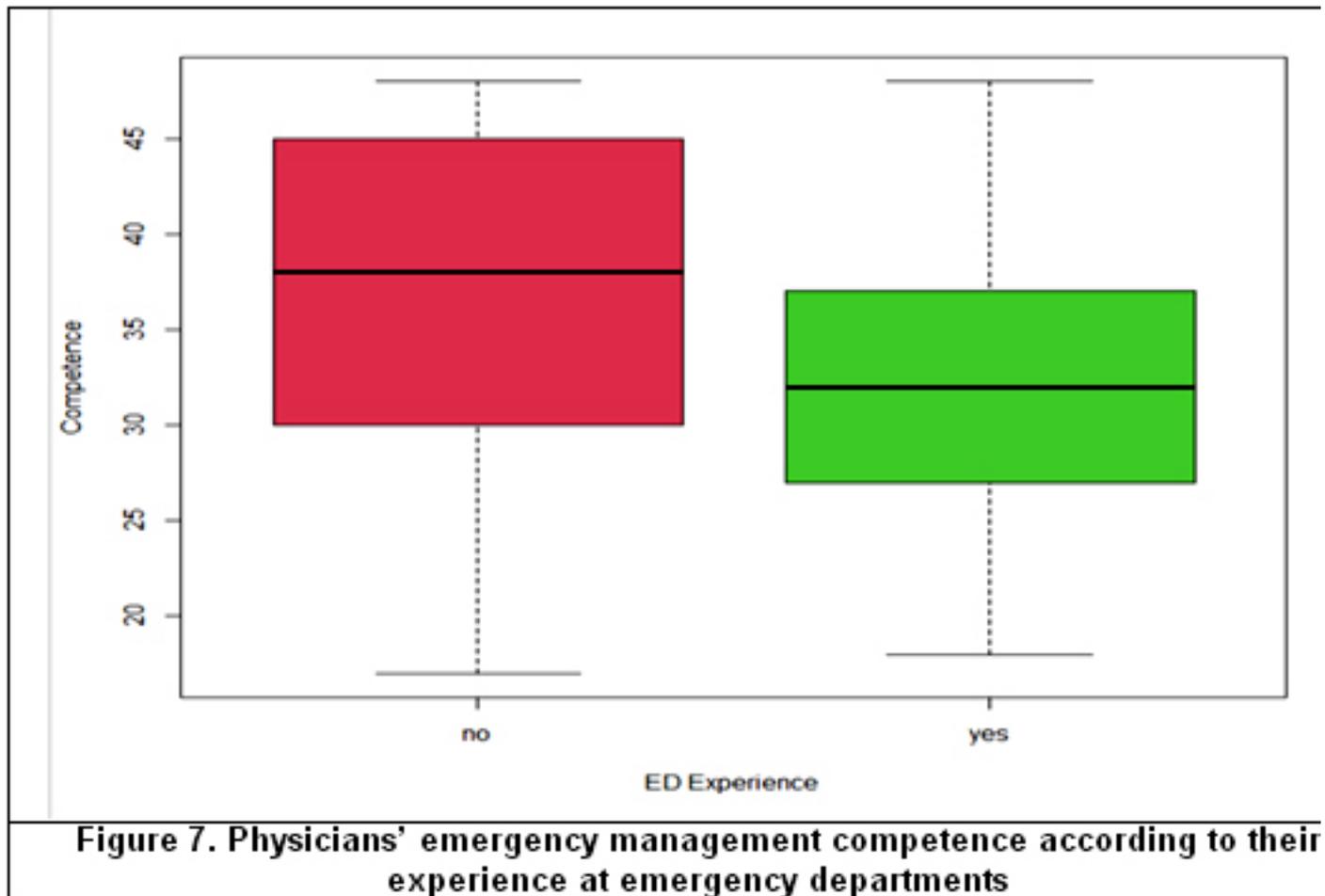
Figure (6) shows that ATLS was associated with better emergency knowledge and competence if completed within one year than within two years (OR = 0.9071, p = 0.002), over two years (OR = 0.8694, p = 1.68X10-05), or not done at all (OR = 0.9527, p = 0.01452).

Figure (7) shows that physicians' experience in ED was associated with worse self-rating of competence in emergency cases (OR = 0.9527, p = 0.01452).

Table (1) provides the details of the demographic results and their impact on competence in handling clinical emergencies in PHC settings. The mean age of participants was 36.5±6.6 years, ranging between 25 and 62 years, and the median age was 35 years. Age did not have any significant effect in terms of perceived competence score (Unadjusted OR = 1.00002, p = 0.986). There were 342 (77.8%) male physicians compared to 100 (22.2%) female physicians. Although male physicians significantly outperformed female physicians in terms of competence rating (t = 2.4896, p = 0.01363), this difference disappeared when adjusted for the effect of other variables. We had 364 (82.7%) Saudi physicians in the survey who did not differ in terms of competence to handle emergency cases than their non-Saudi colleagues. Only 18.4% of physicians had the Arab Board in Family Medicine certification. However, they were outperformed by physicians with all other qualifications, in terms of self-rating for competence in handling emergency cases, including 330 physicians (75.1%) who were only MBBS qualified and 60 (13.3%)

who were Saudi Board SBFM holders and 15 (3.3%) Family Medicine Diploma holders. Recent (i.e., <12 months) BLS training was reported by 297 physicians (67.7%), and recent ATLS training was reported by 148 physicians (32.9%), and 202 physicians (44.9%) were ACLS certified since less than a year. All physicians who attended these training courses rated themselves quite highly in terms of competence in emergency management than those who did not attend the courses or had them one or two years ago. Experience in emergency department, which was reported by 163 physicians (36.2%), was associated with worse competence in handling emergency cases (unadjusted OR = 0.8784, p <0.001).

Table (2) shows participants' self-rating in terms of competence in management of emergency cases. Those with no knowledge about cardiac compression were 11 (2.4%), compared to mouth-to-mouth breathing (37, 8.2%) or bag-and-mask resuscitation (9, 2%). IV cannula insertion would be avoided by 25 (5.6%). Those with no knowledge about cardiac compression were 11 (2.4%), compared to mouth-to-mouth breathing (37, 8.2%) or bag-and-mask resuscitation (9, 2%). IV cannula insertion would be avoided by 25 (5.6%) and intubation by 87 (19%), whereas defibrillation would not be attempted by 95 (21.1%) and ECG by 15 (3.3%). Some 31 (6.9%) rated themselves incompetent in nebulization and oxygen therapy, 14 (3.1%) in simple suture and a further 34 (7.6%) in NGT insertion. Urinary catheterization would not be attempted by 28 (6.2%) and using IV fluids by 35 (7.8%).

Table (3) shows the availability of emergency equipment at PHC settings as reported by participating physicians. The least available equipment was cervical collars 269 (59.8%), while 405 (90%) had a nebulizer in their PHC facility.

Table (4) shows that Ventolin for nebulization was present in 393 facilities (87.3%), and 304 facilities (67.6%) had activated charcoal powder.

Table (5) shows the odds ratios after adjusting for background factors simultaneously in the regression model. Clearly, when compared to ABFM certification, doctors did better if they had FM Diploma (OR = 1.1486, p = 0.03704) or MBBS (OR = 1.1529, p = 0.00371).

Compared to doctors who completed BLS within the last 12 months, competence in clinical emergencies was far worse for those who did not do BLS (OR = 0.6710, p < 0.0001), or did it over two years ago (OR = 0.8796, p = 5.30X10-05). Notably there was no difference between those who did BLS last year or within two years' time frame. ATLS was associated with better emergency knowledge and competence if completed within 1 year than within two years (OR = 0.9071, p = 0.002), over two years (OR = 0.8694, p = 1.68X10-05), or not done at all (OR = 0.9527, p = 0.01452). ACLS course attendance was not associated with significant gains in terms of competence.

Experience in ED was associated with worse self-rating of competence in emergency cases (OR = 0.9527, p = 0.01452).

Table 1. Baseline demographic results of the physicians included in the current investigation

Factor	(No.)/mean	%/SD	Unadjusted OR/mean competence	Statistical test	P-value
Gender					
• Male	342	77.8%	36.01	t = 2.4896	0.014
• Female	100	22.2%	33.93		
Age (in years)	Mean:36.5	SD:6.6	1.00002	Z = 0.018	0.986
Nationality					
• Saudi	364	82.7%	35.71	t = 0.9673	0.335
• Non-Saudi	78	17.3%	34.81		
Qualification					
• Arab Board	18	4%	Reference	Reference	Reference
• Diploma	15	3.3%	1.1818	Z = 2.698	0.00698
• MBBS	330	75.1%	1.2518	Z = 5.044	<0.001
• Saudi Board	60	13.3%	1.1099	Z = 2.122	0.03388
• Others	19	4.2%	1.1599	Z = 2.524	0.01161
Attending BLS course					
• Since < 1 year	297	67.7%	Reference	Reference	Reference
• Since > 2 years	60	13.3%	0.8260	Z=-7.603	<0.001
• Since 1-2 years	79	17.6%	0.9186	Z=-3.963	<0.001
• Not attended	6	1.3%	0.6330	Z=-5.396	<0.001
Attending ACLS course					
• Since < 1 year	202	44.9%	Reference	Reference	Reference
• Since > 2 years	86	19.1%	0.8716	Z= -6.32	<0.001
• Since 1-2 years	63	14%	0.8654	Z= -5.889	<0.001
• Not attended	91	22%	0.8313	Z= -8.784	<0.001
Attending ATLS course					
• Since < 1 year	140	32.9%	Reference	Reference	Reference
• Since > 2 years	91	20.2%	0.8509	Z =-7.281	<0.001
• Since 1-2 years	77	17.1%	0.8499	Z = -.931	<0.001
• Not attended	134	29.8%	0.8125	Z=-10.41	<0.001
Experience in ED					
• Yes	163	36.2%	0.8784	Z =-7.723	<0.001
• No	278	63.8%	Reference	Reference	Reference

BLS: Basic life support; ACLS: Advanced cardiovascular life support; ATLS: Advanced trauma life support; ED: Emergency Department

Table. 2: Participants' perceived competence regarding management of emergency cases

	Competence	No.	%
Cardiac compression	1= I do not know where to start	11	2.4
	2= I will do only if no one else is available	93	20.7
	3= I will attempt in most cases.	179	39.8
	4= I will attempt in all cases.	159	37.1
Mouth to mouth resuscitation	1= I do not know where to start	37	8.2
	2= I will do only if no one else is available	124	27.6
	3= I will attempt in most cases.	117	26
	4= I will attempt in all cases.	164	38.2
Bag & mask resuscitation	1= I do not know where to start	9	2
	2= I will do only if no one else is available	99	22
	3= I will attempt in most cases.	165	36.7
	4= I will attempt in all cases.	169	39.3
Inserting IV cannula	1= I do not know where to start	25	5.6
	2= I will do only if no one else is available	143	32.7
	3= I will attempt in most cases.	129	28.7
	4= I will attempt in all cases.	145	33.1
Intubation	1= I do not know where to start	87	19.3
	2= I will do only if no one else is available	142	33.3
	3= I will attempt in most cases.	103	22.9
	4= I will attempt in all cases.	110	24.4
Defibrillation	1= I do not know where to start	95	21.1
	2= I will do only if no one else is available	123	29.1
	3= I will attempt in most cases.	106	23.6
	4= I will attempt in all cases.	118	26.2
Reading ECG	1= I do not know where to start	15	3.3
	2= I will do only if no one else is available	102	22.7
	3= I will attempt in most cases.	169	39.3
	4= I will attempt in all cases.	156	34.7
Nebulisation & oxygen therapy	1= I do not know where to start	31	6.9
	2= I will do only if no one else is available	87	19.3
	3= I will attempt in most cases.	148	34.7
	4= I will attempt in all cases.	176	39.1
Simple suture	1= I do not know where to start	14	3.1
	2= I will do only if no one else is available	79	17.6
	3= I will attempt in most cases.	150	35.1
	4= I will attempt in all cases.	199	44.2
Nasogastric tube insertion	1= I do not know where to start	34	7.6
	2= I will do only if no one else is available	111	26.4
	3= I will attempt in most cases.	132	29.3
	4= I will attempt in all cases.	165	36.7
Urinary catheter insertion	1= I do not know where to start	28	6.2
	2= I will do only if no one else is available	92	20.4
	3= I will attempt in most cases.	142	33.3
	4= I will attempt in all cases.	180	40.0
Using IV fluid & medications	1= I do not know where to start	35	7.8
	2= I will do only if no one else is available	81	19.8
	3= I will attempt in most cases.	143	31.8
	4= I will attempt in all cases.	183	40.7

Table 3: Availability of emergency equipment at PHC settings as reported by participating physicians

Equipment	Availability (No.)	Availability (%)
Side lamp with stand	338	75.1
Dressing drum	375	83.3
Dressing trays	339	75.3
Dressing table	371	82.4
Urinary catheter	327	72.7
Forceps	348	77.3
Scissors	367	81.6
Suture materials	391	86.9
Needle holder	365	81.1
Suction apparatus	308	68.4
Blades	377	83.8
IV stand	373	82.9
Splints	350	77.8
Nasogastric tubes	336	74.7
Cannulas	402	89.3
Cervical collars	269	59.8
Oxygen mask	403	89.6
Airways equipment	363	80.7
Oxygen cylinder	400	88.9
Ambu-bag	342	76.0
Nebulizer	405	90.0

Table 4: Availability of emergency medications and facilities at PHC settings as reported by physicians

Equipment	Availability (No.)	Availability (%)
Calcium chloride injection	300	66.7
Anti-histamine injection	331	73.6
Hydrocortisone injection	367	81.6
Dextrose 5%, 10%, 50%	398	88.4
Normal saline	404	89.8
Ringer lactate	404	89.8
Activated charcoal powder	304	67.6
Metoclopramide	362	80.4
Adrenaline injection	348	77.3
Ventolin for nebulization	393	87.3
Anti-tetanic serum	305	67.8
Tetanus toxoid	323	71.8
Rabies vaccine	321	71.3
Diazepam	312	69.3
Furosemide	342	76.0
Hyoscine	351	78.0
X-Ray	351	78.0
Laboratory	378	84.0
Equipped ambulance car	336	74.7

Table 5: The adjusted effect for background factors on competence of management of potential emergencies by participating doctors

Factor	Adjusted OR	95% CI of adjusted OR		P value
Age	1.0012	0.9984	1.0039	0.40938
Gender Male	1.0312	0.9889	1.0753	0.15074
Nationality Saudi	0.9569	0.9088	1.0075	0.09398
Qualification FM Diploma	1.1486	1.0084	1.3084	0.0370†
Qualification MBBS	1.1529	1.0473	1.2692	0.0037†
Qualification others	1.1158	0.9860	1.2627	0.08246
Qualification SBFM	1.0486	0.9440	1.1647	0.37613
BLS >2 years ago.	0.8796	0.8266	0.9361	<0.001†
BLS 1-2 years ago.	0.9805	0.9345	1.0288	0.42221
BLS was not attended	0.6710	0.5654	0.7964	<0.001†
ACLS >2years ago.	1.0276	0.9595	1.1005	0.43698
ACLS 1-2 years ago.	0.9465	0.8856	1.0116	0.10515
ACLS was not attended	0.9797	0.9206	1.0427	0.51916
ATLS >2years ago.	0.8694	0.8157	0.9266	<0.001†
ATLS 1-2 years ago.	0.9071	0.8527	0.9650	0.0020†
ATLS was not attended	0.8750	0.8236	0.9295	<0.001†
ED Experience	0.9527	0.9165	0.9905	0.0145†

Discussion

Our study included 450 PHC physicians in the Southwestern area of Saudi Arabia. They were of different nationalities, training backgrounds, age and gender. A significantly positive effect was observed on physicians' perceived levels of competence for recent completion of BLS and ATLS training courses.

BLS remains one of the popular courses among Saudi health professionals, and recent surveys indicated that people tend to repeat the course on an annual basis given its perceived benefits [6]. Recent studies showed that attendance at BLS training in Saudi Arabia substantially improves knowledge among medical students [7], in addition to enhanced attitudes and competence toward cardiac emergencies and better use of automated defibrillator devices [8].

On the other hand, ATLS is not as popular as BLS training, despite calls from researchers to make it so in Saudi Arabia [9]. However, to clinicians in PHC settings, knowledge of advanced life support was not linked to better prehospital emergency care than regular BLS training [10]. Family physicians were found willing to engage and implement advanced trauma management standards, and they appreciated challenges of maintaining their skills in the long run [11].

Our results provided clear evidence that family physicians' annual attendance at these courses improves their knowledge and competence and, it is certainly, cost-effective. However, we noted that attendance of ACLS course was not of substantial impact when we adjusted for other courses. Although patient survival was shown to improve theoretically with proper ACLS certification for healthcare attendants [12], a recent investigation revealed concerning results about less-than-expected performance for ACLS attendees in management of cardiac arrythmias [13].

The ACLS is an intense course and although it is core competence for emergency room clinicians, it may fall above the standards required from family physicians. Our results show that ACLS attendance did not improve perceived competence among family physicians in Saudi Arabia. However, we would not be able to generalize the results to include actual competence in management of emergency cases in PHC settings. Further research would be required to compare such core and advanced competencies between family physicians who completed ACLS and those who did not.

Indeed, ABFM-certified physicians were the minority in our study, but they were outperformed by physicians from other qualifications when it came to perceived competence in attending to emergency cases in PHC settings. Notably, the majority of participants were fresh MBBS graduates. Therefore, one would expect them to be more familiar with advances in emergency care. However, Continuous Medical Education (CME) activities should focus more on providing advanced training in management of emergency cases for all family physicians.

Research found that such CME activities are useful and would, hopefully, improve knowledge and competence of family physicians in a variety of necessary subjects [14]. Educational interventions do improve family physicians' knowledge [15]. Hence, a focused emergency management educational intervention is warranted for PHC physicians in the southwestern area of Saudi Arabia.

One counterintuitive finding that emerged from our current investigation is the negative effect for ED experience among our physicians, in terms of their perceived emergency competence. Family physicians do gain emergency department experience, particularly in rural areas [16] similar to the southwestern area of Saudi Arabia. However, as per our findings, such experience does not seem to help their perceived competence when going back to their primary PHC clinical settings.

One explanation could be that the short-term experience in emergency medicine is counter-productive and would knock trainees' confidence. It may also be the fact that trainees with no prior emergency room experience overestimate their competence, an example of the so-called "Dunning-Kruger overconfidence" effect [17].

A recent study showed training in high-fidelity nearly real-life clinical scenarios could potentially lead to overconfidence rather than improved true competence [18]. We call for a more structured and prolonged exposure for emergency medicine in the family medicine training curriculum. However, focused educational research is required to ascertain the exact effect for emergency medicine placement. Could it be the quality of training rather than its duration?

One fifth of our sample of family physicians would not attempt use of automated external defibrillator (AED) in case of emergencies. This should raise concerns. AEDs are widely available in all urban, rural, and remote healthcare facilities, even onboard civilian aircrafts [19]. Moreover, the use of AED is part and parcel of prehospital emergency management, and all healthcare professionals should be proficient in its use. Early prehospital defibrillation is undoubtedly linked to enhanced chances of survival later on with proper advanced emergency care by specialist hospital staff [20]. Many countries encourage lay citizens to gain competency in life support using AED in public places [21].

Our findings identified a potential gap in defibrillation training among PHC-based family physicians in Southwestern Saudi Arabia. Therefore, more educational interventions and training should be devoted to this important area in clinical practice.

The current survey possesses several strengths. We recruited a large number of family physicians. The questionnaire was a well-designed and tested for self-rating of competence in managing emergency cases. However, any interpretation of our results should consider a range of limitations. There is the possibility of social desirability bias, given the self-rating nature of our survey, that would

have caused overestimation of competence among family physicians [22]. Furthermore, the research team could not validate the actual attendance at life support training course as reported by participants, with some potential for recall bias that would have overestimated the effect of these courses on competence in handling emergency cases [23].

Further research should focus on actual competence in management of frequent emergencies in PHC settings rather than perceived competence. Furthermore, qualitative research should explore learning needs in terms of management of clinical emergencies of family physicians in Saudi Arabia, and follow-on research should evaluate the effect of CME-based educational intervention on achievement of such learning needs.

Conclusions

Attending BLS and ATLS courses improves perceived levels of competence among PHC physicians. Annual attendance of these courses improves PHC physicians' knowledge and competence. One explanation for the negative effect of emergency room experience on perceived competence is that the short-term experience in emergency medicine is counter-productive and would knock trainees' confidence. There is a potential gap in defibrillation training among PHC-based family physicians in the southwestern area of Saudi Arabia.

Therefore, BLS training should be an integral part of family physician core competence in handling emergency cases. It should be provided annually to PHC-based healthcare staff and attendance should be facilitated by PHC policy makers. More educational intervention and training should be devoted to defibrillation skills in clinical practice. Further research should focus on actual competence in management of frequent emergencies in PHC settings rather than perceived competence. Well-designed qualitative research should be conducted to explore self-directed learning needs in terms of management of clinical emergencies of family physicians in Saudi Arabia, and follow-on research should evaluate the effect of CME-based educational intervention on achievement of such learning needs.

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Predictors of Waterpipe Smoking among Male Students of Jazan University, Jazan, Saudi Arabia

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Abstract

Background: Smoking is the leading cause of preventable premature death worldwide. Therefore, tobacco consumption is labeled as one of the major threats to public health.

Aim of Study: To identify predictors of waterpipe smoking among male students of Jazan university.

Subjects and Methods: A cross-sectional study was conducted to evaluate characteristics and factors associated with tobacco use among 409 undergraduate male students in Jazan University, Jazan, Saudi Arabia. A self-administrated questionnaire was used for data collection. It consists of 26 questions in 3 domains, covering demographic and socioeconomic characteristics of participants, tobacco use history, and factors associated with waterpipe use.

Results: A total of 409 university students took part in this study. About three-quarters of students (73.8%) reported having a friend who smokes waterpipe and 37.7% had a sibling who smokes waterpipe, while 15.2% and 2.4% of participants had fathers and mothers who smoke waterpipe, respectively. Moreover, 22.1% of waterpipe smoker students reported that they smoke waterpipe once a day, 12.6% smoke twice a week, 9.1% smoke once a week, 14.7% smoke once a month and 16.9% smoke once a year. For students who smoke waterpipe, the average number of smoking times was 16 times during the last month, 5 times during the last week and twice during the last day. Regardless of waterpipe smoking, 48.4% of students try to smoke cigarettes at least once.

Conclusions: The main factors associated with waterpipe smoking are age, monthly income, and having a father, siblings or friends who smoke waterpipe. Furthermore, students who smoke cigarettes or tobacco or have many friends who smoke waterpipe are significantly more likely to engage in waterpipe smoking.

Key Words: Smoking, waterpipe, cigarette, nicotine, university students, Jazan, Saudi Arabia.

Introduction

Smoking is considered as the leading cause of preventable premature death in the world and because of this, tobacco consumption is labeled as one of the major threats to health. In the United States, the numbers are even higher with more than 480,000 tobacco-related deaths, including deaths from secondhand smoke)[1]. Cigarette smoking causes about one of every five deaths in the United States each year[2]. The economic loss due to tobacco in Saudi Arabia is estimated to reach between 22.6 or 25.6 billion US$ over the last decade. In the United States it costs more than $300 billion each year[3].

Cigarette consumption continues to rise worldwide[4]. The trend of tobacco consumption is increasing in Saudi Arabia(3). In 2010, WHO estimated that about 16% of Saudi Arabia's population smoked (approximately 3,092,300 persons) [5, 6]. The WHO Eastern Mediterranean Region (EMRO) today has the maximum growth rate in the cigarette market, whereas there were significant reductions in smoking rates in the United Kingdom, Australia, Brazil, and other countries [4].

Males at college age are at risk of indulging in risky behaviors predisposing them to injuries, diseases, and death [7]. The college students are known to be full of risky behaviors and experimentation with tobacco products like a cigar, waterpipe, or smokeless tobacco. Due to a large number of behavioral and environmental factors, college students are at risk of adopting novel and often harmful health behaviors[8]. The United States Substance Abuse and Mental Health Services Administration reports showed that young adults aged between 18-25 years had the highest rates of tobacco (cigarettes, cigars, pipe tobacco, smokeless tobacco, chewing tobacco and snuff) consumption, ranging between (45.3%) in 2002 to (41.6%) in 2009 in comparison to older adults aged >26 years (29.9 %) in 2002 to (27.3%) in 2009[9].

One of the foreseen causes of the threat is because there are many forms of tobacco products available in the market for consumers. In recent years, there was a significant reduction in the numbers of cigarettes smoked in some western countries. However, this reduction was associated with an increase in consuming other forms of tobacco. One of the forms that are gaining popularity especially among college-age students is water pipe smoking. Waterpipe is an eastern tobacco pipe with a long, flexible tube that pulls the smoke through water contained in a vessel [10]. Water pipe originated in Persia and spread across Asia to reach India and toward the west to reach Egypt. Nowadays there are an estimated 100 million daily active users all over the world[11]. Reasons contributing to the global increase of water pipe include the introduction of 'Maassel', the booming cafe culture, the growth of the Internet and social media, and the lack of waterpipe regulations and policies [12].

While the knowledge regarding predictors of tobacco products, for example cigarettes, is abundant, little is known about the determining factors of waterpipe use.

Aim of Study
This study aimed to identify predictors of waterpipe smoking among male students in Jazan University.

Subjects and Methods

Definition of Terms
• **Tobacco consumption:** The use of tobacco products in different forms, such as cigarettes, cigars, pipes, waterpipe or smokeless tobacco products [13].
• **Smoking:** Tobacco smoking is the inhaling and exhalation of the fumes of burning tobacco which contain nicotine[9].
• **Lifetime cigarette smoking:** Students responses' that they ever smoked a cigarette, even 1 or 2 puffs [14].
• **Current use of tobacco products other than cigarettes:** Students' responses that they used tobacco products other than cigarettes [14].
• **Current use of waterpipe:** Smoking tobacco in a waterpipe during the past 30 days, even one or two puffs [15, 16].
• **Current Smoker:** A student who smoked at least one cigarette a day within the past 30 days [16, 17].

This study followed a cross-sectional research design at the University of Jazan, Jazan, Saudi Arabia, which is a public university with 45,810 students.

The study population included undergraduate male students aged between 18 and 25 years enrolled at Jazan University, Jazan, Saudi Arabia.

Sample size and sampling technique
Using the G-power 3.1 statistical software, the study included 409 participants, for a two-tail analysis, using logistic regression with a 0.05 α-level, a 0.10 β-level (90% power), and a 1.5 odds ratio.

Colleges in Jazan University were stratified into two groups according to type of studies, as follows:
• Social sciences: Arts, Education, Language and Translation, Law and Political Sciences, Administrative Sciences, and Islamic Studies; and
• Non-social sciences: Science, Computer Science, Medicine, Dentistry, Nursing, Pharmacy and Applied Medical Sciences.

Following a simple random sample, three colleges were randomly selected from each of the two groups. From each selected college, multiple clusters of different classes were selected, and the entire selected class was surveyed.

Data Collection Tools
The study included a self-administrated questionnaire in a simple Arabic Language, which was tested and validated. It consists of 26 questions, within 3 domains, i.e., demographic and socioeconomic characteristics of participants, tobacco use history, and factors associated with waterpipe use.

Pilot Study

A pilot study was conducted to test the clarity of the study questions; the time needed to complete the questionnaire, and to improve the quality and efficiency of the survey. Data collected within the pilot study were not included in the final analysis.

Data Management

Data were collected during the Academic Year 2020-2021. Responses were coded into an Excel worksheet. Statistical analysis was conducted using the Statistical Package for Social Sciences (IBM, SPSS version 26). Descriptive statistics (frequencies and percentages) were calculated. To test hypothesis, chi-square and the Fisher Exact tests were applied. A multivariate logistic regression analysis was applied to identify factors associated with waterpipe use. All tests were two-sided. A p-value less than 0.05 was considered as statistically significant.

Ethical Considerations

Participation of university students in this study was completely voluntary. They were informed that they can withdraw at any time. An informed consent was obtained from all subjects prior to their participation. No incentives or rewards were given to participants. The survey was approved by Jazan University IRB. There is no conflict of interest and all costs for conducting this study were fully carried out by the researcher.

Results

Table 1: Socio-demographics of participant students at Jazan University (n=409)

Socio-demographic characteristics	No.	%
Age (in years)		
• 18-25	327	80.0
• >25	82	20.0
Social status		
• Single	350	85.6
• Married	59	14.4
High school		
• Governmental	384	93.9
• Private	25	6.1
Monthly income (SR)		
• <1000	205	50.1
• 1000-2000	85	20.8
• 2000-3000	20	4.9
• >3000	99	24.2

Table 1 shows that 409 university students took part in this survey. Most students (85.6%) were single. Age group of most students (80%) was 18-25 years. Most students (93.9%) were graduated from governmental high schools. Approximately half of students (50.1%) had <1000 SR monthly income.

Figure 1 shows that 56.5% of male students in Jazan university smoked waterpipe.

Figure 1: Prevalence of waterpipe smoking among male students in Jazan University

Nonsmoker, 178, 43.5%

Smoker, 231, 56.5%
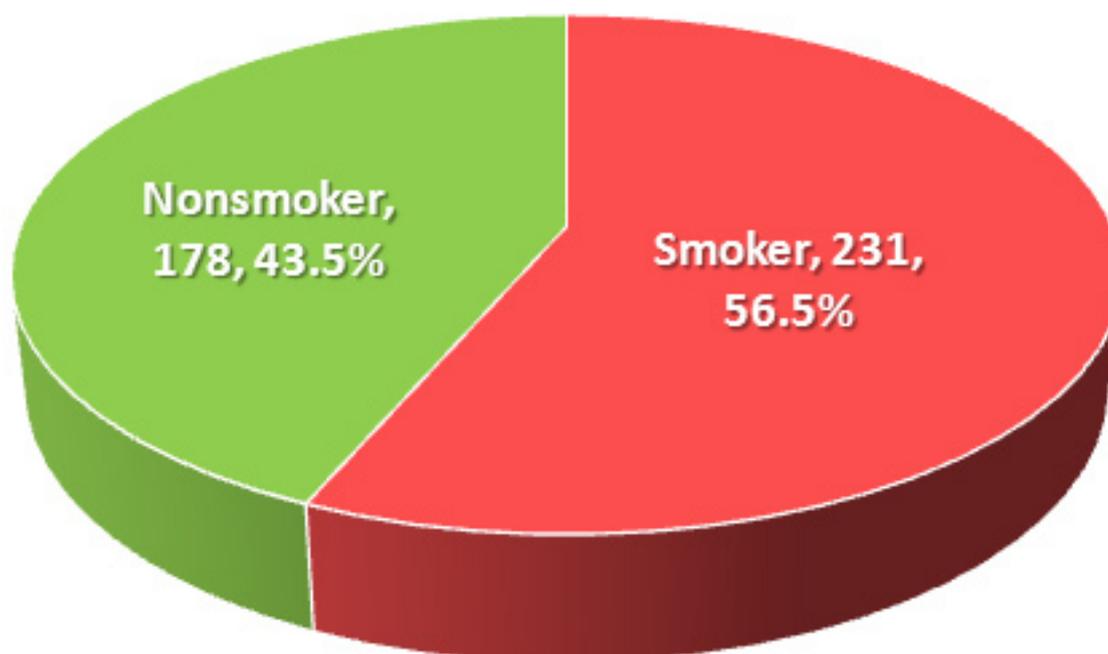
Table 2: Socio-demographics of the Jazan University students in relation to waterpipe smoking (n=409)

Socio-demographic characteristics	Waterpipe Smoking		P
	Yes (n=231)	No (n=178)	value
Age (in years)			
• 18-25	172 (74.5%)	155 (87.1%)	0.023‡
• >25	59 (25.5%)	23 (12.9%)	
Social status			
• Single	193 (83.5%)	157 (88.2%)	
• Married	38 (16.5%)	21 (11.8%)	0.461‡
High school			
• Governmental	211 (91.3%)	173 (97.2%)	<0.001‡
• Private	20 (8.7%)	5 (2.8%)	
Monthly income (SR)			
• <1000	100 (43.3%)	105 (59.0%)	
• 1000-2000	58 (25.1%)	27 (15.2%)	0.004†
• 2000-3000	9 (3.9%)	11 (6.2%)	
• >3000	64 (27.7%)	35 (19.7%)	

‡ Fisher Exact test   † Chi square test

Table 2 shows a significant association between age and smoking waterpipe (p =0.02), with 74.5% of waterpipe smokers being 18-25 years old. Most waterpipe smokers were graduated from governmental high school (91.3%) rather than graduated from private high school ((91.3% and 8.7%, respectively, p=0.02). Less than half of waterpipe smokers reported receiving <1000 SR monthly income compared to waterpipe smokers (43.3% and 59%, respectively, p=0.004).

Table 3. Factors associated with waterpipe smoking (n=409)

Factors associated with waterpipe smoking	Waterpipe Smoking		P value
	Yes (n=231)	No (n=178)	
Having a father who smokes waterpipe			
• Yes	39 (16.9%)	23 (12.9%)	
• No	155 (67.1%)	142 (79.8%)	
• No, he quit smoking last year	3 (1.3%)	1 (0.6%)	0.023†
• No, he quit smoking a long time ago	34 (14.7%)	12 (6.7%)	
Having a mother who smokes waterpipe			
• Yes	7 (3.0%)	3 (1.7%)	
• No	223 (96.5%)	175 (98.3%)	0.461†
• No, she quit smoking a long time ago	1 (0.4%)	0 (0.0%)	
Having siblings who smoke waterpipe			
• Yes	106 (45.9%)	48 (27%)	
• No	104 (45.0%)	122 (68.5%)	<0.001†
• No, they quit smoking last year	7 (3.0%)	3 (1.7%)	
• No, they quit smoking a long time ago	14 (6.1%)	5 (2.8%)	
Having friends who smoke waterpipe			
• Yes	206 (89.2%)	96 (53.9%)	
• No	14 (6.1%)	74 (41.6%)	
• No, they quit smoking last year	7 (3.0%)	6 (3.4%)	<0.001†
• No, they quit smoking a long time ago	4 (1.7%)	2 (1.1%)	
Number of friends who smoke waterpipe			
• None	17 (7.4%)	61 (34.3)	
• One	12 (5.2%)	23 (12.9%)	
• Two	22 (9.5%)	19 (10.7%)	
• Three	28 (12.1%)	11 (6.2%)	<0.001†
• More than three	145 (62.8%)	52 (29.2%)	
• I don't have friends	7 (3.0%)	12 (6.7%)	

† Chi square test

Table 3 shows that fewer waterpipe smokers reported that they have fathers who smoke waterpipe (16.9%, p<0.001), and siblings who smoke waterpipe (45.9%, p<0.001), while 89.2% of waterpipe smokers reported that they have friends who smoke waterpipe (p<0.001). Most students who smoke waterpipe (87.4%) reported that they have more than one friend who smokes waterpipe (p<0.001).

Table 4. Tobacco and cigarette use in relation to smoking waterpipe (n=409)

Tobacco and Cigarette smoking	Waterpipe Smoking		P value
	Yes (n=231)	No (n=178)	
Frequency of daily cigarettes smoked			
• 0	76 (32.9%)	135 (75.8%)	
• 1	41 (17.7%)	29 (16.3%)	<0.001†
• 2-3	38 (16.5%)	9 (5.1%)	
• >4	76 (32.9%)	5 (2.8%)	
Frequency of tobacco smoking daily			
• 0	169 (73.2%)	174 (97.8)	
• 1	38 (16.5%)	2 (1.1%)	<0.001†
• 2-3	8 (3.8%)	0 (0.0%)	
• >4	16 (6.9%)	2 (1.1%)	

Table 4 shows that waterpipe non-smokers stated that they had never smoked cigarettes or tobacco (75.8% and 97.8%, respectively) with p<0.001 for both.

Table 5 shows the results of multiple logistic regression analysis for predictors of waterpipe smoking among Jazan University students in Saudi Arabia, which included variables with a significant level in bivariate analysis. The risk of waterpipe smoking decreased with governmental high school graduates (OR=0.21; 95% CI: 0.056-0.78), and those who had no friends who smoke waterpipe (OR=0.07; 95 CI: 0.007-0.76). Additionally, the risk of waterpipe smoking was approximately three times higher among students who smoked waterpipe during the last month (OR=3.04; 95% CI: 1.47–6.31), and 8 times higher among those who smoked waterpipe during the last week (OR=1.64; 95% CI: 1.64–41.4), and the risk of waterpipe smoking decreased for students who never smoked cigarettes and those who smoked cigarettes at most once during their life (OR=0.42; 95% CI: 0.013–0.13 and OR=0.12; 95% CI: 0.073-1.24, respectively).

Table 5. Multiple logistic regression for predictors of waterpipe smoking

Variables	OR (95% CI)	P-value
Age (in years)		
• 18-25	0.41 (0.16-1.07)	0.070
• >25	1	
High school		
• Governmental	0.21 (0.056-0.78)	0.020
• Private	1	
Monthly income (SR)		
• <1000	1.46 (0.58-3.67)	0.420
• 1000-2000	1.62 (0.71-4.92)	0.390
• 2000-3000	0.80 (0.29-4.51)	0.800
• >3000	1	
Having a father who smokes waterpipe		
• Yes	1.55 (0.37-6.46)	0.540
• No	0.9 (0.27-3.01)	0.870
• No, he quit smoking last year	0.48 (0.034-9.78)	0.640
• No, he quit smoking a long time ago	1	
Having siblings who smoke waterpipe		
• Yes	0.56 (0.11-2.74)	0.480
• No	0.48 (0.10-2.34)	0.360
• No, they quit smoking last year	1.05 (0.09-11.5)	0.960
• No, they quit smoking a long time ago	1	
Having friends who smoke waterpipe		
• Yes	0.48 (0.05-4.67)	0.530
• No	0.07 (0.007-0.76)	0.020
• No, they quit smoking last year	0.91 (0.06-12.78)	0.940
• No, they quit smoking a long time ago	1	
Number of friends who smoke waterpipe		
• None	1.61 (0.15-2.7)	0.610
• One	1.47 (0.087-2.06)	0.690
• Two	1.62 (0.12-2.73)	0.810
• Three	3.66 (0.31-7.26)	0.210
• More than three	2.01 (0.23-3.53)	0.430
• I don't have friends	1	
Number of times using waterpipe during the last month	3.04 (1.47-6.31)	0.003
Number of times using waterpipe during the last week	8.25 (1.64-41.4)	0.010
Number of times using waterpipe during the last day	0.12 (0.04-0.37)	<0.001
Number of times smoking cigarettes		
• 0	0.42 (0.013-0.13)	<0.001
• 1	0.12 (0.037-0.44)	0.001
• 2-3	0.30 (0.073-1.24)	0.097
• >4	1	

Discussion

Waterpipe smoking is a significant public health concern. Recently, waterpipe and cigarette smoking have shown an unprecedented increase worldwide [18].

Findings of the present study showed that, among 409 students, 56.5% were waterpipe smokers, and 97.2% of non-waterpipe smokers were graduates from governmental high school. Being graduates from a governmental high school was shown to be a significant predictor of not smoking waterpipe. Students aged 18-25 years were more likely to smoke waterpipe than those aged over 25 years. Furthermore, this study revealed that receiving low monthly income was associated with decreased risk of waterpipe smoking.

These findings support those reported by a similar study of 1,932 students at a Jordanian University, that students with the highest income had higher odds of being current cigarette and waterpipe tobacco smokers [19].

Our results revealed that not having friends who smoke waterpipe was a significant predictor of not smoking waterpipe. On the other hand, increased number of friends who smoke waterpipe was associated with a significant risk for waterpipe smoking. In this study, fathers and siblings who smoke waterpipe was shown to be significantly associated with smoking waterpipe among university students.

This finding is in accordance with that of a study on 600 Jordanian adults which reported that waterpipe smoking by siblings is an important factor in predicting waterpipe smoking [20]. This can be explained by that waterpipe smoking may become a part of the family's social events, which may encourage the waterpipe smoking habit and affect any preventive efforts. Moreover, smoking cigarettes has also been reported to play an important role in predicting waterpipe smoking.

Students who smoked cigarettes more than once had a higher risk of smoking waterpipe. A similar study that included Lebanese university students showed that smoking cigarettes was found to be a predictor of waterpipe smoking [21].

The percentage of waterpipe smokers during the last month was 62.8%, and 60.2% in the last week. In this study, smoking waterpipe within the past month and within the past week was shown to be a significant predictor of waterpipe smoking.

Most students reported that if they have friends who smoke waterpipe they will try to stop them and tell them about the harms of smoking waterpipe. These findings support the expansion of educational programs addressing the risks of waterpipe smoking to students in all communities, especially schools, universities, and families. In addition, these programs can increase the awareness level of waterpipe risks, among university students to address

any misinformation and misconceptions. Knowledge can positively influence their understanding of the dangers of alternative waterpipe products. Furthermore, it is highly recommended to encourage the existing smoking cessation clinics to include waterpipe smoking among their activities to help quit smoking.

Conclusion

The main factors associated with waterpipe smoking among university students include age, high school type, monthly income, and having a father, siblings or friends who smoke waterpipe. Furthermore, students who smoke cigarettes or tobacco or who have friends who smoke waterpipe are significantly more prone to engage in waterpipe smoking.

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Children's vision health during the COVID-19 pandemic

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Abstract

During the peak months of the COVID-19 pandemic, several countries elected to close schools and adapted to online learning. The aim of the article is to review the impact of lockdown measures instituted during the COVID-19 pandemic on children's vision health and to make recommendations for mitigating potential visual impairment.

Methods: We reviewed studies focused on digital device usage, near work, and outdoor time in relation to myopia onset and progression in children during the COVID-19 pandemic. Studies focused on the relation between screen time, asthenopia and dry eyes in children during COVID-19.

Results: Increased digital screen time, near work and limited outdoor activities were found to be associated with the onset and progression of myopia during the COVID-19 pandemic period. Screen time was positively associated with asthenopia and dry eye in children during COVID-19.

Conclusion: The COVID-19 pandemic has led to dramatic changes in many aspects of daily life. Online learning has become the mainstream public learning mode during the pandemic. Several studies indicate accelerated myopic progression during the COVID-19 pandemic in children and the increase has been found to be related to excessive use of digital screen devices and the decrease of outdoor activities duration. Also prolonged screen time, and online-course time can significantly increase asthenopia and dry eye risk. Several studies have recommended to decrease screen time and to increase outdoor activities.

Key words: Myopia progression, digital screen time, near work, outdoor activity time, asthenopia and dry eye

Introduction

On December 30, 2019, a novel coronavirus disease 2019 (COVID-19) was initially described and rapidly spread worldwide. (1) A few months later, the World Health Organization (WHO) declared COVID-19 a "pandemic" outbreak (2) .

Governments worldwide have implemented various measures to contain the spread of the pandemic, including strict travel bans, social distancing, quarantine policies and school closures. These measures have affected school-age children and students in general. During the peak months of the pandemic, 195 countries elected to close schools, affecting nearly 1.5 billion children and young people (3).

In addition to the negative physical and mental effects of school closures, the children during the home education process were more exposed to smartphones, computers, tablets and television (4). Children's visual system is extremely delicate and is in a phase that is characterized by critical development. Studies have suggested that early decline in eye health is associated with increased risks of developing macular degeneration, glaucoma, and other myopia-related complications (5,6).

Myopia progression

According to the World Health Organization, at least 2.2 billion people worldwide suffer from impaired vision, among whom a significant proportion are those under 18 years old (7). Research has suggested that close to 50% of the world's population may be myopic by 2050, with as much as 10% highly myopic (8).

In addition to genetics (9), there is strong evidence that environmental factors (10) such as time spent outdoors (11), sustained near vision (12) and prolonged higher education (13) play a significant role in the onset of myopia.

Pelligrini et al (14) noted the possibility that prolonged home confinement due to the COVID-19 pandemic would very likely have a significant impact on the global incidence of myopia and worsening of pre-existing myopia among children. The authors termed this quarantine myopia and observed that this would represent a serious public health concern because of the visual disability associated with uncorrected myopia that would particularly affect children in low- and middle-income countries and the sight-threatening complications in later life associated with high myopia.

There is supportive evidence from several studies documenting what was considered a possibility has indeed happened.

Wang et al (15) evaluated non-cycloplegic refractive error values of 123,535   children aged 6 to 13 years from 10 elementary schools in Shandong, Feicheng, China. They found that, in the annual screenings conducted from 2015 to 2019, the mean SER (spherical equivalent refraction) findings were relatively stable for all age groups, whereas in the June 2020 screenings that took place when schools reopened after 5 months of home confinement, the mean SER reflected a myopic shift of about − 0.3 diopters (D) and the prevalence of myopia (defined as an SER of −0.50 D or less) increased 1.4 to 3 times in 2020 compared with the previous 5 years especially among younger children.

In another study, 2 groups of students from 12 primary schools in Guangzhou, China, were prospectively enrolled and monitored from grade 2 to grade 3. A non-exposure group (n=1060) included students who were examined in late 2018 (grade 2) and then in late 2019 (grade 3), and an independent exposure group (n=1054) included students examined in late 2019 (grade 2) and again in late 2020 (grade 3). Compared with the unexposed group, the exposed group experienced a -0.36 D greater myopic shift in SER, an increased axial length of 0.08 mm, and a 7.9% higher incidence of myopia (defined as a SER <−0.5 D). (16)

And in another report, students from primary grades through high school from Chongqing, China, were randomly selected from the 2019 and 2020 surveys (n=1728 and 1733, respectively), which included refractive data recorded by an optometry unit. The percentage of myopia (defined as a mean uncorrected visual acuity <5.0 with a mean SER <−0.50 D) in 2019 was 44.62% and increased to 55.02% in 2020 (P<0.001), and the mean spherical equivalent (SE) refraction (−1.94 ± 2.13 D) in 2020 was lower than that in 2019 (−1.64 ± 5.49 D, P < 0.001) (17).

Also, in Hong Kong, a study with a total of 1793 subjects were recruited, of whom 709 children comprised the COVID-19 cohort with 7.89±2.30 months of follow-up, and 1084 children comprised the pre-COVID- 19 cohort with 37.54 ± 3.12 months of follow-up. The overall incidence was 19.44% in the COVID-19 cohort, and 36.57% in pre-COVID-19 cohort. During the COVID-19 pandemic, the change in SER was –0.50 ± 0.51 D. The authors observed that the COVID-19 cohort over 8 months showed a faster SER progression (−0.50 D) during the current pandemic compared with the studies in Shanghai (−0.27 D), (18) Guangzhou (−0.31), (19) and Taipei of Taiwan (−0.42D), (20) over a 1-year follow-up before COVID-19 (21).

Furthermore, Aslan F et al (22) evaluated the myopic progression of 115 children aged 8–17 years in Turkey between 2017 and 2020 and found that the annual myopic progression amount 0.49±0.26, 0.41±0.36 and 0.54 ±0.43 diopters (D) for the 2017, 2018 and 2019 years and 0.71±0.46 D in 2020, and the increase in myopic progression in 2020 compared to the 2019 and 2018 years, was statistically significant (P < 0.003).

In another study of 201 myopic children aged 7 to 12 years with regular follow-up visits every half a year from April 2019 to May 2020 in Shanghai, China, there was a significantly greater change in spherical equivalent at visit 2 (−0.98 ± 0.52 D) than at visit 1 (−0.39 ± 0.58 D; P < 0.001), whereas the second (visit 2) was four months after the home quarantine (23).

Similarly, in a study in India, a total of 133 children (266 eyes) aged 6–18 years were included in the study. Mean annual myopia progression was found to be statistically significant during COVID-19 as compared with pre-COVID-19 (0.90 vs 0.25 D, P < 0.00001) and a total of 45.9% of children showed an annual progression of ≥1 D during the pandemic as compared with 10.5% before the COVID-19 pandemic (24).

In another study in China of two groups with a total of 154 children, the exposed group was formed from 77 children aged 8 to 10 years who studied at home in the 7-month period during the COVID-19 pandemic (follow-up period: January – August 2020) and did not study at home in the 7-month period before the COVID-19 outbreak (baseline period: July 2019 – January 2020). Seventy-seven children who did not undergo study-at-home (baseline period: 7 months in 2015, follow-up period: 7 months in 2016) were included in the control group. Myopia progression was similar between the two groups in the baseline period. However, in the follow-up period the exposed group had a greater change in refraction toward myopia (−0.83 ± 0.56 D) than the control group (−0.28 ± 0.54 D; P < 0.001). In addition, the exposed group exhibited a significantly greater change in refraction toward myopia in the follow-up period (−0.83±0.56 D) than in the baseline period (−0.33±0.46 D; P < 0.001). (25)

In Spain, 1600 children between 5 and 7 years old were examined in September and October of 2020 and compared with the 4227 examined during the same months of 2019. There was a significant decrease of the spherical equivalent (mean ± standard deviation; 0.66 ± 2.03 D in 2019 vs. 0.48 ± 1.81 D in 2020; P ≤ 0.001) (26).

A summary of myopia progression in these studies is shown in Table 1.

Reference	Location	Age, y	Sample size	Duration	SE pre COVID-19 (D)	SE during COVID-19 (D)	SE Change during COVID-19 (D)	SE Change pre COVID-19 (D)	P value
Hu Y et al. (16)	Guangzhou, China	6 – 8	1054	1 year	0.86 ± 0.94	0.20 ± 1.15	– 0.67 ± 0.56	– 0.31 ± 0.46 *	– 0.36 D P < 0.001
Wang W et al. (17)	Chongqing, China	7 – 12	1733	1 year	– 1.64 ± 5.49	– 1.94 ± 2.13	P < 0.001	#	#
Zhang X et al. (21)	Hong Kong	6 – 8	709	8 months	0.32 ± 1.16	– 0.19 ± 1.33	– 0.50 ± 0.51	– 1.27 ± 1.34 **	-
Aslan F et al. (22)	Turkey	8 – 17	115	1 year	– 1.99 ± 1.04	– 2.7 ± 1.21	– 0.71 ± 0.46	– 0.54 ±0.43	– 0.17 ±0.6 D P 0.003
Ma M et al, (23)	Shanghai, China	7 – 12	201	6 months	– 2.25 ± 0.75	– 3.23 ± 0.65	– 0.98 ± 0.52	– 0.39 ± 0.58	< 0.001
Mohan A et al. (24)	India	6 – 18	133	1 year	– 4.54 ± 2.70	– 5.12 ± 2.70	– 0.45 ± 0.48	– 0.12 ± 0.18	< 0.00001
Ma D et al. (25)	Hebei, China	8 – 10	77	7-month	– 0.26 ± 0.93	– 0.75(–1.13, –0.50)	– 0.83 ± 0.56	-0.28 ± 0.54	<0.0001
Alvarez-Peregrina et al. (26)	Spain	5-7	5827 *#**	1 year	0.66 ± 2.03	0.48 ± 1.81	– 0.13 D	#	#

Table 1: Key results of myopia progression according to the previous studies.

SE spherical equivalent, D diopter, * Myopia progression pre COVID 19 in the non-exposure group (n=1060). ** Myopia progression pre COVID 19 cohort (1084) for 3 years follow up duration. *# Total of (4227) children examined in 2019 and (1600) children examined in 2020. # Not reported in the study.

Digital screen time and near work

The evidence concerning the role of screen time and near work in myopia onset and progression is conflicting. In a meta-analysis involving 15 studies with a total of 49,789 children 3-19 years of age, Lance et al reported mixed findings with respect to an influence of screen time on myopia (27).

Also, many authors report that increased near work is associated with higher incidence of myopia in school age children, (28-30) while others did not observe such a relationship (31-32).

Several studies found that children worldwide had spent extended periods of time with digital media during COVID-19 lockdown, Table 2.

The association between e-learning screen use, near work, and myopia development during COVID 19 was investigated by several studies.

In a study of 3,831 Chinese adolescents during the COVID-19 pandemic, researchers found that every 1-hour increase in daily digital screen use is associated with 1.26 OR [Odds Ratio] higher risk of myopic progression. And using smartphones and computers is shown to be associated with higher risks of myopic progression than television use (41).

In another survey involving 2234 subjects enrolled in 1st to 6th grade in primary schools in China. each additional diopter hour increase in electronic screen use per day was associated with 1.036 odds ratio (OR) increased likelihood of near-sighted refractive error, whereas diopter hour is the proximity-weighted eye use that is computed based on an average distance from electronic screens. It found that the subjects reporting occurrence of near-sighted refractive error on average indicates 3.64 dh additional exposure to electronic screens per day than subjects who did not experience near-sighted refractive error (42).

Similarly, in a study of 3405 children from primary to upper-secondary school, findings show that each diopter hour increase in daily e-learning screen use is significantly associated with progression of myopia symptoms (OR: 1.074). It found an average daily screen time of 3.9 ± 2.3 hours/day. Subjects who reported myopic symptoms on average engaged in 1.4 more hours than subjects who did not ($P < 0.001$) (43).

Also, Ma M et al (23) in their study found that an increase of 1 h/day spent on digital devices for online learning corresponded with a myopia progression of 0.21 D. They observed that an average of 0.67 h/day was spent on digital screen devices for online learning before the COVID-19 pandemic and increased to 5.24 h/day during COVID- 19 pandemic, nearly 10 times longer than before. A significant difference in change of SE was found between different types of digital devices used (mobile phone: −1.63 ± 0.20 D; tablet: −1.00 ± 0.29 D; television: −0.69 ± 0.25 D; projector: −0.61 ± 0.27 D; $P < 0.001$). Children using televisions and projectors had significantly less myopic shift than those using tablets ($P < 0.001$), who had slower myopia progression than those using mobile phones ($P < 0.001$). More time spent on digital devices for online learning and doing other near work was significantly correlated to faster myopia progression ($P < 0.001$ for digital screen time; $P = 0.015$ for other near work).

Also, in the above mentioned study of Wang W (17), the researchers found that the mean SE in the television group (−1.10 ± 1.49 D) was better than that in the computer group (−2.03 ± 2.37 D, $P = 0.0017$) and in the cell phone group (−2.02 ± 2.09 D, $P = 0.0028$) for the students who used digital devices for online courses (17).

Table 2: Children's screen time during COVID-19 in different studies

Country	Age/ year	Screen time effect
Canada	5 - 11	Only 4.8% of children were meeting combined movement behavior guidelines during COVID-19 restriction due to sedentary behavior including screen time (5.1 hours/day) (33)
China	6 - 17	Screen time increased during the pandemic in total (+1730 min [or approximately 30h] per week on average (34)
France	6 - 10	65% of children had increased screen time (35)
Germany	4 - 17	61.2 minutes more screen time per day (36)
Italy	6 - 18	Screen time increased by 4.85 h/day (37)
India	10 - 18	average screen time (3.9 ± 1.9 h) vs (1.9 ± 1.1) pre COVID-19 (38)
Netherlands	4 - 18	screen time increased by 1 hour (39)
Spain	8 - 16	screen time increased by 1.9 ± 2.6 h/d (40)

In addition to that, in a study in India, 96.7% of the children were using smartphones to attend online classes. They noted increase in the duration of mobile game playing (P < 0.0001) during the COVID-19 period and found video game playing on smartphones ≥1 h per day was a significant risk factor for rapid annual myopia progression during the COVID-19 pandemic (OR = 3.46, P = 0.01) (24).

In Hong Kong, Zhang X et al found that screen time had increased from 2.45 ± 2.32 to 6.89 ± 4.42 hours/day (P < 0.001) in 709 children who comprised the COVID-19 cohort group. During the same period, total near work time increased from 3.42 ± 2.50 hours/day to 8.05 ± 4.49 hours/day (P < 0.001). The study also showed association of reading time with SER progression (21).

Also, Ma D et al (25) found that the amount of time spent performing near-work increased during the study-at-home period from 2.96 ± 1.05 hours per day to 4.33 ± 1.04 hours per day (P < 0.001), where near work included homework, reading books, painting, playing chess, using computers and using mobile phones.

In a study in USA, forty children (ages 14.6 ± 0.4 years) simultaneously wore two sensors for one week; a Clouclip for objective measurement of near viewing and light exposure and an Actiwatch for objective measurement of activity and sleep. Objectively measured daily near viewing duration during COVID-19 was 6.9 ± 0.3 hrs. Myopes spent more time in near + intermediate viewing than non-myopes (P = 0.008) and had higher diopter hours (P = 0.03) and electronic device use was (12.0 ± 0.7 hrs per day) (44). Similarly, in another study of 53 children in the USA, the daily electronic device use increased on weekdays and weekends during COVID-19 (7.3 ± 0.6 and 7.9 ± 0.7 hours) compared to a typical summer (4.9 ± 0.5 and 6.1 ± 0.5 hours, P < 0.001 for both weekdays and weekends) and to a typical school session (3.4 ± 0.3 and 5.4 ± 0.5 hours, P < 0.001 for both weekdays and weekend) (45).

Outdoor activity time

The role of outdoor activity in decreasing myopia progression has been disputed. Outdoor activities have been reported to decrease the incidence and progression of myopia. (46-47). Wu et al. suggested that myopia progression in children who spent >11 h a week outdoors decreases by 53% (46). Also, He et al. reported that every additional 40 minutes of outside activities decreases myopia incidence by 23%, (47) While in another meta-analysis, improved outdoor time demonstrates a protective effect for onset but not progression of myopia (48).

Outdoor activity time and myopia progression during COVID 19 was investigated by several studies.

In a study of 1237 school children aged 9-14 years in India, a significant decline was noted in time spent on outdoor activity (from 8.5 hours/week in pre-COVID-19 time to 1.6 hours/week during COVID-19 lockdown; P < 0.001) (49).

Also, outdoor activities time decreased from 1.27 ± 1.12 hours/day at baseline recruitment to 0.41 ± 0.90 hours/day during COVID-19 (P <0.001) (21). Similarly, outdoor activities decreased from 1.84 ± 1.43 hours per day to 0.98 ± 1.01 hours per day (P < 0.001) (25).

Aslan F et al (22) noted that the mean myopic progression was 0.55 ± 0.42 D in children who spent time outside in the daylight for 2 hours a day, and 0.82 ± 0.45 D in children who did not (P = 0.003) and the mean myopic progression was 0.5 ± 0.41 D in children living in detached houses and 0.79 ± 0.45 D in those living in apartments (P = 0.006).

Liu J et al (43) reported that engaging in outdoor exercise four to six times per week (OR: 0.745, p = 0.034) and one to three times per week (OR: 0.829, p = 0.048) is associated with a lower likelihood of myopia progression, than none. Similarly, Wang W et al (17) reported that average time of outdoor activity was positively correlated with SE.

Also, in the abovementioned study in Spain (26), the authors found that 56% of the children changed the amount of time spent outdoors, and in 47% of the cases, this time decreased (P < 0.001), and the relationship between lifestyles and refractive errors showed that children who spent more time outdoors had higher SE in both cases: pre and post confinement (P < 0.001 and p = 0.049).

In another study, home confinement in the form of less sun exposure was found to be the most important risk factor for the rapid progression of myopia during the COVID-19 pandemic. Sun exposure <1 hour per day (P < 0.00001) was found to be an independent risk factor for rapid myopia progression of ≥1 D (24).

Furthermore, in another study, children demonstrated decreased activity and time outdoors during COVID-19, with myopic children exhibiting lower light exposure and activity than non-myopes. However, while myopic children tended to spend less time outdoors (0.7 ± 0.2 hours per day) than non-myopic children (1.0 ± 0.1 hours per day), the difference did not reach significance (P = 0.09) (45).
On the other hand, even the outdoor time during the home quarantine period significantly decreased from an average of 1.11 hours/day to 0.49 hours/day; no association between reduced outdoor time and faster myopia progression was observed (23). The authors noted that this might be because outdoor time was still less than 2 hours/day before the home quarantine, which is under the threshold required to have a positive effect or be due to the different influence of outdoor activities on myopia onset and its progression, with no protective effect in children who are already myopic.

Asthenopia and dry eye

Asthenopia is defined as a subjective sensation of eye strain, eye pain, dry eyes, itching eyes, and headaches, (50). Several previous studies have shown that increased use of digital tools is positively related to asthenopia risk among college students and school-aged children (51-52).

The prevalence of asthenopia among school-aged children and adolescents varies significantly across countries, ranging from (12.4-26.4%) (53) in one study up to 89.9% (54) in another.

During COVID-19, a study in India of 217 children (13 ± 2.45 year) found 36.9% (n = 80) were using digital devices >5 hours in the COVID era as compared to 1.8% (n = 4) before the COVID era. The prevalence of digital eye strain is 50.23% and was significantly associated with male gender, smartphone use, duration of digital device use >5 hours, digital device distance <18 inches, and use of mobile games >1 hour per day (38).

In another study of 654 students (mean age: 12.02 ± 3.9 years) in India, the average per day digital device exposure was 5.2 ± 2.2 hours. (92.8%) of the children reported experiencing at least one asthenopic/dry eye symptom (AS/DS). The most prevalent symptoms were eye redness (69.1%) and heaviness of eyelids (79.7%). Significant positive correlation was reported between age and per day duration of digital device exposure (P < 0.001). Computer vision syndrome (CVS) score for spectacle users was significantly higher (P < 0.001). CVS score was found to correlate significantly with age and duration of digital device exposure (P < 0.001) (55).
Also, in another study of 25,781 school-aged children in China, overall asthenopia prevalence was 12.1%, varying from 5.4 to 18.2%. Authors found that total screen time was positively associated with asthenopia risk and a 100-hour increment of total screen/online-course time was associated with an increased risk of asthenopia by 9% (56).

In Egypt, a study of 403 subjects with a mean age of 12.7 ± 1.9 years (range 10–18) during COVID-19 reported that the most frequent current symptom was eye fatigue followed by dryness/grittiness/scratchiness, then burning, watering, and irritation, and 16.6 % of the patients reported current use of artificial tears. Screen time for both education and leisure increased significantly compared to pre-COVID-19, with a mean difference of 1.06 ± 1.5 and 1.39 ± 2.04 hour per day, respectively (P<0.001). Increased screen time has been associated with increased dry eye symptoms (57).

Furthermore, in a study of 110 healthy children 10-17 years of age who were enrolled in full-time or hybrid virtual school during the COVID-19 pandemic, 61% of children had an increase in convergence insufficiency symptoms and 17% had severe convergence insufficiency symptoms after school, and 53% of children had an increase in asthenopia symptoms. (58)

In another study in China, 2005 children with mean 12 ± 3.0 years had mean screen time of 4.6 ± 3.4 hours/day. 77.0% of students reported at least one CVS symptom with eye dryness and itching the most common (48%). CVS score was independently associated with older age, children with myopia not wearing glasses, astigmatism, other ocular diseases, not complying with the 20-20-20 rule, more screen time and less outdoor activities (59).

Recommendation for screen time, outdoor activity time, and digital eye strain

The World Health Organization's guidelines on physical activity, sedentary behavior, and sleep recommends no more than 1-hour sedentary screen time for those aged 2-5 years, and less is better (60).

The American Academy of Child and Adolescent Psychiatry recommends restricting non-educational screen time to about 1 hour per weekday and 3 hours on the weekend days for children 2-5 years of age and for ages 6 and older, encourage healthy habits and limit activities that include screens (61).

In 2018, the Ministry of Education of China adopted a plan for control and prevention of myopia, which included the restriction of use of electronics as a teaching tool to no more than 30% of overall teaching time, prohibition of phones and tablets in classrooms, the use of electronic products for non-learning purposes should not exceed 15 minutes at a time and should not exceed 1 hour per day, and students are also encouraged to rest their eyes for 10 minutes after using electronic products for 30-40 minutes of learning (62).

In 2020, the National Health Commission of China issued the Guidelines for the Prevention of Myopia in Children and Adolescents During the COVID-19 Epidemic, which limited online learning time in primary school students to 2.5 hours per day, with each time not to exceed 20 minutes; and in secondary school students to 4 hours per day, and each time not to exceed 30 minutes, and video screen time for non-learning purposes to 1 hour per day. It was recommended to choose large-screen electronic products for online learning, with the priority a projector, TV, desktop computer, laptop, tablet, mobile phone, and the viewing distance should be more than 3 meters for projector, more than 4 times for TV and more than 50 cm (about an arm's length) for computer (63).

Increased outdoor activities in children have been shown to reduce the myopic change in both non-myopic and myopic children (43). After the implementation of a myopia prevention program (Tian-Tian 120 outdoor program) in Taiwan, in which primary schools were encouraged to take their students outdoors for 120 minutes per day, the long-term trend of increasing prevalence of reduced visual acuity (defined as uncorrected visual acuity <20/25) in schoolchildren from 2001 to 2011 (34.8%-50%) was reversed from 2012-2015 (49.4% to 46.1%) (64).

In Taiwan, after launching the Yilan Myopia Prevention and Vision Improvement Program (YMVIP) from 2014 through to 2020, myopia prevention strategies such as increasing outdoor activities (2 hours/weekday) was promoted in all kindergartens. The myopia prevalence declined significantly from 2014 through to 2016 and remained stable afterward even during COVID-19 (no school closure or shifting to online education in Taiwan at that time). In total, the prevalence of myopia decreased by

5.2% from 2014 through to 2020 (15.5% to 10.3%) (65). In China, the National Health Commission recommended more than 2 hours of outdoor activity time every day and advocated myopic children and adolescents to spend more than 3 hours outdoor activities every day (63).

Recommendations to reduce digital eye strain include correct ergonomic practices, appropriate correction of refractive error, maintain normal blinking, the use of appropriate lighting, careful positioning of the digital device, adjusting image parameters (resolution, text size, contrast, luminance), taking breaks, and the use of lubricating eye drops (artificial tears) to help alleviate dry eye-related symptoms (66-67). The American Optometric Association promotes the 20-20-20 rule (take a 20-second break to view something 20 feet away every 20 minutes) to help alleviate digital eyestrain (68).

Conclusion

The COVID-19 pandemic has led to dramatic changes in many aspects of daily life. Online learning has become the mainstream public learning mode during the pandemic. Several studies indicate accelerated myopic progression during the COVID-19 pandemic in children; myopic progression ranges from 0.13 D in Spain (26) up to 0.98 D in China (23) and the increase has been found to be related to excessive use of digital screen devices and the duration of outdoor activities. The increase in daily digital screen use is associated with higher risk of myopic progression (41-43). Smartphones and computers are shown to be associated with higher risks of myopic progression than television and projector use (17, 23, 41). A significant decline was noted in outdoor activity time in several studies (21, 25, 49) and engaging in outdoor activities is associated with a lower risk of myopic progression (17, 43).

Asthenopia and dry eye in children has a prevalence between 5.4 % in China (56) up to 92.8% in India (55). Prolonged screen time, and online-course time were associated with higher risk for asthenopia and dry eye (55-59).

Children's health is a collective responsibility of parents, teachers and health care practitioners. Eye and vision health awareness need to be spread in all possible ways. Teachers and parents need to help students and children to develop healthy relationships with digital devices. They should encourage children to put their devices away for an hour or two each day, and to go outside and get some form of exercise. Parents can set limits using in-device applications to restrict the total screen time spent per day or per session and parents should act as role models by reducing their own digital device usage, and spending more time with their children outdoors. Eye care practitioners should educate parents to bring children who have refractive error and who are using spectacles for routine eye examination and emphasize on the importance of reducing screen time and increasing outdoor activity.

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Multiple myeloma presenting as a pathological rib fracture in a primary health care center and its diagnostic challenges during the COVID 19 pandemic

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Abstract

Multiple Myeloma commonly presents with a myriad of symptoms, signs and abnormal laboratory findings namely bone pains, pathological fractures, lytic bone lesions, anaemia, high ESR, hypercalcemia, raised globulin and presence of monoclonal band in serum/urine. Here, we present a 54-year-old gentleman whose initial presentation was a pathological rib fracture. However, review of his past medical history revealed gout (now asymptomatic) and abnormal laboratory findings that helped us to subsequently diagnose as Multiple Myeloma.

The importance of simple investigations like ESR when managing patients with nonspecific symptoms in primary care, listening and looking for signals that suggest an alarming aetiology, following up of investigations and the continuity of care assured by the electronic medical record is highlighted by this case report.

Keywords: Multiple myeloma, pathological rib fracture, telemedicine, early diagnosis, primary care

Introduction

Multiple Myeloma presenting as a pathological fracture of the ribs is not uncommon [1]. Pathological fractures at other sites, such as, shaft of femur [2] and neck of femur [3] have been reported in patients with Multiple Myeloma. However, to pinpoint the diagnosis during a 15-minute telephonic consultation is quite a challenge especially in the setting of a pandemic where a significant proportion of health care force is devoted to diagnosis and management of the COVID 19 pandemic. A past laboratory finding of very high ESR, anaemia and raised globulin with or without resolution of gout should not be overlooked and should prompt the physician to suspect Multiple Myeloma.

The following case report highlights the importance of investigating the causes of pathological fracture especially when preceded or accompanied by high ESR, anaemia and raised globulin. It also highlights the importance of a proper face to face consultation (history, examination and review of past lab investigations) with the patient as opposed to a telephonic consultation, to arrive at a reasonable diagnosis.

Case Report

A 54-year-old man complained of left sided chest pain of three days duration during a telephonic consultation. It was a dull aching pain with no radiation to any other part of the body. Pain was localised and was increased by body movements. There was no relation of pain to exertion. There was no history of diaphoresis, shortness of breath or palpitation, to suggest angina. There was a past medical history of gout (uric acid – 532 micro mol/L) a year ago which subsided with symptomatic treatment. There was no other past medical history of diabetes, hypertension or coronary artery disease. Patient is a non-smoker and does not consume alcohol. Patient denied any history of trauma to the chest. There was no history of general weakness, prolonged fever, anorexia or weight loss. A non-significant low backache of three months duration that did not affect his daily routine was reported on repeated questioning.

A face-to-face consultation was arranged on the same day to get a clarity on the history and for a detailed examination. Clinical examination revealed a moderately built man with normal vitals. He had mild pallor but no icterus, clubbing or lymphadenopathy. There was localised tenderness of the left 6th rib in the mid axillary line. CVS, respiratory and abdominal examination revealed no abnormal findings. Xray ribs revealed cortical disruption on the lateral aspect of the left 6th rib suggestive of a fracture.

A review of investigations done 7 months ago showed high Erythrocyte sedimentation rate (ESR) of 135 mm/hour, mild anaemia (Hb 11.5g/dL), normal uric acid (362 micro mol/L) and a raised serum total protein (91 g/L) which was done as a part of the follow up of gout, was noted from his Electronic Medical Records. It was probably overlooked and there was no follow up arranged for the afore-mentioned abnormal investigations.

Since he had a pathological fracture and past history of gout, anaemia and high ESR a probable diagnosis of Multiple Myeloma was kept in mind and further investigations were targeted to confirm this diagnosis.

The investigations showed:
● Haemoglobin 8.5 g/dL, Red cell indices normal.
● Platelets 140 x103/micro L
● Peripheral smear - normocytic normochromic anaemia with rouleaux formation, mild leukopenia and mild thrombocytopenia.
● ESR more than 150 mm/hour
● Iron profile was normal
● Liver function tests - Total protein 97 g/L (high), Albumin 32.8 g/L (low), Globulin 64.2 g/L (high), Normal enzymes.
● Calcium normal (2.57 mmol/L).
● Renal function tests were normal.
● Xray skull - abnormal density of the calvarium and subtle ill-defined lucent lesions.
● Serum protein electrophoresis- 2 monoclonal bands of IgA lambda, normal Albumin and hypogammaglobulinemia.
● Urine electrophoresis- Bence Jones protein in trace amounts.

As the diagnosis of Multiple Myeloma was high in probability, patient was referred on an urgent basis to the tertiary care centre for further diagnostic confirmation and management.

A bone marrow aspirate and trephine biopsy (increased plasma cells comprising approximately 51%, with many immature forms) confirmed the diagnosis of Multiple Myeloma. A whole-body PET scan revealed mild uptake in the left 6th rib. An MRI spine and skull revealed patchy signals and enhancement of the calvarium and suspicious multilevel vertebral focal osseous lesions, most probably attributed to marrow infiltration. Serum Beta-2 microglobulin was high (2.79 mg/L).

Patient is currently receiving chemotherapy (2nd cycle) from the government tertiary care center. His symptoms have improved remarkably. His recent blood tests showed an Hb of 11.6 g/dL, platelets 313 x 103/micro L, WBC 4.8 x 103/micro L, Calcium 2.2 mmol/L.

Discussion

Telephonic consultation and telemedicine during the current COVID-19 pandemic remain a challenge for the medical professionals to come to an accurate diagnosis [4, 5]. No doubt that telemedicine brings undisputed benefits in a selected group of diseases and patients but also has its limitations. Failure of the physician to understand the symptomatology and connect the dots to make a specific diagnosis, paucity of clinical findings, lack of ability by the patient to the use of new technology especially in the elderly and those with cognitive decline, fear of loss of privacy are some of the pitfalls of telemedicine [4, 6]. Any suspicion of serious illness should prompt the physician to make a conventional face to face consultation.

Causes of pathological fracture should be thoroughly investigated especially when there is a past or concurrent history of gout (or high uric acid) or abnormal laboratory findings (anaemia, high ESR, high globulin, hypercalcemia, renal failure).

Diagnosis of Multiple Myeloma requires the following criteria. [7]
1. 10% or more abnormal plasma cells in the bone marrow or histologic proof of plasmacytoma.
2. At least one of the following 3 features: monoclonal (M-protein) in the serum, M-protein in the urine, or lytic bone lesions/pathological fractures.

All investigations except bone marrow aspiration/biopsy and skeletal survey can be requested in the primary health care setting. The following clues will aid in the diagnosis of Multiple Myeloma in a primary care setting.

1. Low back pain/bone pain/pathological fracture/lytic skeletal lesions [8].
2. Concurrent or a past medical history of gout or high uric acid.
3. Normocytic normochromic anaemia.
4. High ESR.
5. Thrombocytopenia.
6. High serum globulin.
7. Hypercalcemia

Any afore-mentioned abnormalities should prompt the primary care physician to request for serum and urine electrophoresis and refer to Haematology/Cancer Centre on an urgent basis for confirmation and further management.

Conclusion

This case report highlights the importance of looking for clues that might suggest an underlying pathology particularly in those that present with non-specific and uncommon presentations. Furthermore, simple investigations like ESR and Uric acid should not be overlooked in those who present with symptoms. It is important that physicians in a primary care setting consider a diagnosis of multiple myeloma when a patient presents with a rib fracture/pathological fracture. It also highlights the importance of reviewing patient's past medical records, following up on investigations and ensuring patients are triaged appropriately for a face-to-face consultation following a teleconsultation.

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The association between sleep disturbance and coronaphobia among physicians in primary health care centers of Ministry of Health, Jazan Province

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Abstract

Background: Sleep disturbances are extremely common among doctors with profound effect on quality of life. Coronaphobia is the dread of COVID-19 that can affect physicians and their sleep quality.

Aim of Study: Our study aimed to assess sleep disturbance and its association with coronaphobia among primary health care (PHC) physicians in Primary Health care Centers (PHCCs) of the Ministry of Health, Jazan Province, Saudi Arabia.

Method: The study is a cross-sectional questionnaire-based observational investigation using a simple random sampling scheme. The sampling frame was all PHC physicians practicing in Jazan Province. We used the Fear-of-COVID and Pittsburgh Sleep Quality Index (PSQI) questionnaires. Poisson Regression modelling techniques were used to analyse the adjusted effect of sociodemographic factors on Fear-of-COVID and Pittsburgh Sleep Quality scores.

Results: A total of 385 physicians participated in the study. The prevalence of poor quality of sleep among our physicians was 47.3%, while prevalence of coronaphobia was 56.2%. Coronaphobia had significant negative impact on sleep quality, even with adjustment for the effect of all other clinical and demographic variables. A rise by one point in the fear of COVID questionnaire is associated with a rise by 2.3% points in the PSQI score (indicative of poorer sleep quality, p = 0.00081).

Conclusions: Coronaphobia is common and has detrimental effect of sleep quality among PHC physicians. Coronaphobia has negative impact on sleep quality. Higher burden of depressive symptoms worsens physicians' sleep quality.

Recommendations: Support for PHC physicians' psychological and physical well-being is paramount during the current COVID-19 crisis.

Keywords: Coronaphobia, sleep quality, risk factors, South-western Saudi Arabia

Introduction

Coronaphobia is the dread of COVID-19 (1) that was recognized as a significant fear as soon as the COVID-19 crisis ensued. Fear, anxiety, and worry were part of the new normal created by the successive waves of different variants of the coronavirus (2). Healthcare workers, particularly those working as frontline staff, are at increased risk of coronaphobia (3). Specifically, coronaphobia can substantially affect physicians and their sleep quality.

Sleep disturbances are considered one of the most important growing issues in public health and are associated with common complications and difficulties which adversely impact the quality of life with reduction of physical activities. Increasing the risk of obesity, heart attacks, high blood pressure, and stroke are considered the most common complications associated with sleep disturbances. The pandemic of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) showed multiple waves with varying severity over the last 50 months after it first started in Wuhan, China in December 2019. By March 2022, reported cases of Coronavirus Disease 2019 (COVID-19) have exceeded the 450 million mark worldwide with over 6 million deaths toll (4).

Sleep disturbances have an established global prevalence of 7.6% that has detrimental impact on quality of life, with increased risk for obesity, cardiovascular disorders and stroke. In addition to primary insomnia, sleep disturbances encompass several disorders that include parasomnias, and obstructive sleep apnoea (5).

Primary healthcare physicians are front-line practitioners in the health care system (6). Given their unsociable working hours and occupational stress, they are particularly vulnerable to sleep disturbance (7). The prevalence of sleep disorder among physicians was estimated at a staggering 41.6% (8). Studies showed that sleep disturbance among healthcare workers bear a strong relation to immune disorders, cardiovascular diseases, cancer (9), and anxiety disorders (10). Hence, sleep disturbance would have a profound negative impact on the quality of the health care services provided (11).

The current study aimed to assess sleep disturbance and its association with coronaphobia among PHC physicians in PHCCs of the Ministry of Health, Jazan Province, Saudi Arabia.

Methods

Design: A cross-sectional, questionnaire-based, observational study.

Study population: All PHC physicians practicing within Jazan Province in the Southwestern Region of Saudi Arabia.

Inclusion criteria: Registered physician practicing in PHCCs in Jazan, including all ranks of PHC physicians (from resident to consultant).

Exclusion criteria: Physicians in the academic capacity only. Refusal to participate in the study.
Sampling technique: A list of all practicing PHC physicians in Jazan Province was obtained from the Ministry of Health records. This constituted the sampling frame from which a multistage cluster sampling technique was constructed using random tables. Each PHC physician was contacted through their head supervisor and was then invited to take part in the online questionnaire. Receiving a response from the physician was considered as his/her consent to participate.

Data collection tool: The study tool included the following:
• **Personal characteristics:** Age, gender, years of experience, nationality, physician rank, comorbidity, and tea consumption.
• **The Pittsburgh Sleep Quality Index (PSQI):** It is a self-filled inventory that evaluates a one-month period of sleep disorder severity (12). The PSQI has 19 items, grouped together into 57 components. Each component sub-score refers to either daytime dysfunction, sleep latency, subjective sleep quality, sleep duration, sleep disturbance, habitual sleep efficiency, and use of sleeping medication. The total score is then categorized into 'poor sleep quality' or 'good sleep quality'.
• **The Fear of COVID-19 Scale:** This is a seven-item scale, which has a proven one-factor structure with established reliability and validity (13). Its Arabic adaptation was found to have good psychometric properties among Saudi respondents (14).

Sample size calculation: A minimum sample size of 374 was calculated, based on the formula of Wild and Serber (15), and a prevalence of 41.6% (8), with 5% level of significance and 80% power.

Ethical consideration: The study was approved by the Jazan Health Ethics Committee, affiliated to the Ministry of Health, Kingdom of Saudi Arabia.

Data analysis: Statistical analysis was performed using the R Statistical Package (version 3.6.0). Descriptive statistics, such as frequencies and proportions (for categorical data) as well as mean and standard deviation (for continuous data) (for instance: age and count of years of experience) were used. Chi-square test was used to compare dependence of categorical data. T-test was used to analyse the association between continuous and categorical data. Generalized Linear Poisson Regression modelling techniques were used to analyse the adjusted effect of sociodemographic factors on PSQI score. The tests were all two-sided, and the significance level was set at $P<0.05$ with Bonferroni correction where applicable.

Results

The total number of physicians was (n = 385) who agreed to be included in the study and gave consent to participate, of whom there were (n = 309, 80.3%) male doctors and (n = 75, 19.5%) female doctors.

Assessment of PSQI scores among the participating physicians revealed a mean of 5.9 points (SD = 2.29 points), ranging between a minimum score of 1 point and a maximum score of 14 points. Note that higher scores indicate poor quality of life (cut-off is 5 points score). The prevalence of poor quality of sleep among our physicians was (n = 182, 47.3%).

Assessment of fear of COVID results indicated a mean of 16.7 points (SD = 4.36 points), ranging between 7 and 25 points. The median score was 17 points. The prevalence of moderate coronaphobia was (n = 36, 9.4%), and for mild coronaphobia was (n = 180, 46.8%). There were (n = 168, 43.6%) participants with no coronaphobia.

Figures (1-7) show the PSQI scores according to different characteristics of participant PHC physicians.

Table (1) shows that the higher the physician rank, the worse the sleep quality, and being Saudi was associated with better sleep quality. Also, tea drinking led to poorer sleep quality, as did arrhythmia, allergic rhinitis and diabetes.

Table (2) shows that the odds ratio for the effect of coronaphobia on PSQI score was 1.023, indicating that a rise by one point in the fear of COVID questionnaire is associated with a rise by 2.3% points in the PSQI score (indicative of poorer sleep quality, p= 0.00081). Also, a higher burden of depressive symptoms worsened physicians' sleep quality (odds = 1.076, p = 0.0187). Diabetes was associated with poorer sleep quality (odds = 1.374, p = 0.0074). Moreover, two non-consultant ranks were associated with better sleep quality, senior registrar odds = 0.782 (p = 0.0444), and resident odds = 0.763 (p = 0.0299). The longer the clinical experience the better the sleep quality, (odds = 0.976, p = 0.0160).

Figure 1. Comparison of PSQI scores according to participants' ranks
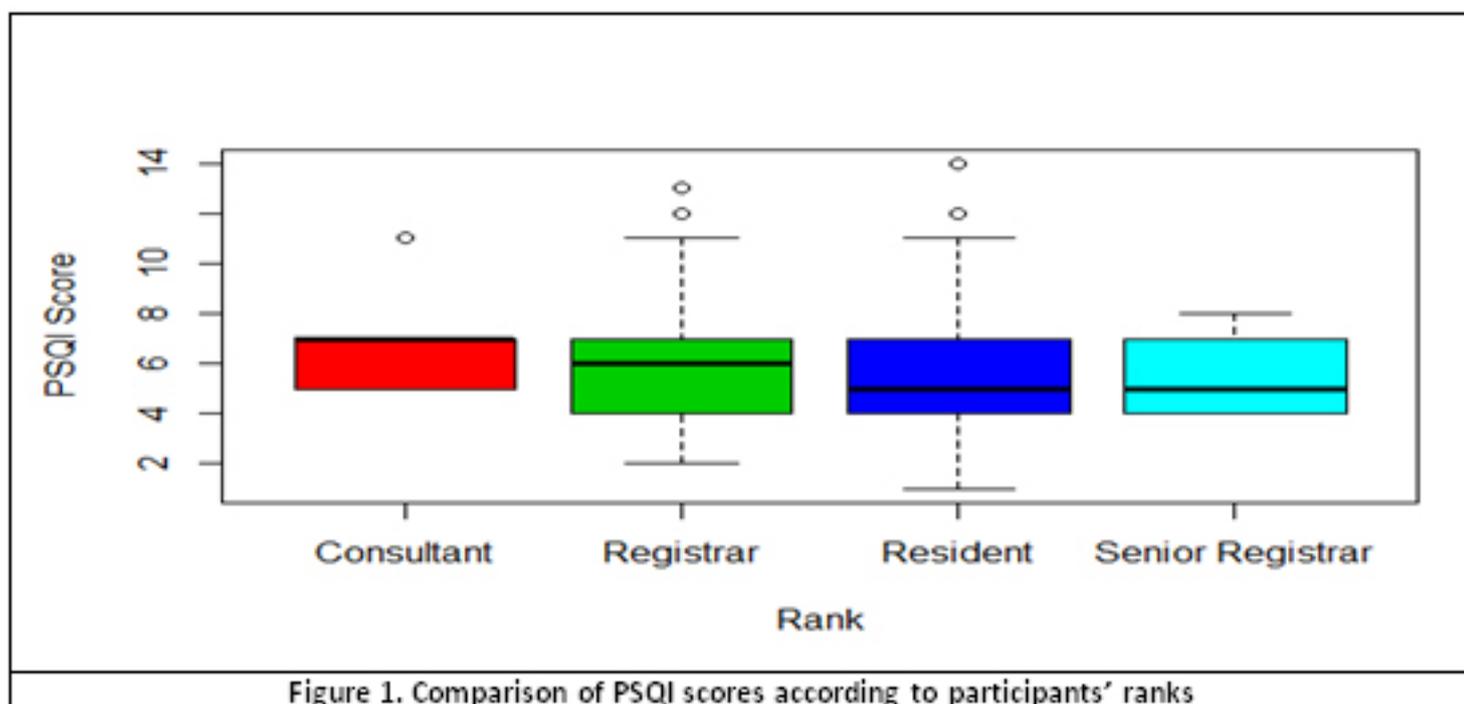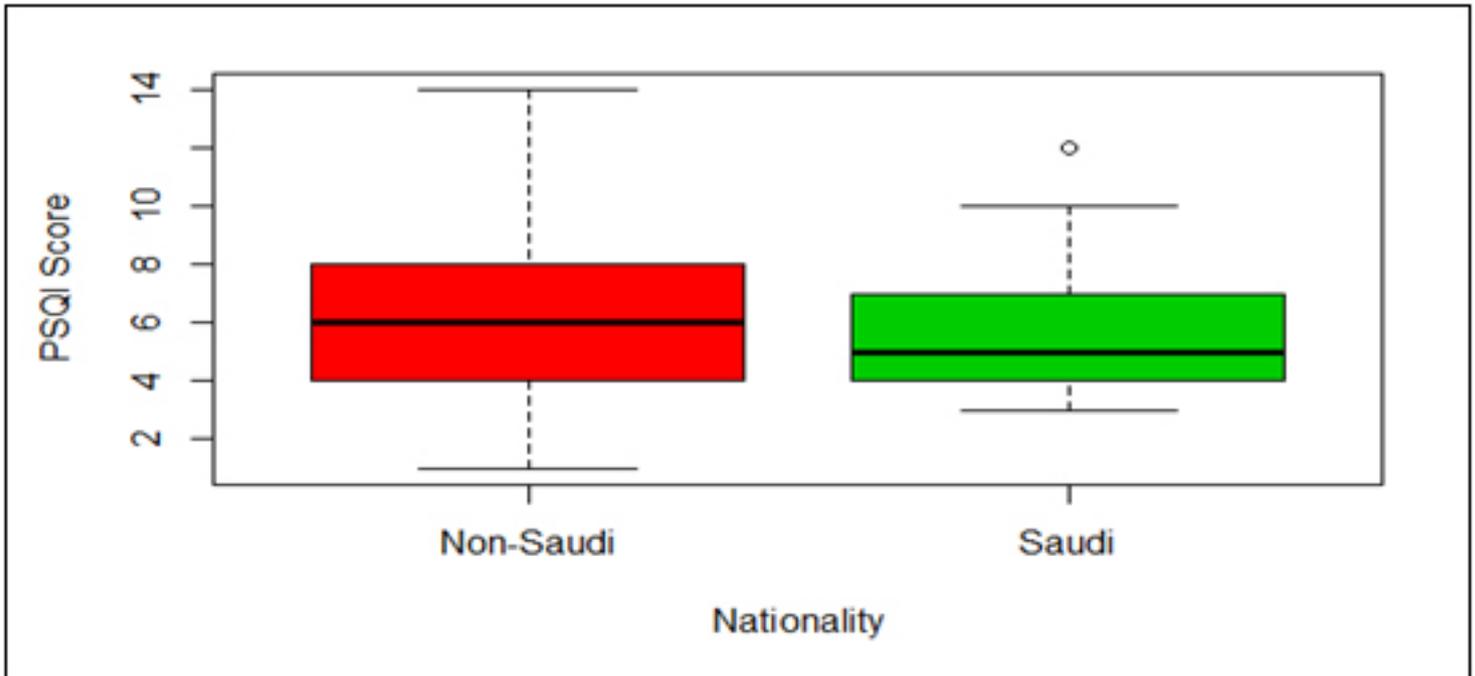
Figure 2. PSQI scores according to participants' nationality
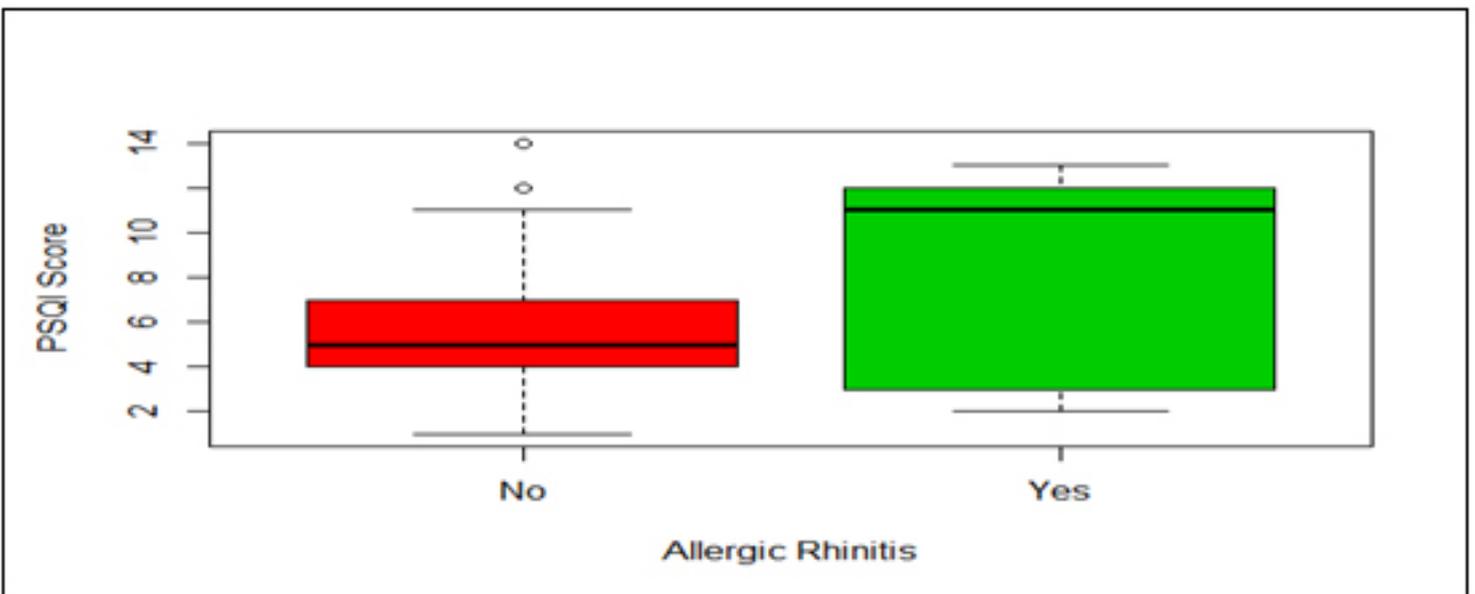
Figure 3. PSQI scores are higher among participants with history of allergic rhinitis
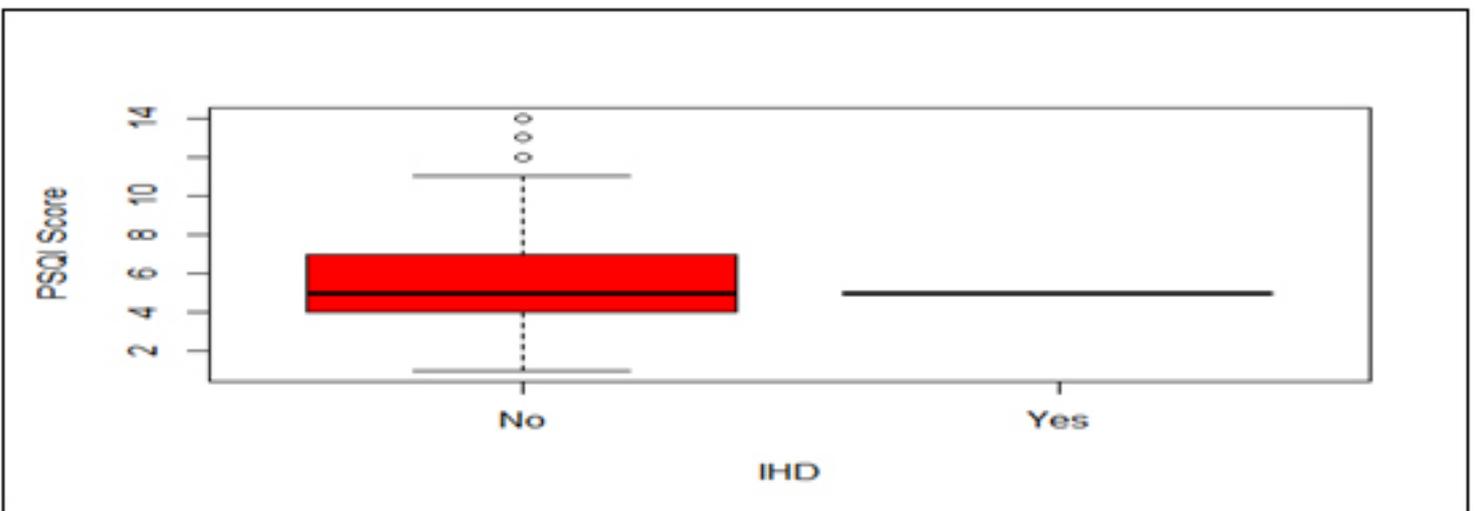
Figure 4. PSQI scores are higher among participants with no history of IHD
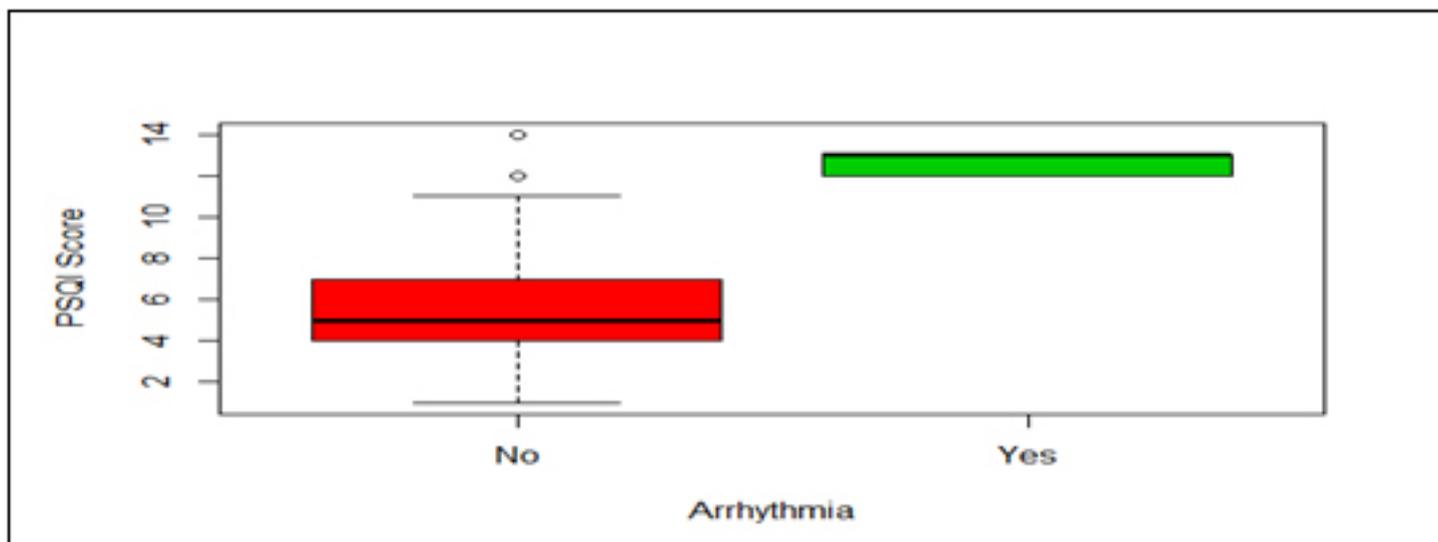
Figure 5. PSQI scores are higher among participants with history of arrhythmias
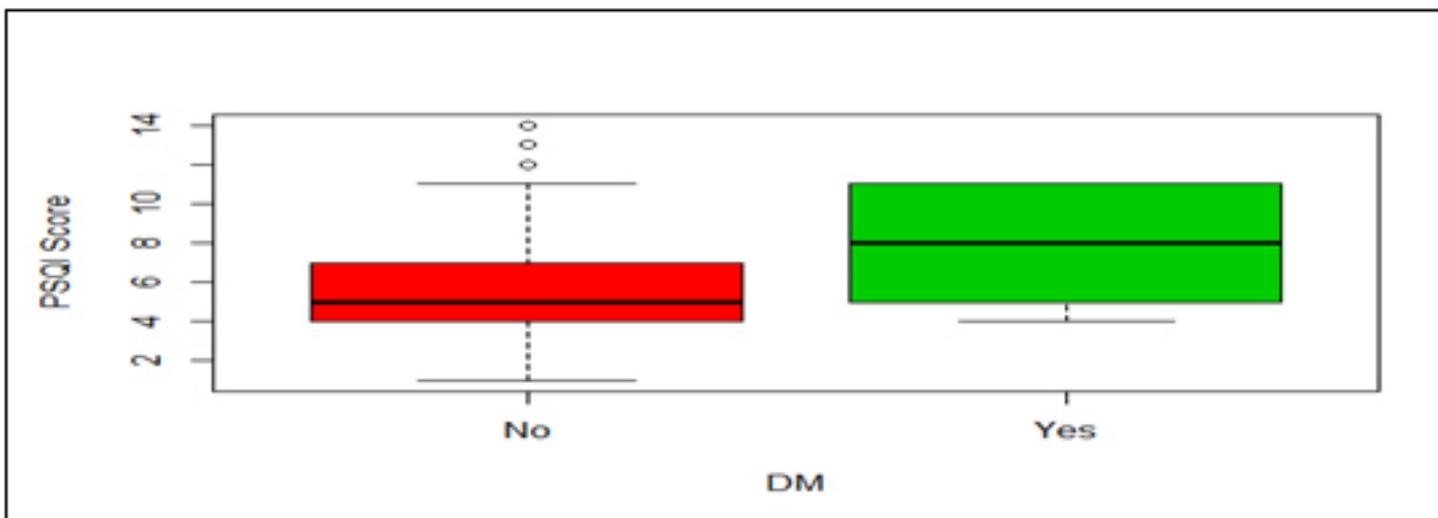
Figure 6. PSQI scores are higher among participants with diabetes
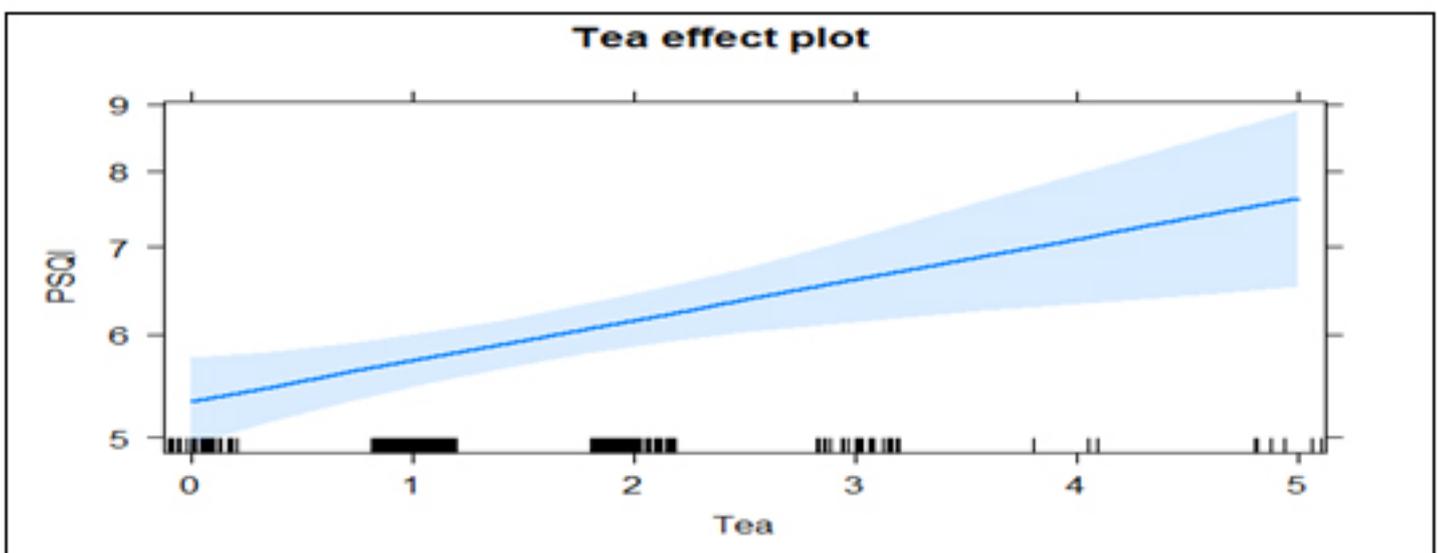
Figure 7. PSQI scores are higher among participants with higher tea intake

Table 1. Baseline demographics of the study participants

Factor	Count (n)/ mean	Percentage /SD	Mean PSQI score/ β estimate	t-test/ F-test	P-value
Overall mean PSQI	μ = 5.9 points, median = 5.0 points				
Age (in years)	33.2	8.4	β = -0.005	z = -0.371	0.711
Gender					
• Male	309	80.3%	μ = 5.8	t = 1.697	0.093
• Female	75	19.5%	μ = 6.4		
Marital					
• Married	299	77.7%	μ = 6.0	t = 0.673	0.502
• Single	85	22.1%	μ = 5.8		
Number of kids	2.1	1.5	β = 0.014	z = 0.991	0.322
Rank					
• Consultant	16	4.2%	μ = 7.0	F = 5.141	0.0017
• Senior Registrar	48	12.5%	μ = 5.3		
• Registrar	84	21.8%	μ = 6.6		
• Resident	236	61.3%	μ = 5.7		
Nationality					
• Saudi	235	61%	μ = 5.6	t = 3.393	0.0008
• Non-Saudi	149	38.7%	μ = 6.5		
Experience years	6.7 years	6.16 years	β = -0.0007	z = -0.205	0.838
On calls					
• Yes	31	8.1%	μ = 5.8	t = 1.737	0.092
• No	353	91.7%	μ = 7.0		
Workplace type					
• Hospital	7	1.8%	μ = 6.4	t = 0.322	0.758
• Health Centre	377	97.9%	μ = 5.9		
History of COPD					
• Yes	0	0%	-	-	-
• No	384	99.7%			
History of Asthma					
• Yes	4	1.0%	μ = 6.0	t = 0.036	0.973
• No	380	98.7%	μ = 5.9		
Allergic rhinitis					
• Yes	18	4.7%	μ = 8.8	t = 2.974	0.00837
• No	366	95.1%	μ = 5.8		
History of IHD					
• Yes	5	1.3%	μ = 5.0	t = 7.838	< 0.00001
• No	379	98.4%	μ = 5.9		
Hypertension					
• Yes	21	5.4%	μ = 7.2	t = 1.743	0.096
• No	363	94.3%	μ = 5.8		
Arrhythmia					
• Yes	7	1.8%	μ = 12.6	t = 29.501	< 0.00001
• No	377	97.9%	μ = 5.8		
Myocardial dysfunction					
• Yes	0	0%	-	-	-
• No	384	99.7%			
History of stroke					
• Yes	0	0%	-	-	-
• No	384	99.7%			
History of DM					
• Yes	31	8.1%	μ = 7.5	t = 3.495	0.001354
• No	353	91.6%	μ = 5.8		
Arrhythmia					
• Yes	7	1.8%	μ = 12.6	t = 29.501	< 0.00001
• No	377	97.9%	μ = 5.8		
Hypothyroidism					
• Yes	0	0%	-	-	-
• No	384	99.7%			
Tea cups	1.4 cups	0.92 cups	β = 0.071	z = 3.275	0.001057
Fizzy drinks	0.7 drinks	0.60 drinks	β = 0.035	z = 1.100	0.271

Table 2. Adjusted effects of the clinical and demographic variables on the score of PSQI sleep quality

Variables	Odds	95% CI odds	β estimate	SE	P value
Fear of COVID Total	1.023	1.010 to 1.037	1.873	0.268	0.00081 ***
Daytime Sleepiness	1.004	0.985 to 1.024	0.023	0.007	0.69365
Restless Leg Scale	1.028	0.978 to 1.080	0.004	0.010	0.27427
Sleep Apnoea Scale	0.949	0.832 to 1.083	0.027	0.025	0.44003
Insomnia	0.999	0.983 to 1.016	-0.052	0.067	0.91795
Depression	1.076	1.012 to 1.143	-0.001	0.008	0.01871 *
Diabetes	1.374	1.089 to 1.733	0.073	0.031	0.00741 **
Arrhythmia	1.411	0.948 to 2.100	0.318	0.119	0.08996 .
Hypertension	1.297	0.968 to 1.738	0.344	0.203	0.08106 .
Ischemic heart disease	1.713	0.986 to 2.976	0.260	0.149	0.05627 .
Allergic Rhinitis	1.069	0.782 to 1.460	0.538	0.282	0.67678
Fizzy drinks	1.056	0.963 to 1.158	0.066	0.159	0.24715
Asthma	0.691	0.432 to 1.107	0.054	0.047	0.12409
Teacups	1.050	0.991 to 1.114	-0.369	0.240	0.09994 .
Workplace: Hospital	0.836	0.566 to 1.234	0.049	0.030	0.36721
Age	0.992	0.981 to 1.004	-0.179	0.199	0.18612
Marital Status: Single	1.044	0.883 to 1.234	-0.008	0.006	0.61317
Kids	1.011	0.952 to 1.073	0.043	0.085	0.72466
Rank: Registrar	0.862	0.678 to 1.095	0.011	0.030	0.22261
Rank: Resident	0.763	0.597 to 0.974	-0.149	0.122	0.02994 *
Rank: Senior Registrar	0.782	0.615 to 0.994	-0.271	0.125	0.04440 *
Nationality: Saudi	0.877	0.779 to 0.987	-0.246	0.123	0.03000 *
Sex: Male	0.935	0.799 to 1.095	-0.131	0.061	0.40561
Experience	0.976	0.957 to 0.995	-0.067	0.080	0.01604 *
On-call shifts	1.101	0.889 to 1.363	-0.024	0.010	0.37794

Discussion

The current investigation surveyed 385 PHC physicians in order to assess the effect of coronaphobia on sleep quality amongst PHC physicians practicing in the southwestern region of Saudi Arabia.

We found that almost half of PHC physicians had poor quality of sleep. This is not a unique finding among Saudi doctors. A recent survey indicated a prevalence of over 43% for sleep disorders in Saudi medics during the COVID-19 pandemic (16). Also, a regional study that evaluated poor sleep among healthcare workers reported the same figure (43%) (17). Similar results were also reported by several international studies (18-21).

This consistent finding is extremely alarming since physicians are responsible for several important clinical decisions that could potentially impact the quality of lives of their patients. Most clinical decision-making abilities require heightened alertness and optimum neurocognitive abilities that could be jeopardized in clinicians by poor sleep quality (22). Errors in medical practice were found to be higher among sleep deprived doctors (23). Furthermore, away from clinical settings and workplaces, sleep deprivation puts doctors at a huge risk of road traffic accidents and personal injury (24). Poor work life balance in the realm of the medical profession has an established relationship with poor sleep quality (25).

The present study showed that more than half of physicians passed the cut-off for coronaphobia. This finding is close to the 66% figure reported among the US and Canadian public (1). Such anxiety symptoms were reported to have progressed to full-blown COVID-19 stress syndrome as the pandemic progressed (26). Lee and Crunk (27) stated that coronaphobia is one of the main factors, beside neuroticism and hypochondriasis, that aggravate the burden of COVID-19-related psychological distress. However, how pandemic-related distress develops among healthcare professional remains a very complex process that involves aspects of fearful attachment and emotional stability personality traits (28).

The prevalence of moderate coronaphobia in our participating physicians was 9.4%, while that for mild coronaphobia was 46.8%. This is in line with the substantial psychological distress caused by the COVID-19 pandemic globally (29) and in Saudi Arabia (2). In Mexico, healthcare workers in emergency departments and intensive care units have shown the highest prevalence for coronaphobia (30).

Among our surveyed physicians, coronaphobia was associated with a significantly negative impact on sleep quality. We found that a rise by one point in the fear of COVID questionnaire is associated with a rise by 2.3% points in the PSQI score (indicative of poorer sleep quality). This is a unique result. To our knowledge no previous studies have attempted to evaluate the link between coronaphobia and sleep quality among physicians. One Turkish study found a link between musculoskeletal pains and coronaphobia, but failed to relate symptoms of coronaphobia with sleep disorders among participants (33). However, more recent investigations among adults in the general public indicated a strong link between coronaphobia and sleep disorders (34). A study in Russia showed that COVID-19 resulted in substantial sleep disturbances in terms of initial insomnia rates and poor satisfaction with sleep quality during the pandemic (35).

We found that a higher burden of depressive symptoms worsened physicians' sleep quality. The relationship between COVID-19, depressive symptoms, and sleep disturbance among the general public was well-documented in the above Russian study (35). Although a barrage of studies investigated the effect of COVID-19 pandemic on sleep quality among different groups of professionals and general public (36-38), none attempted to evaluate the effect of coronaphobia on sleep quality. Over 50% of resident doctors in India indicated that sleep disturbances were a significant issue for them post-COVID (39).

Diabetes was associated with poorer sleep quality among our PHC physicians. Prevalence of poor sleep among patients living with diabetes was estimated to be nearly 60%, with poor glycemic control and longer duration of diabetes as risk factors (40).

Counter-intuitively, two ranks were associated with better sleep quality, namely: senior registrars and residents. This was an unexpected finding. Many previous researchers asserted that non-consultant doctors would have inturrepted sleep because they carry out first on-call duties (41). This could be true in specialties that require oncall cover. A very recent study indicated that across medical specialties, residents and consultants in Saudi Arabia tend to have the worst sleep patterns (16). However, in our sample, about 8% were doing night shifts. Also, consultants and senior registrars do not engage in out-of-hours on-call activities. It is therefore difficult to give a concrete reason for the discerpancy of sleep pattern among different ranks in our sample. This remains to be elucidated by further focused research.

Another important finding from our current investigation of our physicians is that the longer the clinical experience, the better the sleep quality. However, the relationship between years of experience and risk of coronaphobia is still far from settled. Some studies indicated that younger professionals with little experience are at increased risk of coronaphobia (30), whereas others indicated the contrary (3). Certainly, future qualitative research could elucidate some of the underpinnings in terms of the effect of longer clinical experience on virus anxiety.

The present study had several points of strength. It comprised a large data set that included information from over 380 physicians. However, one limitation of the study is the low participation from female physicians as they constituted under a fifth of all of those who were surveyed. Another limitation of our current work is brought on by the cross-sectional design of our research and reliance on an online survey. Hence, causal relationships are difficult to ensure, and social desirability or response bias cannot be eliminated.

In conclusion, coronaphobia is common among PHC physicians in Saudi Arabia. Educational workshops should focus on prevention and treatment of such an important psychological disorder in order to improve care delivery in PHCCs in Saudi Arabia. Coronaphobia among PHC physicians is associated with substantial worsening in their sleep quality. Therefore, support should be provided to physicians with heightened fear of COVID-19 to minimize the risk of sleep difficulties and subsequent clinical under-performance.

Future research should attempt to investigate the effectiveness of targeted psychological interventions that could relieve the burden of coronaphobia among family physicians in Saudi Arabia. Moreover, personality factors that potentiate development of fear of COVID-19 should be explored in more detail among Saudi family physicians.

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What it costs to access skilled birth attendance in Pakistan

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Abstract

Background: A costing study was conducted as part of a randomized controlled trial on promoting safe birthing, among 60,000 pregnancies in Punjab. This costing study aimed to estimate the costs incurred by women for utilisation of skilled birth attendance.

Methods: 640 women were recruited from six public health clusters in two districts of Pakistan. Costs were calculated using the societal perspective where the costs incurred on enhancing birth skilled attendance by delivering birth planning intervention were calculated from both the client and health service provider perspective. Province wise projection of costs were also calculated for two years' time duration.

Results: Health services capital cost for enhancing utilization of skilled birth attendance was Rs: 801 (US$ 8) per LHW and the recurrent per pregnant woman was Rs. 4.8 (US$ 0.05). Client cost of skilled birth utilization for normal delivery ranged from 3564(US$ 35.64) at a public facility vs 5276 (US$ 52.76) at a private facility, while for caesarean delivery it ranged from 10383 (US$ 103.83) at a public facility to 14339 (US$ 143.39) at a private facility. Cost of normal delivery was found to be correlated with category of birth attendant. Personal savings and loans were two main modes of payment for child birthing. In Punjab the incremental investment of Rs 67.7 million (US$ 677000) can achieve 675,971 additional deliveries by skilled birth attendants.

Conclusion: The birth planning intervention was found to be cost-effective in enhancing skilled birth attendance rate as compared to the control arm.

Keywords: Skilled birth attendance, health services cost, out of pocket cost, normal delivery, caesarean delivery

Background

Pakistan has the highest maternal mortality ratio and the third highest rate of neonatal mortality in South Asia(1, 2). The rate of neonatal and maternal mortality in Pakistan is drastic even when compared to its neighbouring countries like Bangladesh(3). Analysis of birthing practices in Pakistan show that only 65% of women seek any antenatal care and around 48% of deliveries occur under sub-optimal conditions without any assistance from skilled birth attendants resulting in a skilled birth attendance rate of 52.1%(4). The priority according to millennium development goals was to enhance the use of skilled birth attendance to more than 90% by year 2015(5) as increased use of skilled birth attendance has been proven to be effective in reducing the maternal and neonatal mortality rate(6). The components of an enhanced skilled birth attendance include: availability, access, perceived quality, and effective cost of skilled birth attendance(7). A key known determinant in use of skilled birth attendance, especially in low and middle income countries is the affordability of antenatal care and skilled birth attendance, as evidence from African and south Asian studies indicate delivery and antenatal care costs are high for households belonging to low-socioeconomic status(8, 9). High costs associated with skilled birth attendance could impede the utilization rate of skilled birth attendants in rural areas of Pakistan which could contribute to the increased rate of neonatal and maternal mortality. Findings from an on-ground situation review in Pakistan (unpublished data) revealed that lack of a birth plan with antenatal care provider before delivery could contribute to the high costs of skilled birth attendance as skilled birth attendants tend to charge more for patients who walk in at time of delivery. To enhance utilization of skilled birth attendance, we implemented a structured birth planning intervention to provide guidance to mothers to improve their birth planning practices that could result in enhanced utilization of skilled birth attendance.

Making birthing safe for Pakistan women
Making birthing safe for Pakistani women was a cluster randomized controlled trial (10) conducted to evaluate the effectiveness of a structured birth planning intervention in reducing the neonatal and maternal mortality rate by enhancing skilled birth attendance rate in three districts of Pakistan i.e. Jhang, Khanewal and Chiniot. The intervention proved to be effective in enhancing the rate of skilled birth attendance from 51% in control arm to 63% in intervention arm (p<0.01), without any significant impact on neonatal or maternal mortality rate (unpublished data).
Economic evaluation as a part of randomized trials is the recommended best practice(11). This costing study was conducted as an extension of the cluster randomized controlled trial of 'making birthing safe' to estimate the costs incurred after implementation of structured birth planning intervention to avail skilled birth attendance using societal perspective.

The research objectives were:

• To estimate costs to avail skilled birth attendance from a societal perspective
• To estimate projected budget required for health service sector to enhance skilled birth attendance utilization in Punjab province of Pakistan

Methods

This costing study was embedded within the parallel, three-arm, cluster-randomised controlled trial to evaluate the effectiveness of two intervention arms; a) structured birth planning intervention arm and b) structured birth planning intervention combined with travel mobilization strategies, in reducing neonatal mortality rate by increasing skilled birth attendance as compared to treatment as usual. Cluster units were defined as a sub-district (tehsil) hospital or a rural health centre (RHC) along with their respective catchment areas. The costing study was designed to analyse cost using the societal perspective(12). The client cost for skilled birth attendance utilization was estimated by calculating the out of pocket costs for women and their households and healthcare cost by calculating the intervention implementation cost to enhance skilled birth attendance (details are given in data collection section). The study was conducted in 2014, therefore the exchange rate used for PKR to USD is of 2014. No discounting method was used as the time horizon was less than one year.

Health services and social context of the study setting
Punjab is a province with a population of around 27 million(13). The provincial health sector is responsible for planning, financing and delivering the health care. The public infrastructure for delivering health care (including Maternal and Child Health Program) at district level, mainly includes: district and tehsil level hospitals; rural health centres; and four to six basic health units around each rural health centre. At these facilities the main qualified skilled birth attendants are: doctors and Lady Health Visitors "LHVs". The LHVs are health facility staff with formal training in maternal and child health care, including antenatal care, safe birthing and post-natal care of mothers and children. The qualified community-based female health workers, linked to these health facilities, mainly include: Lady Health Workers "LHWs" – with focus on mother and child health promotion through bridging their linkage with the facilities and services; and relatively recently introduced (through Maternal and Child Health Program) community midwives – with the prime focus on delivery of safe birthing services. At the community level, the birthing services are also being provided by a range of unskilled birth attendants (semi-qualified and unqualified). In each district, the birthing services (including Emergency Obstetric and Neonatal Care "EmONC") are also being provided by private health facilities that vary widely in quality and cost of care. Within communities LHWs serve about 1,000 women, and as part of their routine duties they are responsible for identifying and registering all new

pregnancies, as well as providing basic antenatal care to registered pregnancies, encouraging women to attend skilled antenatal examinations at their nearest health facility, promoting skilled birth attendance, preparing women and families for possible birth complications, and reporting registered pregnancies and their eventual outcomes on a monthly basis. In their work they are supervised and monitored by a lady health supervisor, employed by the MNCH Programme, as well as by a lady health visitor, who resupplies them with medications and equipment and provides technical support.

Interventions

We compared two interventions, delivered by LHWs, to the existing LHW-led care of pregnant women which includes structured birth planning plus a voucher allowing free travel to an EmONC facility (SBP and travel voucher), and structured birth planning alone (SBP alone).

Prior to the implementation of the intervention all lady health visitors, lady health supervisors and LHWs in the 21 recruited clusters were enlisted. Then, with the support of the district offices, the enlisted lady healthy visitors and lady health supervisors were trained by research staff on a specially designed set of care reporting and monitoring activities to support the implementation and running of the intervention and the data collection. Then, with the support of the respective sub-district hospital/ RHC staff, the enlisted lady health visitors in the 14 intervention clusters were trained by research staff on a specially designed programme to deliver the intervention components, including conducting structured birth planning, and mapping skilled birth attendants, transport service providers and potential suitable EmONC facilities within their cluster catchment areas. Once trained the lady health visitors then trained the LHWs within the intervention clusters on these activities during the LHWs routine monthly meetings.

LHWs in the intervention arms then mapped all the skilled birth attendants (including public and private midwives and doctors), suitable EmONC facilities (providing basic or comprehensive EmONC) and potential travel providers (to EmONC facilities) in their catchment populations. Research staff support the lady health visitors and lady health supervisors then check their data for completeness and correctness, and created directories of the mapped services that were then used by LHWs in the intervention arms during structured birth planning sessions.

The structured birth planning intervention was motivated by the relatively low use of available skilled birth attendants and suitable health facilities, as well as concerns around how well and frequently women and family members recognise danger of signs of birth complications and act appropriately (i.e. access EmONC). We therefore aimed to increase informed access to and use of safe birthing services (and EmONC where necessary) for women via this intervention. Structured birth planning therefore included structured birth-preparedness and complication-

readiness counselling, which were provided to consenting women in both intervention arms by LHWs during their routine visits, following the registration of a pregnancy. During a structured birth planning session in a clients' home, LHWs used the directory to help clients select a skilled birth attendant from those available locally, as well as a place of delivery, which was chosen based on careful consideration of the options available (including the ability to access EmONC if needed), with input from family members planning to be present during the delivery, and following communication with their selected skilled birth provider.

They also provided pregnant women and their family members with information on a range of pregnancy and birth related issues focused on birth-preparedness and complication-readiness. A specially designed illustrated education tool (flipchart) was developed to help LHWs simply and effectively deliver this counselling information. Counselling on birth-preparedness covered the following areas: 1) paying for services (e.g. through savings, a personal loan or selling a disposable asset), 2) making a safe delivery kit (a list of consumables required, and arranged in-advance, for hygienic delivery), and 3) pre-delivery communication with the selected birth attendant to discuss and agree on important service details including how they can communicate, the cost and payment method. Counselling on complication-readiness covered the following areas: 1) recognising the danger signs of birth complications, indicating the need for EmONC services, 2) pre-identifying a MNCH Programme endorsed facility offering comprehensive EmONC services, and 3) arranging, in-advance, transport to the chosen EmONC facility, including selecting a transport service provider with a known type of transport, and contacting them in advance, directly or via mobile phone, to discuss their availability, how they can communicate, the cost and payment method. In addition to this intervention-specific information, the LHWs also provided pregnant women with a range of routinely provided information on antenatal care (relating to diet, rest, hygiene and use of iron tablets) and postnatal care (relating to breastfeeding, diet and family planning).

At the end of a counselling session LHWs then gave pregnant women a specially designed information leaflet containing the same set of key messages as covered during the counselling, including pictures illustrating pregnancy-complication danger signs. We intended this leaflet to act as a reference guide for women to use during their antenatal period. LHWs also recorded information about the birth-preparedness and complication-readiness decisions made by pregnant woman and their families in a birth plan form for the trial. Then in the SBP and travel voucher arm, in addition to the structured birth planning, LHWs also gave pregnant women an EmONC travel voucher. This allowed them to get a cash reimbursement of eight US dollars (equivalent to 800 Pakistani Rupees) for transport costs if they accessed EmONC services from a MNCH Programme endorsed comprehensive EmONC facility (in practice, a district hospital). We therefore hoped

this would encourage women and family members to seek EmONC when needed without hesitation due to concerns over transportation costs.

In the control arm, LHWs continued to give health education to pregnant women following their existing routine practices. This may have included information related to birth-preparedness and complication-readiness, but this would not have been provided in a structured way as CHWs were trained to do in the intervention arm, and CHWs in the control arm had no access to any of the materials developed for the structured birth planning component of the intervention (i.e. the directory, flipchart and information leaflet). Therefore, any such information would have been provided ad-hoc at the CHW's discretion and mixed with the other routine antenatal and postnatal care information provided. More generally, in the control arm the CHWs, through their routine practice, focused on telling women and their family members on what to do, but not the specifics of how to do it. There were no modifications to the intervention during the trial.

Research participants

The trial consisted of 21 clusters in total. For the costing study; through purposive random sampling technique, six cluster facilities randomized to 3 trial arms on 1:1:1 allocation ratio were selected to equally represent urban and rural clusters.

Participants for the costing study were recruited from five sampling strata including; 1) women with normal delivery by doctors, 2) women with normal delivery by lady health visitors, 3) women with normal delivery by community midwives, 4) women with normal delivery by unskilled birth attendants; and 5) women with reported caesarean delivery by doctors. A sample of twenty women in each of the five groups, in each selected cluster, with an anticipated five percent non-response rate, yielded a total sample size requirement of a minimum 630 women for the costing survey. Participants were randomly recruited in the costing study using the trial database for each of the six selected clusters. Randomization sequence for random allocation of participants from the trial database was generated using SPSS.

Power calculations
Sample size was calculated, assuming a mean cost of 10,868 (+ 2000) (US$ 108.68 + 20) of caesarean delivery and a mean cost of 2688 (+ 2000) (US$ 26.88 + 20) for normal delivery (14) taking a ratio of 1:1 for caesarean delivery: normal delivery, five percent level of significance, power 90%, a sample size of 65 was required in one group, thus making a total sample size of 130.

Doing a post hoc power analysis, taking a mean cost of 13184 (+ 6482) (US$ 131.84 + 64.82) of caesarean delivery and a mean cost of 4002 (+ 2558) (US$ 40 + 25.58) for normal delivery, taking a ratio of 3.7:1 for normal delivery: caesarean delivery, five percent level of significance, a sample size of 503 for normal delivery and

137 for caesarean delivery, achieved a power of more than 95%.

Data collection
Data collection for calculating client cost
A standard questionnaire was developed for collecting data on client costs from women on different categories of health service utilization for skilled birth attendance. Costing data was collected from women and their households on out-of-pocket expenses incurred on service cost and travel costs, costs incurred on meals, materials, medicines and tests during the course of seeking antenatal care and skilled birth attendance at public or private healthcare centres, for normal delivery, caesarean delivery and emergency obstetric neonatal care (EmONC) event. Data was collected by external evaluators blind to the allocation status of research participants. Data was collected within two months of delivery date of mothers, using self-report method. The collected data was checked for completeness and correctness by the field staff as well as the supervising economist. Data entry was done in SPSS software and 10% of the entries were then manually checked for possible data entry errors. The analysis was also done using the Statistical Package for Social Sciences software, using a 95% confidence interval.

Data collection for calculating health services cost
Health services costs were calculated by estimating the costs associated with implementation of structured birth planning intervention to enhance skilled birth utilization. The project financial data was used as source data to estimate the cost for the structured birth planning and structured birth planning combined with travel mobilization. We included both the capital costs and the recurrent costs for implementing the intervention. The capital cost estimation covered mainly the: a) costs incurred on producing the directories of skilled birth providers available in the area and available transport service providers, and counselling tools; and b) cost of training the lady health workers, lady health supervisors and lady health visitors for their respective role in the intervention. For the cost estimation purposes, the capital costs once incurred were assumed to be valid for two years i.e. every two years programme might need to update the Directories and arrange refresher training of staff. Recurrent costs included the printing cost of birth plan forms and client communication brochures for each client in the trial.

Data Analysis
Descriptive analyses were used to calculate mean and standard deviations for cost estimates for different types of costs for normal and caesarean delivery and antenatal care at public and private hospitals across three arms. Independent sample t-test and analyses of variance (ANOVA) tests were used to compare mean difference across arms and groups using a 95% confidence interval and a p-value (two-tailed) <0.05. Analyses were performed using SPSS version 21.

Client costs were analysed for skilled birth attendance utilization by calculating the out-of-pocket costs incurred by women and their households.

Data was analysed to estimate cost of normal delivery for different types of skilled birth attendants (Doctors, LHVS, CMWs) and unskilled birth attendants and different places of birth by calculating the mean out of pocket cost for mothers. Mean out of pocket cost was calculated by combining service fee of the birth attendant, expenses incurred on birth materials or supplies, and travel cost to and from the place of birth, using 95% confidence interval and 5% significance level. Cost of service fee of the birth attendant and materials was provided by mothers in figures while travel cost was calculated differently for public and private transport. Public travel cost was calculated for the round trip to the birth attendant by combining the round-trip fare of mother and their accompanying person/s. Private travel cost was divided into two categories of travel by car or bike. Estimated travel cost per km for car and bike was used from our previous projects in similar settings. Private travel cost was calculated just for the respondent and not the accompanying person. In cases where the participants travelled on foot or by bicycle, the cost of travel was recorded as zero. Travel costs for delivery at client's home was calculated for the travel cost incurred by the birth attendant while traveling to the client's home. Mean out of pocket cost of caesarean delivery was calculated for public and private health facility by combining the service fee, meals and travel cost. Service fee included doctor's fee for delivery, hospital charges for the room, and payment of supplies and medicines for the entire duration of stay at hospital. Costs for meals were calculated for the pregnant woman and all accompanying persons to hospital, for the entire duration of stay at hospital. Travel costs were calculated for both public and private travel using the above-mentioned method.

Mean out of pocket costs for both normal and caesarean delivery were compared across the three arms by combining the service fee, meals and travel fee. Mean difference in total out of pocket costs across three arms using 95% CI and 5% significance value was calculated to explore how structured birth planning affected the cost of delivery.

Cost of antenatal care at a public or private health facility, as part of structured birth planning intervention was evaluated by combining the mean care of costs including the cost of clinical examination (i.e. consultation fee), medicines, tests and any other cost incurred to avail health services at the facility with the travel cost. Travel cost was calculated using the above-mentioned methodology. Average costs for all visits to the health facility were calculated.

Different types of financing methods used to pay for normal and caesarean delivery were analysed based on the occupation of participant's husband to analyse the financial implications of type of delivery on different types of households.

Healthcare costs were calculated by combining both the capital and recurrent costs of intervention implementation for two years. Capital costs were calculated by combining the costs incurred on developing directories of skilled birth attendants, emergency services, and transport service providers in the area, cost of intervention materials, and the cost incurred on training of LHWs to deliver birth planning intervention to women. Recurrent costs were calculated by adding the costs incurred on developing birth plan forms and client communication brochures used to deliver intervention sessions to each participating woman in the intervention. Both capital and recurrent costs were calculated per LHWs and per birth.

Based on costing study findings, quick projection of costs for health services and clients for province wide possible scaling of the structured birth planning intervention are described. The projections are based on the following assumptions: the current level of programme inputs are not reduced in the next two years; the capital investment of cost (mainly for provider Directories and staff training) once made will remain relevant for at least the next two years; total number of pregnancies in Punjab in two years period: 6,089,826 (assumed current population: 98.22 million; CBR: 3.1); net increase of 11.1% in the uptake of skilled birth attendance (as achieved in the trial i.e. intervention arms: 75.1%; control: 64%) can be replicated in a scaled-up programme; net additional projected number of skilled birth attendance in two years: 675,971.

In addition to the assumptions for health services cost projects, the client cost projections are based on the following assumptions: the pattern of enhanced attendance across various types of skilled birth attendants will remain the same as in the trial (i.e. overall 11.1% increase, with a clear shift in favour of mid-level skilled birth attendants); average cost per delivery differentials across various types of skilled birth attendants will remain the same as in the trial; if intervention is not implemented, the level and pattern of skilled birth attendance and the average cost per delivery across various types of attendants will remain the same as in the control arm.

Ethical Considerations
Approvals were obtained from the Institutional Review Board of National Bioethics Committee (NBC Ref No.4-87/10NBC-39/RDC/487). Pakistan. Written informed consent from the in-charge of public health care centres was obtained prior to randomisation of the clusters. Written informed consent was obtained from participating pregnant women before their enrolment in the study.

Results

The basic characteristics of women i.e. age, education and mode of delivery (i.e. normal vs caesarean delivery) were similar across all arms. However, the use of public health facilities for antenatal visits as well as caesarean delivery was seen to have increased in intervention arms as compared to control arm (See Table 1).

Client costs for utilizing skilled birth attendance as part of structured birth planning intervention are presented for both normal and caesarean delivery, delivery and antenatal care costs at public and private health care services, differences across arms, and financial implications of different types of deliveries. Results for healthcare costs are provided for in terms of the capital and recurrent costs of intervention implementation per woman. Projected cost implications of possible province-wide scaling-up of the 'structured birth planning' intervention to enhance skilled birth planning are also presented.

Client Costs
Cost of normal delivery by the type of birth attendant and place of birth
The mean difference for out-of-pocket cost incurred by women undergoing normal delivery by using skilled (including doctors, LHV and Community midwives) and unskilled birth attendants was found to be significant ((Rs 1633 US$ 16.33), 95% CI: 1232 – 2033, p=0.001) (Table 2). The service fee accounted for at least 75% of the total out of pocket expenses (95% for doctor and 85% for LHV). The reported mean travel and material costs for normal delivery were found relatively alike across birth attendant types ranging: Rs: 375 – 475 (US$ 3.75-4.75) and Rs: 1,000 - 1,175 (US$ 10-11.75) respectively.

The mean difference between the out-of-pocket cost paid at private hospital as compared to public hospital was found to be significant (1711 {US$ 17}, 95% CI: 1108 – 2315, p=0.001) (Table 2)
The reported mean travel costs for normal delivery at private clinics and/or place of lady health visitor/ community midwife were found slightly higher (statistically insignificant) as compared to deliveries conducted at public health facility and home respectively. The reported cost of materials was found alike for all places of delivery.

Caesarean delivery costs by the place of delivery
The reported mean for total out of pocket cost of caesarean delivery at private clinics was found to be about 35% - 40% more as compared to deliveries conducted at public health facilities (Table 3). The mean difference between average total out of pocket cost at private hospital compared to public hospital was found to be significant (3829 {US$ 38}), CI: 1309 - 6348).

Service-fees were higher at private clinic (Rs. 13,229 {US$ 132}) as compared to public health facility (Rs. 9020 {US$ 90}), with a significant mean difference (4281 {US$ 43}, CI:1941-6620); whereas the reported EmONC travel cost was found to be 70% higher for public facilities (Rs.1126

{US$ 11}) as compared to the private clinics (Rs. 652 {US$ 6.5}), with a significant mean difference (457 {US$ 5}, CI: 110-804). However, the reported cost of meals was found relatively alike for the two place-of-caesarean options.

Costs of antenatal care by the place of antenatal visit
Mean total out of pocket cost of antenatal visits was high in both public and private health centres (i.e. Rs: 1416 {US$ 14} and 1527 {US$ 15} respectively). This average cost of an antenatal visit is about 15% of the minimal monthly wage in the country (Table 4). However, the mean difference between cost at public and private health facilities was found to be insignificant (107 {US$ 1}, CI: -364-150).

Total out of pocket costs for normal and caesarean delivery across arms
Mean total out of pocket cost (including service-fee, drugs/materials, tests, other service costs and travel for normal delivery) was less in intervention arms exposed to structured birth planning intervention as compared to control arm (Table 5). The mean difference between average total out of pocket costs for normal delivery in the two intervention arms as compared to the control arm was found significant (1030 {US$ 10}, CI: 553-1506). However, the difference between total out of pocket cost of caesarean delivery between intervention arms and control arm was found to be insignificant (1000 {US$ 10}, CI: -1194-3194).

Financing of normal delivery and caesarean delivery by husband occupation
The majority of clients across all occupational groups used savings and loans as two main sources of financing the normal delivery as well as the caesarean delivery (Table 6). The breakdown of the reported mode of financing shows that saving was the main source of financing for businessmen and white-collar employees (i.e. 70% and 68% respectively); whereas about a quarter or more of them reported taking a loan to finance the normal delivery. Around 50% of the daily wagers (skilled: 49%; unskilled: 51%) reported to have taken some loan for financing the normal delivery. About 40% of blue-collar employees were found to have used loan (i.e. more frequent than businessman/white collar and less than daily wagers). In farmers, in addition to saving and loan (47%; 36% respectively), about 14% also reported to have sold an asset (generally a goat) for financing the delivery.

Table 1: Demographics

	Control	Birth plan + travel support	Birth plan only
n (%)	213 (33.4)	222 (34.6)	205 (32)
Average number of years of schooling (S.D)	2.3 (1.37)	1.9 (1.22)	2.15 (1.36)
Average number of antenatal visits (S.D)	2.69 (1.95)	3.27 (1.5)	2.75 (1.82)
Mode of delivery:			
Normal delivery (%) (n=503)	163 (76.5)	173 (77.9)	167 (81.5)
C-section delivery (%) (n=137)	50 (23.5)	49 (22.1)	38 (18.5)
Birthplace for normal delivery:			
Health facility (%) (n=153)	62 (38.2)	49 (28.3)	42 (25.1)
Private clinic (%) (n=139)	44 (27.2)	56 (32.4)	39 (23.4)
SBA informal setup (%) (n=45)	10 (6.2)	7 (4)	28 (13.7)
Home setting (%) (n=165)	46 (28.4)	61 (35.3)	58 (34.7)
Place of c-section delivery:			
Public hospital (%) (n=40)	14 (28)	19 (38.8)	7 (18.4)
Private clinic (%) (n=97)	36 (72)	30 (61.2)	31 (81.6)
Place of last antenatal visit:			
Public hospital (%) (n=476)	146 (69.8)	181 (84.2)	149 (75)
Private clinic (%) (n=147)	63 (30.2)	34 (15.8)	50 (25)

Table 2: Cost of normal delivery by the type of birth attendant and place of birth

Type birth attendant	Respondent Mother n (%)	Mean Out of pocket cost in Pak Rs. (S.E.)			
		Service fee	Material	Travel	Total
Doctor	162 (32)	4691 (212)	1172 (80)	459 (46)	4957 (240)
LHV	128 (26)	3193 (146)	1098 (85)	367 (37)	3785 (188)
CMW	76 (15)	3427 (242)	1003 (83)	480 (41)	4558 (260)
Unskilled	130 (26)	2090 (104)	1055 (102)	397 (56)	2833 (150)
Place of delivery (n=488)					
Public health facility	153 (30)	3342 (194)	1157 (69)	357 (32)	3564 (207)
Private clinic/hospital	139 (28)	4467 (195)	1168 (103)	463 (50)	5276 (226)
LHV/ CMW place	45 (9)	4202 (367)	924 (118)	536 (54)	5486 (380)
Client's home	157 (31)	2147 (94)	1019 (87)	362 (43)	2866 (120)

Table 3: Cost of caesarean delivery by the place of delivery

Place of delivery	Respondent Mothers n (%)	Mean Out of pocket cost in Pak Rs. (S.E.)				Mean difference in total cost (95% CI); p-value
		Service fee	Meals	Travel	Total	
Public hospital/ facility	39 (29)	9020 (992)	592 (35)	1126 (157)	10383 (1038)	3829 (1309-6348), p=0.004
Private hospital/ clinic	94 (71)	13229 (570)	550 (19)	652 (92)	14339 (621)	

(Rs. 1= US$ 0.01 approximately)

Table 4: Cost (average) of antenatal by the place of antenatal visit

Place of last antenatal visit	Mean Care costs in Pak Rs. (S.E)					Travel cost	Total	Mean difference in total cost (95% CI); p-value
	Clinical exam	Drugs/material	Tests	Any other	Total			
Public health facility (n=476)	373 (23)	1170 (75)	566 (31)	291 (33)	1486 (70)	276 (16)	1416 (61)	107 (-364 to 150); p=0.412
Private health facility (n=147)	321 (27)	1726 (267)	719 (132)	279 (14)	1728 (111)	178 (36)	1527 (133)	

Table 5: Average service fee and travel cost by arms in normal and caesarean delivery

Trial Arms	Mean cost in Pak Rs. (S.E)			Mean difference in total out of pocket cost between control vs any intervention (95% CI); p-value
	Service fee	Travel	Total out-of-pocket	
In case of normal delivery:				
Birth plan + travel support	2506 (139)	345 (26)	3557 (175)	1030 (553 to 1506); p=0.02
Birth plan (only)	3550 (186)	426 (43)	4541 (246)	
Control arm (no birth plan or travel)	4061 (169)	532 (52)	5420 (246)	
In case of caesarean delivery:				
Birth plan + travel support	11085 (981)	675 (119)	12441 (1025)	1000 (-1194 to 3194); p=0.368
Birth plan (only)	12660 (969)	693 (149)	13764 (1105)	
Control arm (no birth plan or travel)	12470 (755)	1046 (159)	14165 (1007)	

(Rs. 1= US$ 0.01 approximately)

Table 6: Financing of normal delivery and caesarean delivery by husband occupation

Occupation of husband	Respondent Mothers	Mode of financing			
		Savings	Loans	Saving + loan	Any other mode(s)
	n (%)	n (%)	n (%)	n (%)	n (%)
Normal delivery					
Daily wager (skilled)	129 (25)	65 (50)	42 (33)	21 (16)	1 (1)
Daily wager (unskilled)	170 (34)	79 (46)	69 (41)	17 (10)	5 (3)
Employee (blue collar)	45 (9)	26 (58)	13 (29)	5 (11)	1 (2)
Employee (white collar)	37 (7)	25 (68)	12 (32)	0 (0)	0 (0)
Businessman	71 (14)	50 (70)	16 (23)	4 (6)	1 (1)
Farmer	36 (7)	17 (47)	13 (36)	1 (3)	5 (14)
Unemployed	6 (1)	1 (17)	5 (83)	0 (0)	0 (0)
Total	494 (97)	263 (53)	168 (34)	50 (10)	13 (3)
Caesarean delivery					
Daily wager (skilled)	27 (20)	8 (30)	7 (26)	10 (37)	2 (7)
Daily wager (unskilled)	37 (28)	1 (3)	19 (51)	13 (35)	4 (11)
Employee (blue collar)	14 (11)	4 (29)	6 (43)	3 (21)	1 (7)
Employee (white collar)	15 (11)	3 (20)	11 (73)	1 (7)	0 (0)
Businessman	28 (21)	12 (43)	11 (39)	5 (18)	0 (0)
Farmer	12 (9)	3 (25)	3 (25)	3 (25)	3 (25)
Total	133 (100)	31 (23)	57 (43)	35 (26)	10 (8)

Table 7: Client cost projections for normal delivery

Birth Attendant	Estimated women clients		Average cost/ delivery (in Rs.)	Estimated Total cost (in Rs.)
	Number	Percent		
Scenario-1: Estimated client cost of normal delivery, if no intervention is implemented				
Doctor	1997463	32.8	5406	10798284978
LHV	1577265	25.9	5111	8061401415
CMW	322761	5.3	4111	1326870471
TBA	2192337	36	3902	8554498974
Total	6089826	100	-	28741055838
Scenario-2: Estimated client cost, if intervention is implemented province-wide				
Doctor	1321492	21.7	4632	6121150944
LHV	2734332	44.9	3379	9239307828
CMW	517635	8.5	4773	2470671855
TBA	1516367	24.9	2407	3649895369
Total	6089826	100	-	21481025996
Client cost savings with province-wide scaling of the intervention				7260029842

(Rs. 1= US$ 0.01 approximate**ly)**

The breakdown of the reported mode of caesarean delivery financing shows that saving was the main source of financing for businessmen (i.e. 43%); whereas more than half of them reported taking some loan to finance the caesarean delivery. Around two thirds of the daily wagers (skilled: 63%; unskilled: 86%) and employed (blue collar: 64%; white collar: 80%) reported to have taken some loan for financing the caesarean delivery. In farmers, the distribution was found more symmetrical across financing options (including selling of an animal asset).

Health Services Costs
The estimated capital costs for a two-year implementation of intervention is Rs: 801 (US$ 8) per lady health worker and Rs 36 per birth (US$ 3.6). The incremental recurrent cost was Rs 130 (US$ 13) for each LHW and remained less than Rs. 5 (US$ 0.05) per pregnant woman who received intervention. The low capital and recurrent costs highlight the effectiveness of embedding the intervention within the routine health care provision by LHWs.

Projected costs for scaling-up the intervention in Punjab

Health Services Incremental Cost Projections

Incremental **capital** cost for enabling 48,000 LHWs in the whole of Punjab:
48,000 (LHW) x 801 (Unit capital cost/ LHW):
Rs. 38,448,000 (US$ 384480)
Incremental **recurrent** cost for 6,089,826 pregnancies in two years:
6,089,826 (pregnancy) x 4.8 (Unit recurrent cost/ pregnancy):   Rs. 29,232,000 (US$ 292320)

Total incremental cost (capital + recurrent) for two years:
Rs. 67,680,000 (US$ 676800)

Total estimated additional number of skilled birth attendance: 675,971

Estimated incremental cost per additional skilled birth attendance: Rs. 100 (US$ 1)/ pregnancy

Cost Implications in a Scaled-Up Intervention In Punjab
Table 7 shows that with certain valid assumptions the intervention will save Rs. 7.26 billion (US$ 72.6 million) client cost on conduct of normal delivery.

Discussion

Cost of safe birthing practices has proven to be an important determinant of enhancing the rate of skilled birth attendance to reduce neonatal and maternal mortality and has been a much researched topic in low and middle income countries(15). This paper analyses the cost of enhancing skilled birth delivery in rural Pakistan by implementing a structured birth planning intervention. The cost of utilizing skilled birth attendants varied with respect to the qualification of birth attendant and the nature of roles defined within the context of birth delivery. Cost of deliveries facilitated by doctors was highest, followed by community midwives, LHVs and then unskilled birth attendants. The relatively high community midwives service cost, as compared to lady health visitors, is a testament of the fact that for community midwives the service fee is the sole source of income; whereas for lady health visitors, as public servants, it is a part of their many responsibilities and sources of income. The costing study also indicated higher service-payments for caesarean (as compared to normal delivery), which leaves some room for the provider's decision to be based on an undesirable balance between medical and commercial responsibilities and sources of income.

The costing study also indicated higher service-payments for caesarean (as compared to normal delivery), which leaves some room for the provider's decision to be based on an undesirable balance between medical and commercial considerations.

Mean cost of deliveries by LHV accounts for a nominal higher cost than the deliveries facilitated by unskilled birth attendants. Overall, the preference shift in the study (i.e. from unskilled and doctors to the mid-level skilled attendants) does indicate that cost of service is important but not the sole criteria for a family to select a birth attendant; other important considerations for making a selection include perceived quality(16), and social and physical access of the birth attendant (17).

Pakistani women face significant costs in accessing skilled birth attendance for normal or caesarean delivery at both public and private sectors as found in this study. However, the cost of both (normal and caesarean) deliveries were found to be approximately twice as higher at private health facilities as compared to public health facilities. The total out of pocket cost of normal delivery at private clinics and/or place of lady health visitor/community midwife was approximately 50% more as compared to deliveries at public health facilities and approximately 85% at client's own home respectively.

This trend of higher cost for delivery at private health facilities as compared to public health facilities was also found in rural Bangladesh where women were likely to pay one and half times more for normal and caesarean deliveries at private health facilities compared to public health facilities(18). Higher cost of private healthcare services are reflected in the perceived higher quality of services at private facilities, due to which participants are more likely to pay hefty amounts for healthcare services at private facilities(19). This difference in quality of services at public and private healthcare centres account for the higher number of women preferring to deliver at a private healthcare facility, especially in case of caesarean deliveries. A study in Gujranwala, Pakistan found that although only 50% of the respondents could afford private healthcare services, they did not avail a public health facility as 97% were of the view that they would not get immediate attention and would be subjected to a long waiting period and poor treatment there(19). This public vs private healthcare disparities are also evident in other low and middle income countries such as Nigeria ,Uganda and South Africa(20). This highlights the fact that cost-effectiveness of interventions to enhance skilled birth attendance may not yield the desirable results if the quality of services by skilled birth attendants is not improved concurrently.

Cost of delivery might be more reasonable at public healthcare centres but when it comes to cost of antenatal care, there is not much of a difference across public and private health facilities. The widely believed notion that antenatal services at public health facilities are free of cost was found to be a myth in reality. The study found that not only was there a significant cost of antenatal services at public a health facility but it was also comparable to cost of antenatal services in private health facilities. The cost of antenatal visit at both the public and private health facility was found to be 15% of the minimum monthly wage in Pakistan. These relatively high costs of an antenatal visit justify the low uptake of antenatal care at public and private health centres, as seen in the trial. Similar to Pakistan, 'Free' maternity care in Bangladesh was also found to involve substantial hidden costs which was seen as a possible major contributor to low utilization of maternity services, especially among low-income groups(21).

The cost of availing skilled obstetric care at a health facility has been reported to be unaffordable for most of the poor households and impedes the utilization of safe birthing services(22, 23). This study found that most of the respondents used their savings and took loans as modes of financing the obstetric care, while some had to resort to selling off their personal assets to afford a skilled birth attendant. The same findings were reported from rural Tanzania and Bangladesh, where nearly half of the population financed the delivery by using their savings and borrowing money (or selling assets) (24,25). Mode of financing was found to vary depending on the occupation of the husband in this study.

A comparison of the costs incurred by women and their household to pay for normal or caesarean delivery using skilled birth attendance showed statistically significant difference for costs incurred by women who received structured birth planning intervention and those who were not exposed to the intervention. It indicates that costs were significantly reduced when participants made a birth plan that incorporated agreeing with their service provider on the charges for delivery and antenatal care beforehand as birth attendants tend to charge more for last minute appointments. Travel costs were also reduced in the intervention arm as the intervention involved guiding mothers to decide on the travel mode to the health facility for delivery and make the proper arrangements beforehand. Similar findings were reported in a study from Ethiopia where birth preparedness intervention resulted in reduced costs of skilled birth attendance utilization (26). Using a birth plan under the guidance of LHWs can significantly reduce costs for utilizing skilled birth attendance which has major policy implications for maternal and child healthcare in Pakistan.

The two-year cost-effect analysis based on trial data projections, shows an estimated total investment of Rs 67.7 million (US$ 677,000) during the next two years to get an additional approximately 675,000 skilled birth attendance (i.e. Rs. 100 {US$: 1} per additional skilled birth attendance). Looking at the investment from the client perspective, assuming similar effects are achieved in the province-wide expansion, the estimated cost saving of about Rs. 7.26 billion will take place mainly due to better negotiated deals between birth attendants and consumers of safe birthing services.

In short, based on trial results and cost projections, the relatively modest investment of Rs 67.7 million (US$ 677,000) is justified, both for health services and consumers, to achieve the gains of enhanced LHW birth planning in the province.

Costing Study Limitations

As women and family members were interviewed after the pregnancy outcomes, so a possibility of biased client responses (either due to recall or perception) cannot be ruled out. Similarly, there are chances of missing expense details as some women were only able to tell a total of costs paid and could not give further breakdown of the expenditures.

Conclusion

The costing study showed that a mean total out of pocket cost of normal delivery and caesarean were lesser among those exposed to structured birth planning intervention as compared to those not exposed. The savings and personal loans have been two main reported modes of financing for normal and caesarean delivery. In conclusion, based on trial results and cost projections, the relatively modest investment of Rs 67.7 million (US$ 677,000) can lead to enhanced birth planning in the province.

Contributions

NK and MAK jointly conceived the study and supervised study implementation. SEK & MAK contributed to literature review; AW contributed to manuscript development. JW provided technical input and contributed to the design of the study. All authors critically reviewed and approved the final manuscript.

Data sharing

De-identified data that underlie the results reported in this article, will be made available to researchers whose proposed use of the data has been approved by an independent ethical review committee. Requests should be directed to the corresponding author of this study.

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Complementary and alternative medicine practice and perceptions of Saudi subjects in Western region of Saudi Arabia

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Abstract

Background: Complementary and alternative medicine (CAM) offers a different approach to conventional medicine. CAM is very popular in many countries.

Objectives: To study the magnitude of use, and determinants and awareness of CAM therapy use among the population in Western region of Saudi Arabia.

Method: This was a cross sectional study; a non-probability convenient sampling method was used to select 1073 subjects through online Google survey. Data were collected using interview questionnaire, which provided information on the sociodemographic characteristics of the subjects, as well as questions on the practices and awareness of CAM therapies. The GAD-7 test to assess anxiety state was also used.

Results: Almost half of the study population used CAM (51.6%), particularly those who live in the villages of Makkah city. CAM therapies were used by almost half of all patients with chronic diseases particularly those with gastrointestinal disorders and anxiety. Most common CAM method were Honey, Herbs, Ruqayyah and black seeds; while Acupuncture was the least method used. CAM methods were mainly used if needed, and main source of information about its use, was from the family. Almost half of the users were satisfied with the results of using it; however, their attitude about CAM in general was neutral.

Conclusion: Use of CAM is a common health practice among the Saudi population. The majority of the participants had equivocal awareness about its effects. More health education programs by specialized health care authorities on the use and benefits of CAM are needed. Doctor-patient communication regarding CAM use is important. Increasing awareness of Saudi population about instructions and restrictions when using CAM is greatly needed.

Keywords: CAM, Saudi Arabia, anxiety, Jeddah city, Gastro intestinal disorders.

Introduction

Complementary and alternative medicine (CAM) is the term for medical products and practices that are not part of standard medical care. Many different areas make up the practice of complementary and alternative medicine (CAM) (1-3). Females were more likely than men to use CAM (4-6). In Saudi Arabia, CAM therapy was more frequently used among those living in Riyadh region, housewives, employees, and students, and among those people with low income (4). Spiritual healers, herbalists, providers of honeybee products, and Hijama (cupping) therapists were providers most commonly visited. More than half were satisfied with outcome of last visit mostly for honeybee products. Self-reciting of Quran on water or oil represents most of all CAM users then represents recited oil or water by a friend or relative. Fathers and mothers used recited oil on their children. Most of those who used CAM were with poor health (4-11). CAM users agreed that CAM methods are safer and more effective than traditional Western medicine, respectively, and most CAM users planned to continue to use CAM in the future. Less than half CAM users did not consult a doctor before using CAM. Most patients were willing to use CAM with modern medicine in future (5). The most frequently stated information sources regarding CAM use were family, friends, and religious guidance (12 -18). In a US study, a quarter of patients revealed that their physicians did not know about their CAM use and patients used alternative therapy for chronic disorders (19 -30). The aim of the present study was to investigate the magnitude of CAM practices among Saudi subjects, and to study its determinants and the awareness of the Saudi population about it.

Subject and method

The design of the study was a cross sectional one where a convenient nonprobability sampling method was used. The minimal sample size according to alpha 5%, and beta 20%, and 5 degrees of freedom is 227 (31). The study was conducted online, where 1037 subjects were enrolled in the study. A questionnaire was delivered for all subjects; it provided information on personal and socio-demographic characteristics, health status, as well as information on CAM practice, and perception about it. Also GAD7 questionnaire on anxiety disorder was asked of each participant (32). Scores of 0, 1, 2 and 3 are given for experiencing symptoms 'not at all', for 'several days', for 'more than half the days' and for 'nearly every day', respectively. The scores are then totaled and presented from 0 to 21. Scores of 5, 10 and 15 represent cut-off points for mild, moderate and severe anxiety, respectively. Statistical analysis: data was analyzed using SPSS version 23. Chi square test of significance was used. Level of significance was 0.05.

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

Result

The present study included 1037 subjects (40% males, and 60 % females). Almost half of the subjects used CAM (51.6%). Table 1 displays the relationships between use of CAM and sociodemographic characteristics of the studied subjects. A higher proportion of females were found among subjects who used CAM compared to those who did not (64.1%, and 56.4% respectively) compared to males (35.9%, and 43.6% respectively). This difference was significant where p < 0.011. Use of CAM was significantly more common among Non-Saudi subjects compared to Saudi ones (p <0.05). Residents of the city of Makkah used CAM significantly more than residents in the other cities of Makkah region e.g. Jeddah, Al-Laith and Al-Taif (p< 0.01). However, there were no significant differences in the use of CAM between residents of Makkah region and other regions of the Kingdom (p < 0.826). Subjects who lived in villages used CAM significantly more than those who lived in urban areas (p<0.041). Educational level, the monthly income, and ownership of the home were irrelevant to the use of CAM among studied subjects (p > 0.05).

Table 2 displays the distribution of the studied subjects according to use of CAM and history of chronic disorders. Greater proportions of those who used CAM, had history of gastro-intestinal disorders for 5 years or less (16.4%), or for more than five years or more (11.2%) , compared to those who didn't use CAM (14.1%, and 4.1% respectively). These differences were statistically significant (P < 0.000). Greater proportions of those who used CAM, had a history of moderate anxiety score (17.6%), compared to those who didn't use CAM (11.0%). This difference was statistically significant (P < 0.024). History of other chronic disorders e.g. hypertension, DM, respiratory or cardiovascular disorders, endocrine disorders, immunological disorders, or cancer were irrelevant to use of CAM (p >0.05). Table 3 shows the relationships between gender and type of CAM used by the subjects who used CAM. The most common substances used by the subjects as CAM were Honey (82.8%), herbs (75.5%), Ruqayyah (73.1%) and Black seeds (69.0%). Use of Hijama was more common among males compared to females (43..3% and 26.8 respectively), and p<0.000. Use of black seeds and Herbs for less than 5 years was significantly more common in females compared to males; on the other hand its use 5 years or more was more common in males compared to females. These differences were statistically significant compared where p values were <0.05. The use of the other methods of CAM were similar in both males and females. Table 4 shows the relationships between age categories and type of CAM used by the subjects who used CAM. Use of Hijama, Oil Recited, Ruqayyah, and Zamzam water were significantly more used by subjects older than 40 years old, compared to those younger than 40 years of age. The other methods were similarly used by both the younger and older than 40 years of age.

Table 5 reveals the distribution of the subjects who used CAM according to gender and practicing CAM. The majority of the subjects used CAM only if needed (78.5%),

and no significant differences were found between males and females (p >0.05). About one third of the subjects (36.6%) visited sheikhs for CAM, and this was similar in males and females (p >0.5). Almost half of the subjects did not visit the doctors for CAM (49.6%); no significant differences were found between males and females (p> 0.05). The majority of the subjects felt more efficient after use of CAM (79.4%), and this was significantly higher in males compared to females (p <0.01). A greater proportion of male subjects significantly reported that they improved after CAM compared to females (p < 0.006). Although the proportions of those who reported that the symptoms improved after doctor consultation (53.3%), a large proportion of the subjects using CAM reported that their symptoms improved after practicing CAM (46.7%). No significant differences were found in both genders (p > 0.05). About one-third of the subjects got their information about using CAM from their families (33.7%). A greater proportion of females got their information about using CAM from their families compared to males; on the other hand a greater proportion of males got their information from doctors, compared to females. These differences were statistically significant where p < 0.002. Table 6 shows the distribution of the studied subjects according to use of CAM and their perception and awareness of the benefits and advantages of CAM for the individuals and the community. No significant differences were found between those who used CAM and those who did not, regarding their perception and awareness about CAM and its advantages to the individuals and community. The greatest proportion for each question of this CAM awareness questionnaire was for the neutral response.

Table 1: Distribution of Studied Subjects by use of CAM & sociodemographic characteristics

Variable	Categories	Practicing CAM				Total		χ^2 (p- value)
		No		Yes				
		N	%	N	%	N	%	
Gender	Male	219	43.6%	192	35.9%	411	39.9%	6.481 (0.011)
	Female	283	56.4%	343	64.1%	626	60.4%	
Age in years	< 40 years	444	88.4%	465	86.9%	909	87.7%	0.56 (0.45)
	≥ 40 years	58	11.6%	70	13.1%	128	12.3%	
Nationality	Saudi	364	72.5%	358	66.9%	722	69.6%	3.832 (0.050)
	Non-Saudi	138	27.5%	177	33.1%	315	30.4%	
	Yes	446	88.8%	473	88.4%	919	88.6%	
Cities of Makkah Region	Jeddah	390	87.4%	415	87.7%	805	87.6%	11.326 (0.010)
	Makkah	42	9.4%	56	11.8%	98	10.7%	
	Al-leith	4	0.9%	0	0%	4	0.4%	
	Al-taif	10	2.2%	2	0.4%	12	1.3%	
Educational Level	Illiterate	3	0.6%	0	0%	3	0.3%	3.218 (0.200)
	School	147	29.3%	156	29.2%	303	29.2%	
	College or Higher	352	70.1%	379	70.8%	731	70.5%	
Living Area	City	491	97.8%	511	95.5%	1002	96.6%	4.182 (0.041)
	Village	11	2.2%	24	4.5%	35	3.4%	
House Ownership	Owned	259	51.6%	299	55.9%	558	53.8%	1.921 (0.166)
	Rented	243	48.4%	236	44.1%	479	46.2%	
Salary	Less than 10,000	307	61.2%	322	60.2%	629	60.7%	0.102 (0.750)
	More than 10,000	195	38.8%	213	39.8%	408	39.3%	

Table 2: Distribution of studied subjects by use of CAM and history of chronic disorders

Variable	Categories	Practicing CAM				Total		X² (p- value)
		No		Yes				
		N	%	N	%	N	%	
Hypertension	No	466	92.8%	489	91.4%	955	92.1%	1.823ª (0.402)
	Yes, ≤ 5years	21	4.2%	32	6.0%	53	5.1%	
	Yes, > 5 years	32	6.0%	14	2.6%	29	2.8%	
Diabetes Mellitus	No	463	92.2%	495	92.5%	958	92.4%	0 .337ª (0.845)
	Yes, ≤ 5years	21	4.2%	24	4.5%	45	4.3%	
	Yes, > 5 years	18	3.6%	16	3.0%	34	3.3%	
Endocrine disorders	No	482	96.0%	503	94.0%	985	95.0%	2.169a (0.338)
	Yes, ≤ 5years	10	2.0%	16	3.0%	26	2.5%	
	Yes, > 5 years	10	2.0%	16	3.0%	26	2.5%	
Heart disease	No	486	96.8%	520	97.2%	1006	97.0%	0.928a (0.629)
	Yes, ≤ 5years	12	2.4%	9	1.7%	21	2.0%	
	Yes, > 5 years	4	0.8%	6	1.1%	10	1.0%	
Respiratory disorders	No	463	92.2%	491	91.8%	954	92.0%	452 (0.798)
	Yes, ≤ 5years	14	2.8%	13	2.4%	27	2.6%	
	Yes, > 5 years	25	5.0%	31	5.8%	56	5.4%	
Gastrointestinal and colorectal disorders	No	409	81.5%	387	72.3%	796	76.8%	19.005 (0.000)
	Yes, ≤ 5years	71.	14.1%	88	16.4%	159	15.3%	
	Yes, > 5 years	22.	4.4%	60	11.2%	82.	7.9%	
Liver	No	500	99.6%	530	99.1%	1030	99.3%	2.026 (0.363)
	Yes, ≤ 5years	2	0.4%	3	0.6%	5	0.5%	
	Yes, > 5 years	0	0.0%	2	0.4%	2	0.2%	
Immunological disorders	No	488	97.2%	520	97.2%	1008	97.2%	0.018a (0.991)
	Yes, ≤ 5years	9	1.8%	10	1.9%	19	1.8%	
	Yes, > 5 years	5	1.0%	5	0.9%	10	1.0%	
Cancer	No	501	99.8%	531	99.3%	1032	99.5%	1.824a (0.402)
	Yes, ≤ 5years	1	0.2%	3	0.6%	4	0.4%	
	Yes, > 5 years	0	0.0%	1	0.2%	1	0.1%	
Skin disease	No	472	94.0%	487	91.0%	959	92.5%	3.986a (0.136)
	Yes, ≤ 5years	16	3.2%	21	3.9%	37	3.6%	
	Yes, > 5 years	14	2.8%	27	5.0%	41	4.0%	
Categories of anxiety score	Minimal	201	42.7%	210	40.5%	411	41.6%	9.474 (0.024)
	Mild	169	35.9%	176	34.0%	345	34.9%	
	Moderate	52	11.0%	91	17.6%	143	14.5%	
	Severe	49	10.4%	41	7.9%	90	9.1%	

Table 3: Distribution of the subjects who used CAM by gender and type of CAM

Variable	Categories	Gender				Total		x^2 (p- value)
		Female		Male				
		N	%	N	%	N	%	
Zamzam Water	No	154	44.9%	83	43.2%	237	4.3%	0.148 (0.928)
	Yes, ≤ 5years	93	27.1%	53	27.6%	146	7.3%	
	Yes, >5 years	96	28.0%	56	29.2%	152	28.4%	
Ruqayyah (Quran)	No	86	25.1%	58	30.2%	144	26.9%	2.166 (0.539)
	Yes, ≤ 5years	105	30.6%	54	8.1%	159	29.7%	
	Yes, >5 years	152	44.3%	80	41.7%	232	43.4%	
Acupuncture	No	318	92.7%	175	91.1%	493	92.1%	0.633 (0.729)
	Yes, ≤ 5years	15	4.4%	9	4.7%	24	4.5%	
	Yes, >5 years	10	2.9%	8	4.2%	18	3.4%	
Herbs	No	79	23.0%	52	27.1%	131	24.5%	9.104 (0.011)
	Yes, ≤ 5years	158	46.1%	63	32.8%	221	41.3%	
	Yes, >5 years	106	30.9%	77	40.1%	183	34.2%	
Honey	No	57	16.6%	35	18.2%	92	17.2%	5.410 (0.067)
	Yes, ≤ 5years	136	39.7%	57	29.7%	193	36.1%	
	Yes, >5 years	150	43.7%	100	52.1%	250	46.7%	
Oil Recited	No	169	49.3%	106	55.2%	275	51.4%	1.916 (0.384)
	Yes, ≤ 5years	72	21.0%	38	19.8%	110	20.6%	
	Yes, >5 years	102	29.7%	48	25%	150	28.0%	
Hijama	No	251	73.2%	109	56.8%	360	67.3%	15.638 (0.000)
	Yes, ≤ 5years	47	13.7%	47	24.5%	94	17.6%	
	Yes, >5 years	45	13.1%	36	18.8%	81	15.1%	
Blackseed	No	107	31.2%	59	30.7%	166	31.0%	6.747 (0.034)
	Yes, ≤ 5years	120	35.0%	49	25.5%	169	31.6%	
	Yes, >5 years	116	33.8%	84	43.8%	200	37.4%	

Table 4: Distribution of people who use CAM by type of CAM and age groups

Variable	Categories	Age groups				Total		X² (p- value)
		40 years or less		Over 40 years				
		N	%	N	%	N	%	
Zamzam Water	No	213	45.8%	24	34.3%	237	44.3%	9.980 (0.007)
	Yes, ≤ 5years	131	28.2%	15	21.4%	146	27.3%	
	Yes, >5 years	121	26.0%	31	44.3%	152	28.4%	
Ruqayyah (Quran)	No	137	29.5%	7	10.0%	144	26.9%	13.858 (0.003)
	Yes, ≤ 5years	137	29.5%	21	30.0%	158	29.5%	
	Yes, >5 years	190	40.9%	42	60.0%	232	43.4%	
Acupuncture	No	427	91.8%	66	94.3%	493	92.1%	0.578 (0.749)
	Yes, ≤ 5years	22	4.7%	2	2.9%	24	4.5%	
	Yes, >5 years	16	3.4%	2	2.9%	18	3.4%	
Herbs	No	117	25.2%	14	20.0%	131	24.5%	2.036 (0.361)
	Yes, ≤ 5years	194	41.7%	27	38.6%	221	41.3%	
	Yes, >5 years	154	33.1%	29	41.4%	183	34.2%	
Honey	No	79	17.0%	13	18.6%	92	17.2%	1.293 (0.524)
	Yes, ≤ 5years	172	37.0%	21	30.0%	193	36.1%	
	Yes, >5 years	214	46.0%	36	51.4%	250	46.7%	
Oil Recited	No	248	53.3%	27	38.6%	275	51.4%	12.475 (0.002)
	Yes, ≤ 5years	99	21.3%	11	15.7%	110	20.6%	
	Yes, >5 years	118	25.4%	32	45.7%	150	28.0%	
Hijama	No	326	70.1%	34	48.6%	360	67.3%	13.924 (0.001)
	Yes, ≤ 5years	77	16.6%	17	24.3%	94	17.6%	
	Yes, >5 years	62	13.3%	19	27.1%	81	15.1%	

Table 5: Distribution of subjects who used CAM according to gender and practicing and outcome of using CAM

Variable	Categories	Gender		Total	X² (p- value)
		Female	Male		
		N %	N %	N %	
Frequency of Alternative Medicine Usage	If needed	281 8.1%	161 79.3%	442 78.5%	2.872 (0.412)
	Weekly	28 7.8%	18 8.9%	46 8.2%	
	Monthly	17 4.7%	4 2.0%	21 3.7%	
	Daily	34 9.4%	20 .9%	54 9.6%	
Sheikh Visitation	No	228 63.3%	129 63.5%	357 63.4%	0.003 (0.960)
	Yes	132 36.7%	74 36.5%	206 36. 6%	
Doctor Consultation	No	188 52.2%	91 44.8%	279 49.6%	2.839 (0.092)
	Yes	172 47.8%	11255.2%	284 50.4%	
Efficacy after using Alternative Medicine	No effect	84 23.3%	26 12.8%	110 19.5%	9.234 (0.010)
	Worse	4 1.1%	2 1.0%	6 1.1%	
	Better	272 75.6%	175 86.%	447 79.4%	
Symptoms improvement After Practicing Alternative Medicine	Highly	85 23.6%	54 26.6%	139 24.7%	14.491 (0.006)
	Mild	89 24.7%	64 31.5%	153 27.2%	
	No	146 40.6%	52 25.6%	198 35..2%	
	Got severe	25 6.9%	24 11.8%	49 8.7%	
	Got very severe	15 4.2%	9 4.4%	24 4.3%	
Symptom Improvement with	Doctor consultation	187 51.9%	113 55.7%	300 53.3%	0.722 (0.396)
	using CAM	173 48.1%	90 44.3%	263 46.7%	
Source of Information	Family	234 37.4%	115 28.0%	349 33.7%	16.593 (0.002)
	Friends	69 11.0%	60 14.6%	129 12.4%	
	Social media	140 22.4%	79 19.2%	219 21.1%	
	Doctor	121 19.3%	108 26.3%	229 22.1%	
	Others	62 9.9%	49 11.9%	111 10.7%	

Table 6: Distribution of the studied subjects according to their perception and awareness of benefits and advantages of CAM for the individuals and the community

Variables	Categories	Practicing CAM				Total		X² (p- value)
		No		Yes				
		N	%	N	%	N	%	
CAM Contribution in Community Health	Strongly agree	110	17.6%	79	19.2%	189	18.2%	5.511 (0.239)
	Agree	100	16.0%	53	12.9%	153	14.8%	
	Neutral	268	42.8%	191	46.5%	459	44.3%	
	Disagree	89	14.2%	44	10.7%	133	12.8%	
	Strongly disagree	59	9.4%	44	10.7%	103	9.9%	
CAM Improves People's lives	Strongly agree	97	15.5%	62	15.1%	159	15.3%	1.870 (0.760)
	Agree	102	16.3%	78	19.0%	180	17.4%	
	Neutral	254	40.6%	163	39.7%	417	40.2%	
	Disagree	96	15.3%	65	15.8%	161	15.5%	
	Strongly disagree	77	12.3%	43	10.5%	120	11.6%	
CAM Contribution in Society Perceptions	Strongly agree	89	14.2%	64	15.6%	153	14.8%	4.396 (0.355)
	Agree	102	16.3%	67	16.3%	169	16.3%	
	Neutral	234	37.4%	169	41.1%	403	38.9%	
	Disagree	112	17.9%	55	13.4%	167	16.1%	
	Strongly disagree	89	14.2%	56	13.6%	145	14.0%	
Practicing CAM is healthier than following treatment plan from any trustable sources	Strongly agree	93	14.9%	60	14.6%	153	14.8%	7.940 (0.094)
	Agree	85	13.6%	47	11.4%	132	12.7%	
	Neutral	234	37.4%	188	45.7%	422	40.7%	
	Disagree	111	17.7%	60	14.6%	171	16.5%	
	Strongly disagree	103	16.5%	56	13.6%	159	15.3%	
CAM Contribution in Feeling Healthy	Strongly agree	114	18.2%	73	17.8%	187	18.0%	1.985 (0.739)
	Agree	123	19.6%	83	20.2%	206	19.9%	
	Neutral	226	36.1%	162	39.4%	388	37.4%	
	Disagree	84	13.4%	47	11.4%	131	12.6%	
	Strongly disagree	79	12.6%	46	11.2%	125	12.1%	

(continued next page)

Table 6: Distribution of the studied subjects according to their perception and awareness of benefits and advantages of CAM for the individuals and the community (continued)

CAM Contribution in Society Affiliation	Strongly agree	99 15.8%	65 15.8%	164 15.8%	0.899 (0.925)
	Agree	92 14.7%	61 14.8%	153 14.8%	
	Neutral	244 39.0%	170 41.4%	414 39.9%	
	Disagree	99 15.8%	60 14.6%	147 14.2%	
	Strongly disagree	92 14.7%	55 13.4%	147 14.2%	
CAM Decreasing The Medical Consultation	Strongly agree	100 16.0%	64 15.6%	164 15.8%	3.676 (0.452)
	Agree	81 12.9%	57 13.9%	138 13.3%	
	Neutral	225 35.9%	167 40.6%	392 37.8%	
	Disagree	85 13.6%	48 11.7%	133 12.8%	
	Strongly disagree	135 21.6%	75 18.2%	210 20.3%	

Discussion

The present study included 1037 subjects (40% males, and 60 % females). Almost half of the subjects used CAM (51.6%). A higher proportion of females used CAM compared to males.

The majority of national survey studies in both UK (1) and US report that women are more likely than men to use CAM. However, some national studies have not found significant gender differences (33) and a small number of studies reported men more likely to use CAM (2). The present difference between females and males may be attributed to the reduced accessibility that women in Saudi Arabia have to the health care system, in addition to their long stay at home where many herbs are available as well as the influence of the media. In the present study almost 50% of the subjects with chronic disorders like hypertension, diabetes mellitus, Heart diseases, skin diseases and particularly GIT and anxiety disorders used CAM therapies. This is in line with reported previous studies (9, 16, 19, 21). In this study, the most common substances used as CAM were Honey, herbs, Ruqayyah and Black seeds. Use of Hijama was commoner among males than female. Use of black seeds and Herbs for <5 years was significantly more in females than males; on the other hand its use ≥5 years was commoner in males than females. Use of Hijama, Oil Recited, Ruqayyah, and Zamzam water were significantly more used by subjects > 40 years than < 40 years of age. The other methods were similarly used by both the younger and older than 40 years of age. In Qassim province, Spiritual healers, herbalists, providers of honeybee products, and hijama (cupping) therapists were providers most commonly visited. More than 50% were satisfied with the outcome (33). In this study, the majority of subjects used CAM only if needed and no significant differences were found between males and females. About one third of subjects visited sheikhs for CAM, and this was similar in males and females. This is in line with previous study results in Saudi Arabia where more than 50% of studied subjects were satisfied with outcome of their last visit to CAM providers. The most prominent types of CAM were of a religious nature, such as supplication, Quran recitation, consuming Zamzam water, and water upon which Quran was read (28). In another study they reported that CMA types used were self-reciting of Quran on water or oil, and recited oil or water by a friend or relative and fathers and mothers who used recited oil on their children (4). In the present study, the majority of the subjects felt more improved after use of CAM, and this was significantly higher in males compared to females. Although the proportions of those who reported that the symptoms improved after a doctor consultation, a large proportion of the subjects using CAM reported that their symptoms improved after practicing CAM. This is in line with previous studies (4, 33). In the present study, most CAM users believed that CAM was safe and saw no harm in using CAM for their skin problems. CMA types used were self-reciting of Quran on water or oil, and recited oil or water by a friend or relative and fathers and mothers used recited oil on their children (4). This is in line with a previous study where they observed that CAM users reported that CAM methods are safer and more effective than traditional Western medicine, and most CAM users planned to continue to use CAM in future (5). In this study, about one-third of the subjects got their information about using CAM from their families. A greater proportion of females got their information about

using CAM from their families compared to males; on the other hand a greater proportion of males got their information from doctors, compared to females. This is in line with previous studies (12, 16). In a previous study in Saudi Arabia, they found a high prevalence and increased public interest in CAM use in the Riyadh region; there was a positive attitude towards CAM, yet most participants were reluctant to share and discuss CAM information with their physicians (34). Similarly, in the present study there was no significant differences between those who used CAM and those who did not, regarding their perception and awareness about CAM and its advantages to individuals and community. The greatest proportion for each question of this CAM awareness questionnaire was for the neutral response.

Limitations

There are some limitations to this study: as this study is cross-sectional, the causal relationship remains unknown. It is also a nonprobability convenient sample, and its generalization to the population may be defective; however, it is an exploratory study, which threw some light on the use of CAM and awareness of the population of its benefits and adverse effects.

Acknowledgments

Conclusion

Use of CAM is a common health practice among the Saudi population, particularly those residing in Makkah city. The majority of the participants have equivocal awareness about its effects. Increasing awareness of Saudi population about instructions and restrictions when using CAM is greatly needed. More health education programs by specialized health care authorities on the use and benefits of CAM are needed to increase the awareness of the population on the use of different CAM therapy methods. Doctor-patient communication regarding CAM use is of paramount importance.

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Prevalence of physical and verbal violence against physicians and nurses in primary health care centres, Buraidah, Qassim province

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Abstract

Background: Workplace violence in healthcare settings is a global problem, with negative effects on safety and well-being of health care workers as well as workplace activities. However, there is a lack of studies on workplace violence generally and in Saudi Arabia particularly.

Objectives: To estimate the prevalence and determine the demographic and occupational characteristics associated with workplace violence in primary health care centres (PHCCs) in Buraidah, Saudi Arabia.

Subjects and Methods: A cross-sectional study including 288 physicians and nurses working at PHCCs in Buraidah city in Qassim region was carried out during June and July, 2021. A semi-structured self-administered questionnaire was used to estimate the frequency, timing, causes, reactions, and consequences of workplace violence in addition to participants` demographic and occupational data.

Results: Among 288 study participants, 64.2 % were nurses and 63.7% were females. The mean (±SD) age of study participants was 36.7±8.2 years. History of exposure to workplace violence was mentioned by 41.2% of the participants. The majority (98.2%) of insults were verbal. The offender was a patient in most of the incidents (79.7%). Females represented 63.2% of offenders and those aged between 21 and 45 years represented 72.1% of them. The reasons for the violent event included misunderstanding, unmet service demand, overcrowding, and long waiting time. No action was taken as a reaction to violent event by 56.3% of the victims while reporting to supervisors was mentioned by 34.8% of the respondents.

Conclusions: A considerable proportion of physicians and nurses in PHCCs were exposed to violence in the workplace; mainly verbal type. More than half of the violent incidents were not reported. Implementation of an appointment system in PHC settings and increasing awareness of patients regarding their rights and responsibilities is recommended.

Key words: physical violence, verbal violence, physiciand, nurses, PHC, Qassim province, Saudi Arabia

Introduction

Worldwide, healthcare workers (HCWs) are at risk of facing violence; between 8% and 38% of health workers suffer from physical violence at some point in their careers [1]. Workplace violence can be physical, sexual or psychological in nature and can be actual or threatened [2-4]. The violence sources against HCWs can be from the patients or from patients' relatives or other health workers. Consequences of violence in workplace for both staff and patients include direct and indirect effects beside compromised patient care [5].

The World Health Organization (WHO) defines violence as: "The intentional use of physical force or power, threatened or actual, against another person or against oneself or a group of people that results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development or deprivation"[6].

There are numbers of factors that increase the risk of workplace violence against health care workers, including factors related to doctors and nurses, offender or co-workers and to the environment of the work place [7-9]. Several studies have explored the factors associated with violence by patients. These factors include anxiety, acute stress reaction, dementia, suicidal ideation, alcoholism and drug intoxication, male gender, older age, having history of violence, and access to firearms. The factors associated with HCWs include patients' service in emergency and psychiatric department, less staff members (especially during meal times and visiting hours), working alone, and long working hours. Moreover, workplace factors of violence were reported as long waiting period, over crowdedness, uncomfortable waiting places, poorly designed place of service, lack of good functioning security, surveillance video cameras, and policies that prevent violence [10].

Because of adverse effects of violence and its risk among doctors and nurses, this issue needs to be explored in order to help develop policies, regulations, and interventions to prevent violence. There is a lack of statistics and a dearth of studies from Saudi Arabia in general and in Qassim region in particular regarding violence against HCWs. The available literature mostly addresses the violence in hospitals including emergency departments and psychiatric units, with little investigated violence in the primary care setting. To fill this gap, we designed the current study with the objectives to determine the prevalence of violence against physicians and nurses, to investigate the causes and consequences of violent events, and to explore the association of violence with demographic and occupational characteristics of physicians and nurses working at PHCCs in Buraidah, Qassim region. The results of this study will help in designing interventions to prevent the events of violence against health care workers.

Methods

1. Study Design, Setting and Study Population
A cross sectional study was conducted at Primary Health Care Centers (PHCCs) in Buraidah city, Qassim Region, Saudi Arabia. Buraidah, the capital of Qassim, has 39 PHCCs belonging to the Ministry of Health (MOH), Saudi Arabia. The physicians and nurses working at PHCCs in Buraidah constituted the study population. All physicians and nurses working in the selected PHCCs were included in the study. However, those who had vacations or were absent during the data collection period, were excluded from the study. Pharmacists, dentists, dental assistant and lab technicians working at PHCCs were also excluded from the study.

2. Data collection tool and procedure
Data were collected by standardized validated, semi structured and self-administered questionnaire. The study questionnaire was adapted from the WHO survey questionnaire about violence in health care settings [11]. The questionnaire had two main sections. The first section gathered information about demographic characteristics (age, sex, marital status, occupation and nationality) and occupational characteristics (years of work experience, working hours and duty shifts, number and gender of coworkers) of the study participants. This section also included questions about experiencing violence by the health care workers and questions about violence reporting system at PHCCs. The second section included questions specific to the last violent event faced by the respondent including questions about the details of the incident and the offender. Questions regarding reasons and consequences of the violent event were also included in this section. Finally, the participants were asked about their suggestions for prevention of violence at PHCCs. The questionnaire was pilot tested for clarity and understandability. No modifications were required in the questionnaire as the respondents found it clear and understandable.

All physicians and nurses working at PHCCs in Buraidah were invited to participate. Five medical students participated in data collection. The medical students were trained for data collection. After explaining the objectives of the study and taking informed consent, the physicians and nurses available at the time of the survey were provided with the questionnaire. The data collectors collected the filled questionnaires on the same day. The data was collected during June 2021-July 2021.

3. Data analysis
Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) software, version 26. Descriptive analysis was carried out; the mean, range, and standard deviation (SD) were calculated for quantitative variables; frequency and proportion were calculated for categorical variables. For comparisons, chi-square test was used for testing the association between categorical variables while t-test and ANOVA were used for the quantitative variables. A p–value ≤0.05 was considered significant for all inferential analysis.

4. Ethical consideration

The ethical approval was taken from the Regional Research Ethics committee, Qassim. A permission letter was obtained from the administrative authorities before starting the data collection. Informed consent was obtained from each participant. The confidentiality of the participants was maintained at all steps of the study.

Results

1. Demographic characteristics

A total of 288 physicians and nurses participated in the study. The demographic characteristics of the study participants are summarized in Table 1. Their age ranged between 24 and 66 years with an arithmetic mean (±SD) of 36.7±8.2 years. Females represented 63.7% of them while nurses represented 64.2% of the respondents. The majority were married (81.4%) and Saudi nationals (75.3%).

Table 1: Demographic characteristics of the study participants (n=288)

Demographic characteristics	No.	%
Age in years (n=204)		
<30	32	15.7
30-50	160	78.4
>50	12	5.9
Range	24-66	
Mean±SD¶	36.7±8.2	
Gender (n=278)		
Female	177	63.7
Male	101	36.3
Job (n=274)		
Physician	98	35.8
Nurse	176	64.2
Marital Status (n=273)		
Single	46	16.8
Married	222	81.4
Divorced/widow	5	1.8
Nationality (n=275)		
Saudi	208	75.6
Non-Saudi	67	24.4

¶SD: Standard deviation

2. Occupational characteristics

Table 2 presents the occupational characteristics of the study participants. The health sector experience of almost one-third (33.7%) of the participants ranged between 6 and 10 years whereas that of 19.9% exceeded 15 years. The experience in primary healthcare ranged between 1 and 5 years for 33.8% of the study participants whereas 12.5% respondents had more than 15 years of experience in the primary healthcare system. The majority of the respondents (97.1%) worked in morning shifts. Number of co-workers ranged between one and five in 50.7% of cases. In the majority of cases, the usual patient`s gender was either female (39.4%) or both genders (40.7%).

Table 2: Occupational characteristics of the participants (n=288)

Occupational characteristics	No.	%
Experience in the health sector (years)		
1-5	59	20.9
6-10	95	33.7
11-15	72	25.5
>15	56	19.9
Experience in primary health care (years)		
1-5	105	38.8
6-10	86	31.7
11-15	46	17.0
>15	34	12.5
Time of the work (n=279)		
Morning shift	271	97.1
Evening/night shift	5	1.8
Both	3	1.1
Number of co-workers (n=278)		
1−5	141	50.7
6−10	88	31.7
>10	49	17.6
Usual patient`s gender (n=282)		
Male	56	19.9
Female	111	39.4
Both	115	40.7

3. Violence reporting system

More than one-third of the participants (n=109, 39.5%) reported existence of a system for reporting violence at their primary healthcare center. Among those who reported existence of a system for reporting violence at PHCC, 75.2% knew how to use the system; 63.1% mentioned that there is encouragement to report violent events and 61.8% believed that the violence reporting system is effective (Table 3).

Table 3: Experience of the participants with the violence reporting system at primary healthcare center (n=109)

	No.	%
Do you know how to use the system of reporting? (n=105)		
Yes	79	75.2
No	26	24.8
Is there encouragement to report violent event? (n=103)		
Yes	65	63.1
No	17	16.5
Don`t know	21	20.4
Do you think the violence reporting system is effective (beneficial)? (n=102)		
Yes	63	61.8
No	8	7.8
Don`t know	31	30.4

4. Prevalence of workplace violence

History of exposure to workplace violence was mentioned by 41.2% of the participants as illustrated in Figure 1.

Figure 1: Study participants' history of exposure to work place violence over the past 12 months (n=172)
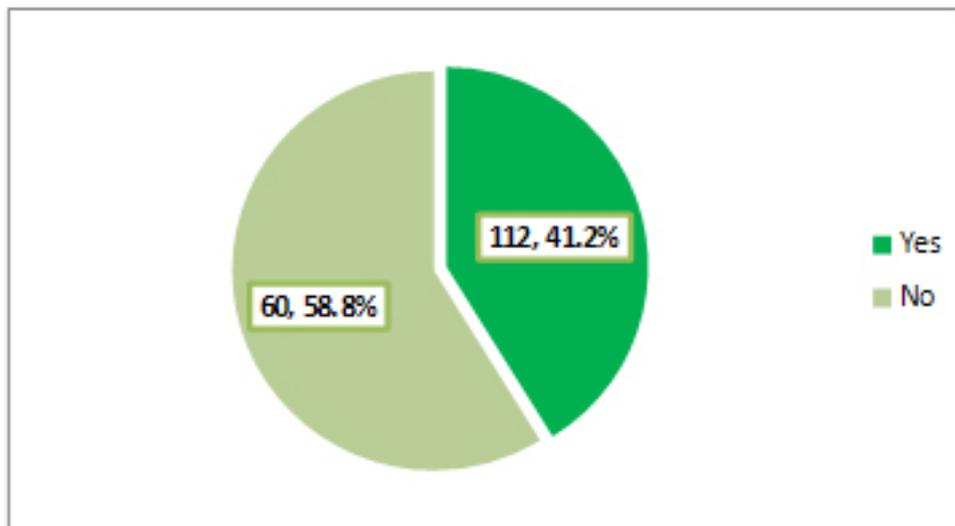
Violent incidents were faced monthly by almost half (48.2%) of those reporting history of exposure to workplace violence. The majority (98.2%) of the incidents were verbal. Slightly more than half of the incidents (52.6%) happened within 1-3 months prior to the survey. Time of the attack was morning shift in the majority of cases (88.1%) and inside the workplace (96.4%). The offender was a patient in most of the incidents (79.7%). Females comprised 63.2% of offenders and those aged between 21 and 45 years represented 72.1% of them (Table 4).

Table 4: Description of the workplace violence experienced by the participants in the last 12 months (N=112)

	No.	%
Frequency of facing violent insults (n=108)		
Daily	4	3.7
Weekly	12	11.1
Monthly	52	48.2
Less than monthly	40	37.0
Type of last event of violence		
Physical	1	0.9
Verbal	110	98.2
Both	1	0.9
How long since the last attack happened?		
Within 1-3 months	59	52.6
Within 4-6 months	20	17.9
Within 7-12 months	33	29.5
Time of the last attack (n=109)		
Morning shift (8am-4pm)	96	88.1
Evening shift (5pm-8pm)	11	10.1
Night shift (8pm-11pm)	2	1.8
Place of the last attack		
Inside workplace	108	96.4
Outside workplace	4	3.6
Who is the offender? (n=108)		
Patient	86	79.7
Companion	15	13.9
Staff member	5	4.6
External colleague/worker	1	0.9
Others	1	0.9
Gender of the offender (n=106)		
Male	39	36.8
Female	67	63.2
Age of the offender in approximate years (n=104)		
21 – 45	75	72.1
≥46	21	20.2
Don`t know	8	7.7

Regarding the cause of the violent event, the most frequently reported were misunderstanding (41.1%), unmet service demand (29.5%), overcrowding (26.8%) and long waiting time (25%). Nothing happened as a reaction to violent events by 56.3% of the victims, while reporting to supervisors was mentioned by 34.8% of them. Among those who did nothing, the main reason was non-efficiency of the reporting system (95.2%). More than half (57.5%) of the victims reported no action was taken to investigate the causes of the incident. As regards consequences of the event, 78.9% reported nothing while 11.4% reported decrease in performance of their work. More than half of the victims (53%) were either unsatisfied or very unsatisfied with the consequences.

Table 5: Reasons and consequences of the violent events faced by the participants in the last 12 months

	No.	%
The reason of the violent event: participant`s view*		
Unmet service demand	33	29.5
Lack of penalty for offender	18	16.1
Over crowding	30	26.8
Long waiting time	28	25.0
Misunderstanding	46	41.1
Reaction to the violent event*		
Nothing	63	56.3
Report to supervisor	39	34.8
Request to move from your work place	8	7.1
Consult colleague or friend	9	8.0
Report to police	1	0.9
Others	2	1.8
Reasons for not reporting the violent event* (n=63)		
Fear of revenge	13	20.6
Fear of loss of job	4	6.3
Felt ashamed/guilty	11	17.5
Not efficient system of reporting	60	95.2
Fear of negative reaction from family	4	6.3
Others	11	17.5
Any action taken to investigate the causes of the incident? (n=106)		
Yes	13	12.3
No	61	57.5
Don`t know	32	30.2
Consequence of the last violent event (n=105)		
Nothing	83	78.9
Injury, need no medical care	1	1.0
Absenteeism	3	2.9
I was transferred from the work place	1	1.0
I had decreased performance of work	12	11.4
I felt ashamed or guilty	4	3.8
Others	1	1.0
Level of satisfaction with consequences (n=102)		
Very satisfied	4	3.9
Satisfied	14	13.7
Neutral	30	29.4
Unsatisfied	41	40.3
Very unsatisfied	13	12.7

5. Factors associated with workplace violence

Females were more likely to be exposed to workplace violence compared to males (46.7% versus 33.7%, p=0.039). Half of the physicians compared to 37.5% of nurses reported exposure to workplace violence. However, the difference was borderline insignificant (p=0.052). The majority of divorced/widowed participants (80%) compared to 25% of singles reported exposure to violence at workplace (p=0.011). Participants` age and nationality were not significantly associated with exposure to workplace violence.

The highest rate of exposure to workplace violence was observed among participants who had between 11 and 15 years of experience in the health sector (54.5%) whereas the lowest rate was observed among those who had the lowest experience (1-5 years) (30.9%). However, the difference was borderline insignificant (p=0.055). Participants who reported female or both genders as regards the usual patient`s gender were more likely to report workplace violence opposed to those who reported males (47.6% and 45.9% versus 21.2%, p=0.003). Other studied factors (experience in the primary healthcare, time of work, and number of co-workers) were not significantly associated with exposure to workplace violence.

On asking whether the violent event was preventable, 106 participants responded; more than half (n=60; 56.6%) of them believed that the incident could have been prevented.

Regarding suggestions for prevention of violent events at PHCCs, the study participants suggested availability of security guard for primary healthcare centres, mandatory penalty for offenders, and implementation of appointment system for patients.

Discussion

Workplace violence towards health care providers has increased during the last decades with serious consequences that may extend beyond individuals to an entire health care organization [13]. Therefore, this study was conducted to explore the extent and characteristics of work-related violence against physicians and nurses working in primary health care centers in Buraidah, Qassim Region, Saudi Arabia.

In the current study, workplace violence was reported by 41.2% of HCWs. A comparable rate was reported recently in the Eastern Province of Saudi Arabia (2020) as the prevalence of violence against healthcare workers at primary care centers was 46.9% [14]. Additionally, few local studies were conducted among workers in primary healthcare settings. In Abha city (2018), a study carried out in two governmental hospitals and ten primary healthcare centers revealed that 57.5% of healthcare workers had experienced some kind of workplace violence at least once [15]. In Riyadh (2016), in 12 Family Medicine centers, the prevalence of any kind of workplace violence over 12 months prior to the study was 45.6% [10]. In AL- Hassa

city (2010), 28% of primary HCWs experienced at least one violent event during the past 12 months [16].

International studies on workplace violence have reported varying figures. In Egypt (2010), 28% of nurses working in four hospitals and 12 primary health care centers encountered at least one type of violence [17]. In Bosnia and Herzegovina (2019), the prevalence rate of all forms of workplace violence was very high (90.3 %) [13]. A systematic review in Africa (2020) revealed that the overall prevalence ranged from 9% to 100% with the highest in Egypt (59.7%-86.1%) and South Africa (54%-100%) [18]. In the current study, verbal violence was the most common type of violence encountered by the vast majority of respondents (98.2%), which is consistent with the previous research conducted elsewhere [13,16,18]. The majority of perpetrators of violence were the patients themselves followed by their companions. These results are consistent with those reported in the literature in different places [9,14,19,20].

Several studies [15,18,21] have reported that nurses were more exposed to violent events than physicians because they comprise one of the largest groups in the health care professions and have direct contact with patients and their relatives. However, in this study, the rate of violence was higher, although not reaching the critical significance level among physicians, than nurses. This may be explained by the fact that our study was conducted in primary health care centers where physicians and nurses are equally in direct contact with patients. Similar results have been obtained from a study carried out among HCWs working at primary healthcare settings in Turkey [13].

There is contradictory evidence on whether a healthcare provider's gender is a risk factor for being exposed to violence. While some researchers [22] reported that men experience violent events significantly more often than women, others ascertained the opposite and reported that women, particularly nurses, are more likely to encounter violence and aggressive behaviour than men [12,23]. However, other authors in accordance with our study reported that there was no difference in the overall frequency of violent events between health staff according to their gender [13].

In the current survey, in accordance with others [14] almost one-third of the study participants were aware of the existence of reporting system. Also, 34.8% of victims reported a violent incident to their supervisor and one victim reported it to police. Among those who did not report, the main reason was non-efficiency of the reporting system (95.2%). Additionally, more than half (57.5%) of the victims reported that no action was taken to investigate the causes of the incident. As regards consequences of the event, 78.9% reported nothing and overall, more than half of those (53%) were not satisfied with consequences. In the same context, 56.6% of victim HCWs thought that violent attacks could have been prevented. Quite similar results have been observed in other local studies carried out among primary healthcare workers in Eastern Province [14] and Riyadh [10].

Conclusion

A considerable proportion of HCWs (physicians and nurses) in primary health care centers in Buraidah, Qassim Region, Saudi Arabia were exposed to violence in the workplace. The most common type of violence encountered by the majority of respondents was verbal violence. Physicians were more likely than nurses to experience violence in the workplace. Most of the violent incidents were not reported mainly because of the belief of the victims that the system of reporting is inefficient. Ever married health workers and those usually dealing with females or both genders were more likely to be exposed to violence in the work place. According to the respondents' suggestions, availability of a security guard for primary healthcare centers, application of penalty role for offenders and implementation of appointment system could decrease the incidents of violence at primary healthcare settings. Implementation of an appointment system at primary healthcare settings and increasing awareness of patients regarding their rights and responsibilities towards healthcare staff is recommended.

Data Availability
The data used to support the findings of this study are presented in the research article and are available from the corresponding author upon request.

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Assessment of Food Safety Knowledge and practice and Factors that may affect them among the General Population at Family Medicine Outpatient clinic

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Abstract

Introduction: Foodborne diseases are considered a major health problem worldwide; knowledge and practice of consumers' adherence to food safety practices will help them to take preventive cautions to protect themselves from the risks of foodborne illnesses.

Methods: This study was a descriptive cross-sectional study that aimed to assess the knowledge and practice of food safety awareness among Egyptian healthy adults attending family medicine outpatient clinics, Cairo University. The study involved 305 participants. Food safety knowledge and practice were evaluated by Food Safety reliable and valid questionnaire.

Results: Only (0.3%) of participants had sufficient knowledge and (19.3%) had sufficient practice. There was a statistically significant difference between the studied participants regarding practice grade and education with (78%) of participants with sufficient practice being moderately or highly educated.

Conclusion: We concluded from this study that the general community has insufficient food safety knowledge and practices; as a result, it is required to hold training programs in the form of workshops or to incorporate courses in the Ministry of Health's curriculum .

Key Words: food safety, knowledge, practice

Introduction

Foodborne disease is any disease caused by eaten food. Ingestion of sufficient quantity is the primary cause in producing such diseases [1]. Developing countries are much more affected by foodborne diseases due to food safety training negligence, insufficient hygiene practices and unhygienic storage [2]. According to the World Health Organization (WHO), roughly 2 million foodborne illnesses occur each year worldwide, primarily in impoverished nations [3]. So, foodborne diseases are considered a major health problem and therefore food safety is a global health goal [4].

Food safety is defined as the degree of certainty that food will not cause illness or harm to the customer when cooked, served, and consumed as advised [5].

Although food producers, manufacturers, and traders are the main parties responsible for ensuring food safety, knowledge and practice of consumers adherence to food safety practices, will help them take preventive caution to protect themselves from foodborne disease hazards [6]. Disease-causing microbes, viruses, parasites, and other food-borne organisms proliferate and are spread as a result of unsanitary food preparation, transport, and preservation [7]. In the house, there are no rules for food preparation, handling, or storage. International studies have demonstrated that during domestic food preparation, consumers often implement unsafe behaviors with food handling, thereby such malpractices may increase the risk and incidence of food poisoning [2].

Consumer education is the only way used to maintain food safety at home. Previous study [8] has indicated the necessity for ongoing initiatives to educate consumers about the dangers of inappropriate food handling.

Method

Type of study: This is a descriptive Cross-sectional study, done in the family medicine outpatient clinic at Cairo University.

Ethical considerations: Approval was obtained from the ethical committee in Cairo University number MS-128-2021.

Sample Size and Participants: Patients attending Kasr Alainy Outpatient Family Medicine Clinics for any medical reason and who were more involved in food preparation, of both sexes, were invited to participate in the study. Based on the previous study of El Sakhy et al. in 2020 [4] at which poor knowledge was reported in 40%, and the rate of population of the selected age group at the clinic was 1500 in the last 3 months, the minimal required sample size was calculated to be 300 by using open epi6 program with confidence interval 90% and power 80%.

Inclusion and exclusion criteria: All adults of both sexes aged 18-65 years and involved in food preparation, were included in this study, while adult patients who had any cognitive or psychological problems were excluded.

The study tools: The study was conducted from February 2021 to October 2021. Food safety knowledge and practice was evaluated by Food Safety reliable, and valid questionnaire which was developed by Byrd-Bredbenner, et al (2007) [9]. The questionnaire was designed in English language so; a back-to-back translation into Arabic was conducted via Cairo University Center for Foreign Languages and Translation Specialist.

Study design: This study was conducted on 305 adults of both sexes aged 18-65 years, involved in food preparation, attending Kasr Alainy Outpatient Family Medicine Clinics, who were invited to participate in the study. Participants completed the following package: Firstly, written informed consent was taken after explaining the steps of the study, and then the researcher took detailed history to exclude any medical problem which may interfere with the study, finally fulfilling the food safety questionnaire to evaluate the food safety knowledge and practice.

The questionnaire consisted of three parts:
1. Demographic characteristics
2. Food-handling practices, which is subdivided into: food bacteriology practices, food cooking and preparation processes, storage of food and sanitizing practices.
3- Food safety knowledge, which is organized into three categories: preparation of food, storage of food, and sanitizing knowledge.

Statistical analysis of data:
The data was coded, entered, displayed, and analyzed by computer using the Statistical Package for Social Science (SPSS) version 26 data base software application. The Chi square ($X2$) test was used to find a relationship between distinct qualitative variables. Qualitative data were expressed as frequencies and percent .

For quantitative variables, mean and standard deviation (SD) were calculated, and an independent t-test (t) was performed to find differences between them . When the significant probability (P value) was < 0.05 and <0.001, the results were declared statistically significant and very statistically significant, respectively.

Result

As illustrated in Table (1), the majority of participants were females (85.9%). The high education constitutes only (11.8%) of the participants. The distribution of age groups was nearly equal. The majority live with their families (94.1%).

Table (2) shows that, regarding Frequency of meals consumed away from home where (81.6%) of participants almost always consume meals away from home. Regarding personal food poisoning, only (11.8%) experienced food poisoning. The main source of food health advice was from family and friends in (66.9%) of cases.

Table (3A) shows that, regarding food handling practice about (21.3%) know that after using a chopping board to slice uncooked meat or chicken and needing to slash tomatoes, they should clean it with soap and wash it under

heated water, and (13.8 percent) knows that if they have a wound on the back of their hand, they should gauze pad the wound and wear a glove when preparing food for others.

About (10.2%) of the studied participants know that a hamburger is properly cooked if it has the correct food thermometer reading. About (27.5%) of participants are aware that putting cold ice cream in their basket should be done at the end of the shopping excursion.

Table (3B) shows that; (36.1%) of the studied participants knows that they should defrost frozen meat in the refrigerator and (20.0%) knows that in case of the power being turned off any beef, chicken, or fish in their freezer that has melted and feels warm, should be thrown away. Table (4A) shows that (14.1%) of the studied participants are aware that Staphylococcus bacteria can cause food poisoning, and (5.9%) knows that that Campylobacter germs are most commonly found in uncooked poultry. About (6.9%) of the participants in the study are aware that if they don't wash their hands after handling raw chicken, they increase the risk of contaminating the next meal they touch, with Salmonella germs.

About (10.8%) percent of the participants in the study are aware that all meals are harmless when prepared to a temperature level of 74 degrees.

Table (4B) demonstrates that (3.9%) of the participants in the study are aware that the average temperature in freezers should be 4 degrees Celsius to ensure food safety .

About (11.1%) of the participants in the study are aware that kitchen countertops should be cleansed, disinfected, and sterilized after all of these activities. (If the counter is in continual use, clean it after use, whenever you start working with another sort of food, and at 4-hour intervals).

As illustrated in Table (5) and Figure (1) only (0.3%) had sufficient knowledge and (19.3%) had sufficient practice. As illustrated in Table (6) and Figure (2) there was a statistically significant difference between the studied participants regarding practice grade and education with (78%) of participants with sufficient practice who were moderate or highly educated.

Table 1: Sociodemographic characteristics of the studied group (n=305)

Variables		Study group (N=305)	
		N	%
Gender	Male	43	14.1
	Female	262	85.9
Education	Primary or less than primary education	127	41.6
	Secondary education	142	46.6
	Higher education	36	11.8
Age group	20-25	53	17.4
	26-30	50	16.4
	31-35	69	22.6
	36-40	61	20.0
	≥41	72	23.6
Residential status	Family	287	94.1
	Alone	14	4.6
	Dormitories	4	1.3

Table 2: Personal food habits in the studied group (n=305)

Variables		Study group (N=305)	
		N	%
Purchases for household consumption at home	Yes	286	93.8
	No	19	6.2
Personal cooking habit Meals eaten outside home on a regular basis	Yes, almost, always	249	81.6
	Sometimes	56	18.4
Frequency of meals eaten outside	Never	50	16.4
	1-3 times/month	68	22.3
	1-2 times/week	68	22.3
	>2 times/week	60	19.7
	Everyday	59	19.3
Exposure to food poisoning:	Yes	36	11.8
	No	269	88.2
Main source of customer and food healthy advice from:	Family/friends	204	66.9
	Personal doctor	7	2.3
	Mass media	45	14.8
	Internet	41	13.4
	Other	8	2.6

Table 3A: Food handling practice among the studied group

Questions	Response	Study group (N=305)	
		N	%
(1) After slicing fresh meat on a chopping board	Soap the chopping board and run it under heated water to clean it [Proper Practice]	65	21.3
	[Improper Practice]	240	78.7
(2) When you need to re-use the knife after cutting raw flesh	Using detergent and heated water [Proper Practice]	78	25.6
	[Improper Practice]	227	74.4
(3) Raw meat stored in	Lowest shelf [Proper Practice]	43	14.1
	[Improper Practice]	262	85.9
(4) If you have a wounded hand, do you cook food for others?	Yes, when I wrap the wound in gauze and use a glove [Proper Practice].	42	13.8
	[Improper Practice]	263	86.2
(5) How do you check that a hamburger is sufficiently cooked?	When it has reached the desired temperature on the monitor [Proper Practice]	31	10.2
	[Improper Practice]	274	89.8
(6) Time needed to reheat leftover foods	Till the water boils [Proper Practice]	106	34.8
	[Improper Practice]	199	65.2
(7) How do you know whether the chickens are fully cooked?	When the meat has reached the desired temperature on the monitor [Proper Practice]	29	9.5
	[Improper Practice]	276	90.5
(8) When do you add frozen ice cream to your shopping basket?	Just before finishing off, at the end of the shopping excursion [Proper Practice]	84	27.5
	[Improper Practice]	221	72.5

Table 3B: Food handling practice among the studied group

Questions	Response	Studied group (N=305)	
		N	%
(9) Defrost frozen meat	In the refrigerator [Proper Practice]	110	36.1
	[Improper Practice]	195	63.9
(10) Do you have a thermometer in your refrigerator?	Yes [Proper Practice]	96	31.5
	[Improper Practice]	209	68.5
(11) If the power is turned off and the beef, chicken, or fish in your fridge is melted and becomes warm,	Throw them away [Proper Practice]	61	20.0
	[Improper Practice]	244	80.0
(12) Is there a way to keep the meal fresh until the individual is ready to consume it?	Keep it in the fridge and reheat if needed [Proper Practice]	123	40.3
	[Improper Practice]	182	59.7
(13) Before you begin making meals, wash your hands by	Water and regular soap [Proper Practice]	119	39.0
	[Improper Practice]	186	61.0
(14) How frequently do you clean your kitchen faucet?	Daily [Proper Practice]	119	39.0
	[Improper Practice]	186	61.0
(15) You rinse vegetables and fruit using	Cold running water [Proper Practice]	209	68.5
	[Improper Practice]	96	31.5
(16) You wash your hands after handling food while touching	Touching Face [Proper Practice]	55	18.0
	[Improper Practice]	250	82.0

Table 4A: Food safety knowledge among the studied group

Questions	Response	Studied group (N=305)	
		N	%
(17) Staphylococcus bacteria are associated with	Cooks who create food with their bare hands and just let it cool at room temperature. [Proper Knowledge]	43	14.1
	[Improper Knowledge]	262	85.9
(18) Which food is most often related with Campylobacter bacteria?	Poultry that is raw or undercooked [Proper Knowledge]	18	5.9
	[Improper Knowledge]	287	94.1
(19) Risk of polluting the next food with Salmonella bacteria, if you don't wash your hands after handling?	Uncooked poultry [Proper Knowledge]	21	6.9
	[Improper Knowledge]	284	93.1
(20) Listeria bacteria are most linked to	Deli meats [Proper Knowledge]	22	7.2
	[Improper Knowledge]	283	92.8
(21) At which temperature meals are considered safe?	74 c [Proper Knowledge]	33	10.8
	[Improper Knowledge]	272	89.2
(22) How can foodstuff be protected if it harbors Salmonella?	It should be cooked properly [Proper Knowledge]	47	15.4
	[Improper Knowledge]	258	84.6
(23) What consistency should omelettes have in order to feel safe to eat?	Albumen and yolk are solids [Proper Knowledge]	109	35.7
	[Improper Knowledge]	196	64.3
(24) Food that is lowest prone to induce food illness	Chocolate cake [Proper Knowledge]	56	18.4
	[Improper Knowledge]	249	81.6

Table 4B: Food safety knowledge among the studied group

Questions	Response	Study group (N=305)	
		N	%
(25) Fridges should be kept at an optimum temperature of?	4 c [Proper Knowledge]	12	3.9
	[Improper Knowledge]	293	96.1
(26) Food can be frozen to kill hazardous microorganisms?	False [Proper Knowledge]	97	31.8
	[Improper Knowledge]	208	68.2
(27) The riskiest way to defrost a freezer roast is?	Place it on the kitchen counter to defrost. [Proper Knowledge]	38	12.5
	[Improper Knowledge]	267	87.5
(28) When keeping raw beef, fish, or poultry in the fridge?	All precautions should be taken. [Proper Knowledge]	38	12.5
	[Improper Knowledge]	267	87.5
(29) The most crucial method for avoiding food contamination	Keep items frozen till ready to serve or cool. [Proper Knowledge]	52	17.0
	[Improper Knowledge]	253	83.0
(30) In order to avoid food contamination,	1 or 3 [Proper Knowledge]	31	10.2
	[Improper Knowledge]	274	89.8
(31) What is the most effective way to avoid food contamination in the kitchen?	Wipe with a sanitizing solution after washing with a detergent and rinsing. [Proper Knowledge]	34	11.1
	[Improper Knowledge]	271	88.9
(32) Kitchen countertops should be cleaned, disinfected, and sterilized.	All of the choices [Proper Knowledge]	52	17.0
	[Improper Knowledge]	253	83.0

Table 5: Practice and knowledge among the studied group

Variables		Studied group (N=305)	
		N	%
Practice score	Mean	4.49 ±3.14	
	Range	0-13	
Knowledge score	Mean	2.3 ±1.54	
	Range	0-8	
Practice grade	Sufficient	59	19.3
	Insufficient	246	80.7
Knowledge grade	Sufficient	1	0.3
	Insufficient	304	99.7

Figure 1: Practice and knowledge degree among the studied group

Knowledge and practice

■ Sufficient   ■ Insufficient

practice: 80.7 / 19.3
knowledge: 99.7 / 0.3
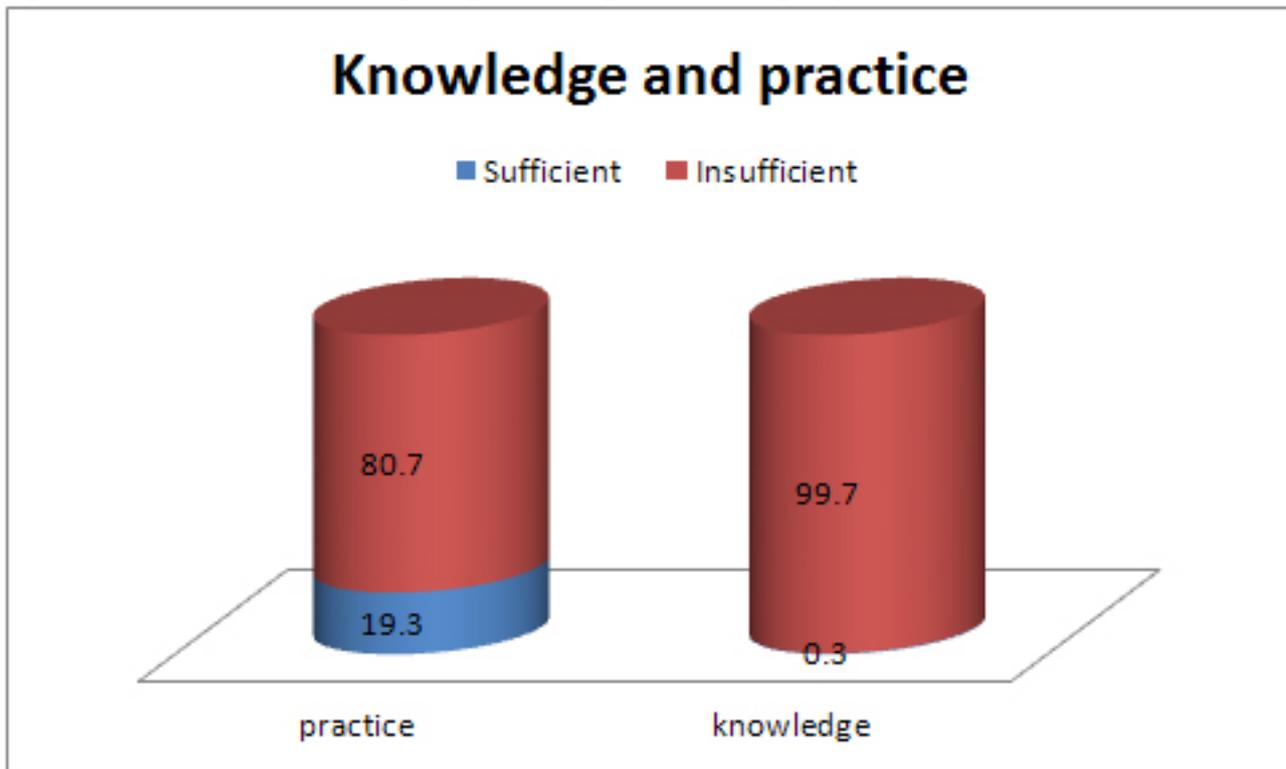
Table 6: Relation between different parameters and practice grade:

Variables		Practice grade				P-value
		Sufficient (N=59)		Insufficient (N=246)		
		N	%	N	%	
Age groups	20-25	11	18.6	42	17.1	0.244
	26-30	10	16.9	40	16.3	
	31-35	7	11.9	62	25.2	
	36-40	13	22.0	84	19.5	
	≥41	18	30.5	54	22.0	
Gender:	Male	7	11.9	36	14.6	0.583
	Female	52	88.1	210	85.4	
Education:	Primary school or less	13	22.0	114	46.3	<0.001*
	Secondary school	27	45.8	115	46.7	
	Higher education	19	32.2	17	6.9	
Residential status:	Family	56	94.9	231	93.9	0.605
	Alone	3	5.1	11	4.5	
	Dormitories	0	0	4	1.6	

Figure 2: Relation between practice and education among the studied group
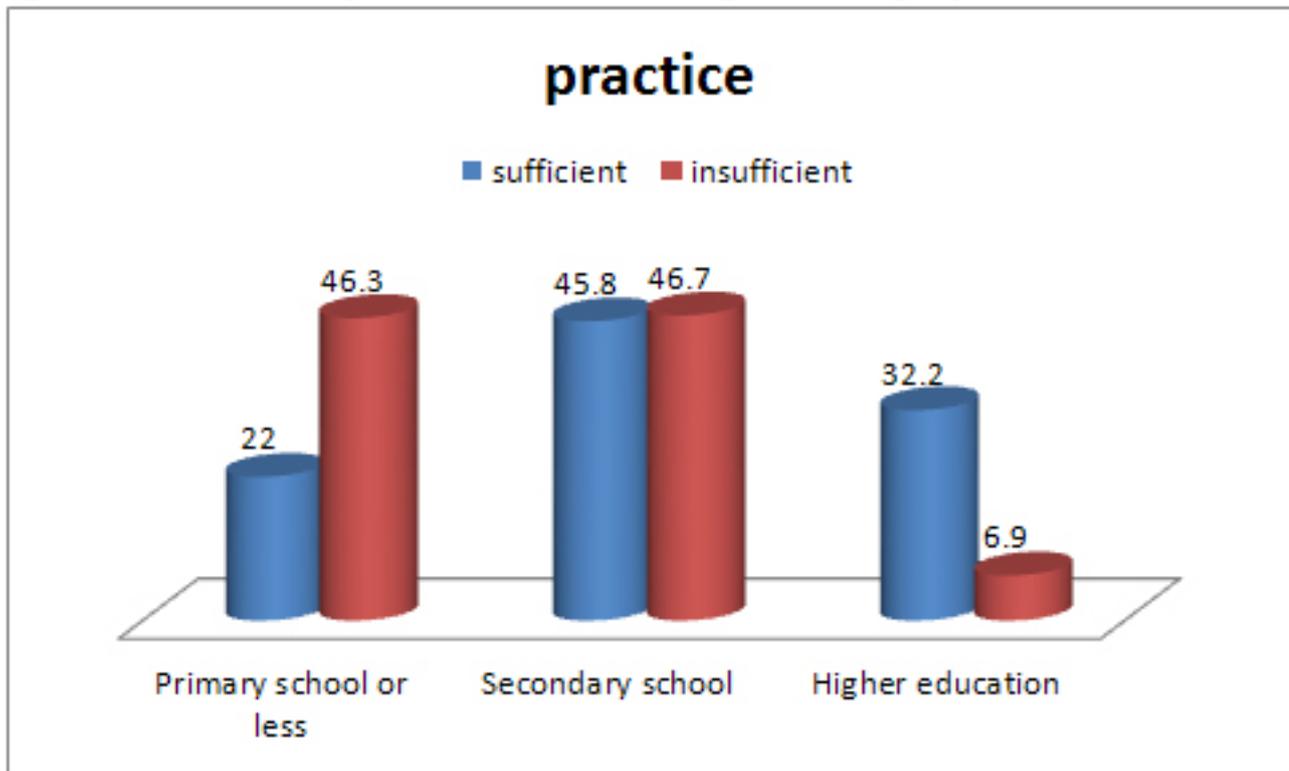
Discussion

Foodborne illness breakouts remain an issue, suggesting a culture that does not follow safe food preparation methods. Foodborne illness prevention requires that both food manufacturers and consumers have an adequate understanding of hygienic and safety requirements. Customers' understanding, and practises about these concerns, on the other hand, is limited. Customers' knowledge, and practises about food service standards, as well as potential associated factors, was investigated in this study.

The bulk of the participants in this study were women (85.9%). Only 11.8 % of the participants have a high level of education. The age groupings were virtually evenly distributed. The vast majority of people (94%) live with their family.

Regarding meal frequency away from home, 81.6 % of individuals eat meals outdoors practically every day. Only 11.8% of people have personally suffered food poisoning. In 66.9 percent of cases, family and friends were the primary source of food safety information.

El Sakhy et al. in 2020 [4]. Conducted a study to determine the knowledge, practises, and attitudes of elderly persons in Marsa-Matrouh about food safety, and found that a few of the participants had experienced food poisoning in the previous year, which occurred by going to restaurants and eating outside their homes, while about (50.8%) made their meals by themseves. Television was the primary source of knowledge on food safety, followed by social customs (38.7 percent and19.4 percent respectively).

Ashkanani et al. in 2021[10] conducted a study to examine the food safety students' knowledge at Kuwait's Faculty of Basic Education. Merely 10% of the students said they always make their own food, while 41.7 percent said their mothers are housewives, and they prepared their food. Nearly 47 % of students said their nannies prepared meals in their homes. For the students, social media and the Internet were the primary sources of food safety information (49.6%).

Only 0.3 percent of the participants in this study had sufficient knowledge regarding food safety, while 19.3 percent had sufficient practise.

Fawzi and Shama. 2009 [11] investigated Food Safety Knowledge and Practices between Women Who work in Alexandria University, Egypt, and discovered that average mean percentage of safe practices in food handling variables, processing, and cooking (70 and 77.5, respectively) were substantially greater than its relating knowledge (60 and 70 percent). The percentage of knowledge from the other two variables, purchase & keeping, and hygienic practices (64.5 and 73.8%, respectively), was likewise greater than their related practises (63 and 71%).

This suggests that, despite their lack of awareness, some women follow the necessary protocols. This conclusion might be explained by the fact that these women were taught correct preparation and cooking skills by their parents or other relatives who did not have the necessary skills.

In research conducted in Sohag by Hamed and Mohammed (2020) [12], who evaluated food safety knowledge about food serving, it was discovered that (39 %) had proper food

handling awareness and (56.3%) were using adequate food safety measures.

Rahman et al., 2012 [13] study of food safety awareness between food providers in Borneo, discovered that only a small number of participants had adequate practise (10.8%) while respondents had adequate knowledge (37%).

This was in contrast to Iwu et al., 2017 [14], who researched food safety awareness across Nigerian food providers and discovered that (81%) had good food safety knowledge. In the present survey, roughly (21.3%) of people know that after using a cutting board to cut uncooked meat or poultry, they should wash it with soap and rinse it under hot water. (36.1%) of those polled knew that they thawed frozen food in the refrigerator, and (20.0%) know that if the power is turned out and the beef, chicken, or other fish in the freezer thaws and feels warm, they should throw it in the trash.

According to a survey conducted by Hamed and Mohammed (2020) [12], 45% of respondents believed that vegetables and uncooked meat should not be processed on the same chopping board, and 21.8 percent claimed that they often isolate uncooked meat from cooked meals.

This study's high proportion of customers with knowledge of raw meal preparation was consistent with a study by Redmond et al. 2004 [15], that found that even more than 90% of clients knew the significance of isolating kitchen utensils for uncooked and cooked foods. Similar research on the Irish population discovered that just 3% of people reused the knives they had previously used for uncooked meat cutting.

According to research conducted by El Sakhy et al. 2020 [4], nearly 78 percent of participants always kept uncooked and cooked food apart. And over half (56.5 percent) of them never permit raw chicken, fish, or meat to come into contact with one another, and nearly two-fifths mentioned that after buying food products that could spoil in a brief period, they often kept them in the fridge within 2 hours, and they often defrost frozen stuff on countertops/radiators (46 percent and 39.5 percent respectively).

In the current study, 14% of those interviewed were aware that Staphylococcus bacteria may cause food poisoning. Approximately 7 percent of the participants in the study are aware that if they do not wash their hands after touching food, they may infect the next meal they contact with Salmonella germs. Approximately 10.8 percent of the study participants are aware that all foods are found to be safe when cooked to a temperature level of 74. Nearly 4% of the study participants are aware that 4 °C is the highest temperature fridges must be set to in order to maintain food safety.

The main objective of this study done by Ismail KA, et al. 2018 [7], was to analyse the general Saudi population's awareness, attitude, and behaviours about food safety awareness. 75.7 percent of the population had a positive attitude and followed health and food safety, such as

rinsing their hands before eating. 78% did not check the fridge temperature. 61.8 percent of the study population was aware of the optimal temperature for bacterial development, which is between 4 and 50°C, and around 73.5 percent of the public was aware of illnesses that may be transferred by food. However, only 27.2 percent of the public were aware of an appropriate way of beef thawing.

According to El Sakhy et al. 2020 [4], over two-fifths of the elderly retain cooked meals at room temp till they cool, do not handle cooked foods after handling raw foods, and also don't freeze products once more after defrost.

In the current study there was a statistically significant difference between the studied participants regarding practice grade and education with (78%) of participants with sufficient practice being moderately or highly educated. This is in line with many study findings that show that the higher the participant's education, the more food safety practises they have, and vice versa.

According to Alqurashi et al. 2019 [16], who studied Food Safety Knowledge and Practices between Food manufacturing Personnel in Al Madinah Hospitals, Saudi Arabia, there was a strong correlation between participants' education levels and food safety precautions, with 48.5 percent of participants with a university education having a greater level of safe food handling.

Sibanyoni et al. 2017 [17] discovered a strong relationship between adequate food safety knowledge and practises and the educational status of food service workers in school feeding programmes in Mpumalanga, South Africa.

Others, on the other hand, claimed that there were no significant variations in participants' knowledge and educational backgrounds, as discovered by Al-Mohaithef, 2014 [18], who researched food safety knowledge and practises of food service employees in Riyadh's hospitals, Saudi Arabia.

This difference might be explained by the difference in occupational level, with his study focusing on particular food service personnel and this study focusing on non-specified professions.

Conclusion and Recommendations

According to the current survey, the general community has insufficient safety knowledge and practices. The disparities in practise and knowledge highlight the importance of implementing on-going food safety education and health awareness programmes. In addition to the increased demand for improving the consumer protection system, as well as the power for food production monitoring and assessment by local authorities, and expanding public understanding of environmental standards for food services.

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