Umm Al-Qura University, Saudi Atabia

Knowledge of complications of Type 2 diabetes mellitus among patients visiting the

Diabetes Centers in the Western Region of KSA

Editorial

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In this issue a number of papers dealt with diabetes mellitus issue and some papers discussed issues related to eye disease in addition to various topics of interest to primary health care.

Dr. Basheikh, did a population-based, cross-sectional study was conducted among adolescents aged 14–19 years residing in the Western region of Saudi Arabia. This study aimed to estimate eye risk extent related to CL use among adolescents and understand the association between risk level and CL use patterns and adherence to hygiene and maintenance instructions. Of 350 participants, 248 (70.9%) used CLs. There was an overwhelming female predominance (93.1%) among users, with occasional, cosmetic, and combined cosmetic-medical uses without prescription or follow-up being the most frequent pattern. The author concluded that young Saudi adolescents are highly exposed to unregulated CL use with significant ophthalmological risks. This has several clinical, public health, and policy-making implications.

Almatrafi, et al., did a cross-sectional study to assess the level of knowledge regarding complications of diabetes mellitus among patients with type 2 diabetes in the Western Region of KSA. Overall, 571 patients with diabetes were enrolled in this study. We found that most over seventy-six percent of the participants were knowledgeable about diabetes complications, as conveyed by their treating physician. Although knowledge about hyperglycemia symptoms was quite good among our participants, their knowledge about hypoglycemia symptoms was less impressive. The authors concluded that knowledge about diabetes complications remain suboptimum among Saudi individuals. Makkah city needs to be targeted by effective educational interventions to help improve its residents' knowledge level about diabetes complications. Educational interventions should focus on systematic complications of diabetes, particularly highlighting how diabetes causes cerebrovascular accidents and neurological

problems. Future research should be longitudinal and attempt to assess the link between better knowledge of diabetes complications and their preventability.

Al-Amri 1 et al., did a descriptive cross-sectional study was used to Assess the knowledge of diabetic children regarding the risk of ocular complications and prevalence of ocular complications among diabetic children. Data were collected from participants using an online pre-structured questionnaire. A total of 499 children fulfilling the inclusion criteria completed the study questionnaire. The authors concluded that diabetic eye complications among children were not frequent with poor diabetic control. Participants knowledge regarding diabetes eye related complications was on average especially for the significance of ophthalmologist visits and early detection of the disorders.

Dr Tayeb, performed a study looking at egg allergy in Jeddah. He reviewed 143 patients during 2021 in Jeddah city. Only positive RAST sIgEs results to egg white or yellow was included. RAST results was taken from patient files retrospectively. Additionally, the associated allergic diseases were taken. EH in adults in Jeddah is more common in males 85 (59.4%) than females 56 (39%), more common in white egg 54 (37.8%) than yellow egg 28 (19.5%). Additionally, EH in Jeddah city is commonest in age of thirties 40 (28%) and adulthood 31 (21.7%). The author concluded that EH in Jeddah city have several characters. It's more common in adults (specially males) in age period between 20-40 years, more common to white than yellow egg. Common allergic diseases associated with EH are allergic rhinosinusitis, atopic dermatitis, asthma and food allergy respectively. EH severity is mostly of mild class; however, this must be correlated with the clinical findings.

Alhejaili, et al., did observational, analytical, cross-sectional study included 297 COVID-19 patients evaluated between April and May 2020 in Al-Madinah, Saudi Arabia. the study aimed to measure the anxiety

levels and different coping strategies of COVID-19 patients in Saudi Arabia. The mean age was 35 ± 10.6 years (range, 17–63 years). The frequency of patients with moderate to severe anxiety (score > 10) was 55.9%, and the most frequently used coping strategy was religion 7.20 ± 1.35. The authors concluded that moderate to severe anxiety was experienced by 55.9% of COVID-19 patients, and anxiety was associated with self-blame, venting, denial, and active coping. Therefore, increasing awareness of the effects of COVID-19 on mental health, and patient education on healthy coping mechanisms for anxiety management are recommended for the Saudi Arabian population.

Alharbi et al., looked at how to address problems such as long length of stay and overriding in emergency departments. This was done through studying the literature and picking the appropriate solutions in the evidence- based practice. A review of the past literatures to identify the strategies that can be used to overcome crowding and LOS at pediatric emergency departments. Scopus, Web of Science, Medline, PubMed, Science Direct, and Wiley online library. According to the ideal patient journey model, as this model is used as mentioned in the literature section in order to improve the level of health care in pediatric emergency departments, in our results, those strategies will be commented on in terms of their disadvantages and advantages according to our point of view. The authors concluded that overcrowding in the emergency department is one of the current challenges, according to the studies mentioned, as in order to improve the care of children and patients, different strategies of high quality must be followed in order to reduce overcrowding and achieve effectiveness and efficiency.

Alshammari & Sulaiman Sait, report a case about Tinea Corporis that had unusual presentation in 18-year-old female without any underlying chronic skin disorders. The patient was treated antifungal medication oral and topical, was followed up for 6 months. They stressed that Tinea corporis is a common fungal infection that mimics many other annular lesions, and it is commonly misdiagnosed. Primary care Physicians must familiarize themselves with this condition and its treatment.

Dr. Haidarah,did a retrospective study to evaluation of outcome of distal humerus fracture fixation by two-locked plate. The study involved 72 patients with distal humeral fractures who were managed surgically fixation with two-locked parallel. The total study patients were 72 and they were (79.2%) males and (20.8%) with a ratio male to female 3.8:1. Partially articular fractures were in (86.1%) cases and complete articular fractures were in (13.9%) cases. Transpositions of ulnar nerve were found in (65.3%) cases. Ulnar nerve neuropraxia were found in (5.6%) cases and the Range of Motion (ROM) were limited (pron. – sup 30-45/flex – exten 30 – 130) in (29.2%) cases and no range of motion in (9.7%) cases. Non-union were found in (4.2%) cases while superficial infection was in (5.6%) cases. Stiffness were found in (9.7%) cases. The author concluded that this study revealed that managing

the distal humeral fractures by internal fixation of two Parallel-Plate gives satisfactory results.

Helvaci et al., tried to understand whether or not there is a persistent inflammatory process in Familial Mediterranean fever (FMF). They did a consecutive patients with the FMF and controls were studied. The study included 39 patients with the FMF (18 females) and 39 controls. Mean age of the FMF patients was 27.5 ± 11.9 (11-58) years. Although the body weight and body mass index (BMI) were retarded in the FMF patients (64.6 versus 71.7 kg and 24.1 versus 25.7 kg/m2, respectively), the differences were nonsignificant probably due to the small sample size of the study (p>0.05). The authors concluded that although the FMF is described as intermittent attacks of painful inflammation, probably there is a persistent vascular endothelial inflammation all over the body. The suppressed body weight, BMI, LDL, HDL, and systolic and diastolic BP and the increased TG levels probably play roles of positive and negative APR in the systemic inflammatory process.

Dr Faqeeh; did an analytical cross- sectional study to assess concerns, perceived impacts and preparedness of health care workers for epidemic and pandemic events in Ministry of Health (MOH) hospitals, Jazan, 2021. The study included 307 healthcare workers. The age of 39.7% of them ranged between 31 and 40 years. Almost two-thirds (62.2%) were males. The total score of work-related concern of Covid-19 among the participants ranged between 7 and 28, out of a possible maximum of 35, with a median (IQR) of 18 (15-22). HCWs in the age group 31-40 years, master holders, doctors expressed the highest concerns score. The author concluded that some work-related and non-work-related concerns of HCWs in Jazan regarding Covid-19 pandemic have been identified. Also, perceived impact of the pandemic on HCWs` work and professional life has been documented. Their preparedness as well as that of the health care system to the Covid-19 pandemic was satisfactory in most aspects.

Dr. Alodainy, did a cross-sectional study at primary health care centers (PHCC) To determine prevalence of childhood obesity among attendants of primary health care centers, its associated risk factors, and to identify parental misperceptions regarding their children's actual weight. Prevalence of overweight among children was 5%, while 13.8% were obese. Fast foods, sweets and soft drinks were commonly consumed by children, while 36.3% did not practice any sports. Children's BMI grades did not differ significantly according to their or their parents' sociodemographic factors, or their dietary habits, but differed according to their parents' educational level (p=0.038), with highest prevalence of obesity among less educated parents. The authors concluded that the prevalence of obesity among primary school children in Yanbu Albahr City is high. Unhealthy dietary habits, and physical inactivity are common among Saudi children. Most parents misperceive their children's actual body weight. Children's BMI grades differ significantly according to their parents' educational level, with highest prevalence of obesity among less educated parents.

Knowledge of complications of Type 2 diabetes mellitus among patients visiting the Diabetes Centers in the Western Region of KSA

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Abstract

Background: To reduce morbidity and mortality, awareness regarding diabetes and its complications is necessary. This study aimed to assess the level of knowledge regarding complications of diabetes mellitus among patients with type 2 diabetes in the Western Region of KSA.

Methods: A cross-sectional study was conducted recruiting patients with diabetes from the Diabetes Centers at Prince Mansoor Military Hospital in Taif and Al-Noor, Hera hospital in Makkah. Overall, 571 patients with diabetes were enrolled in this study. The interviewer filled out a pretested questionnaire with face-to-face interviews. Levels of knowledge were determined by calculating the scores.

Results: (n=570) agreed to be included in the study. We found that over seventy-six percent of the participants were knowledgeable about diabetes complications, as conveyed by their treating physician. Although knowledge about hyperglycemia symptoms was quite good among our participants, their

knowledge about hypoglycemia symptoms was less impressive. Knowledge about diabetes complications was affected positively by a range of factors, including living in Taif, college education, and family history of diabetes.

Discussion: We confirmed, in this work, that knowledge about diabetes complications is suboptimum, superficial, and lacking among Saudi patients.

Recommendations: Knowledge about diabetes complications remains suboptimum among Saudi individuals. Makkah city needs to be targeted by effective educational interventions to help improve its residents' knowledge level about diabetes complications. Educational interventions should focus on systematic complications of diabetes, particularly highlighting how diabetes causes cerebrovascular accidents and neurological problems. Future research should be longitudinal and attempt to assess the link between better knowledge of diabetes complications and their preventability.

Key words: Knowledge, diabetes complications, risk factors, Saudi Arabia.

Introduction

Diabetes mellitus (DM) appears to be a global epidemic and an increasingly significant non-communicable disease threatening both affluent and non-affluent societies (Obirikorang et al., 2016).

Diabetes is one of the major causes of early illness and death worldwide. Type 2 diabetes affects approximately 13 percent of the United States population, and the worldwide prevalence is estimated at 9.3 percent in adults, equivalent to 463 million people (Centers for Disease Control and Prevention. 2020; Yuen et al., 2019). Type 2 diabetes accounts for over 90 percent of patients with diabetes (Yuen et al., 2019).

The World Health Organization (WHO) has reported that Saudi Arabia ranks the second-highest in the Middle East and is seventh in the world for the rate of diabetes. It is estimated that around 7 million of the population are diabetic, and almost 3 million have pre-diabetes. Even more worrying, perhaps, is the increasing pattern of diabetes noted in Saudi Arabia in the recent past. In fact, diabetes has approximately registered a ten-fold increase in the past three decades in Saudi Arabia.

Diabetes mellitus (DM) has been found to be related to high mortality, morbidity, and vascular complications, accompanied by poor general health and lower quality of life. In Saudi Arabia, DM is quickly reaching disturbing proportions and becoming a significant cause of medical complications and even death (Abdulaziz Al Dawish et al., 2016).

Most diabetics had poor knowledge of their disease and are unaware of its complications in a study about knowledge and awareness in patients about type 2 diabetes mellitus (DM) assessing 120 DM Pakistani Patients (Habib& Aslam., 2003). Several studies confirmed a low level of awareness among diabetic patients regarding long-term and short-term complications such as ischemic heart disease and stroke (O'Sullivan et al., 2009; Murugesan et al., 2007).

They also supported that many sufferers become aware that they have diabetes only when they develop one of its life-threatening complications. Based on this issue, healthcare professionals, as well as public policymakers, must be well aware of the public health impact of diabetes. Much effort has been devoted to educating the public about diabetes through various forms of media. Therefore, this study aimed to assess the level of knowledge regarding complications of diabetes mellitus and associated factors among type 2 diabetic patients and determine their needs to provide adequate care for patients.

Secondary objectives:
1. To estimate the level of overall knowledge in Makkah and Taif regions about diabetes complications.
2. To estimate the level of knowledge in the Makkah region about macro and microvascular complications of diabetes.
3. To estimate the frequencies of different sources of knowledge about diabetes complications.
4. To estimate the level of knowledge about hypoglycemic and hyperglycemic symptoms.
5. To estimate the impact of background sociodemographic and clinical factors on knowledge level about diabetes complications.

Material and Methods

Materials:
Study design: a cross-sectional study was utilized to conduct the study.
Setting: The study was conducted in Diabetes Centers at (Prince Mansoor Military Hospital (PMMH) in Taif) and (Al-Noor, Hera hospital in Makkah).
Study subjects: all adult diabetes patients attending Diabetic Centre clinics in Taif and Makkah region from February to April 2021.
Inclusion criteria:
1. adult patients.
2. diagnosis of diabetes.
3. attending Diabetic Centre.
4. Resident in Makkah province.
5. literate with sound cognitive abilities.
Exclusion criteria:
1. Pediatric patients.
2. Patients with severe cognitive impairment such as dementia or delirium.
3. Patients unwilling to give written consent to participate.

Tools: The data was collected through an interview questionnaire that was developed by the researchers after reviewing the related literature (Sabri et al., 2007; Mohieldein et al., 2011). It was translated into simple Arabic language to suit the understanding level of the entire study subjects. The questionnaire contains four sections. First section: containing items related to demographic data as age, sex, marital status, and occupation. The second section comprising questions to assess the general information regarding diabetes mellitus complications such as heart diseases and stroke. The third section consisted of questions to assess the knowledge of complications of diabetes mellitus that result from hyperglycemia. The fourth section added questions to assess the knowledge about hypoglycemia complications.

Method:
• Approval to carry out the study was obtained from the responsible authorities after explaining the purpose of the study and the date and time of data collection.
• The study tool was developed by the researchers after a thorough review of relevant literature (Sabri et al., 2007; Mohieldein et al., 2011) and translated into the Arabic language.

• The study tool was tested for content validity by five (5) experts in the field of the study. Their opinions were elicited regarding the format, layout, consistency, accuracy, and relevancy of the tool.

• The study tool was tested for reliability using Cronbach's coefficient alpha reliability method. The reliability result was = 0.881.

• The pilot study was carried out on 25 participants in order to test the clarity and applicability of the constructed tool and who were excluded from the study. The pilot study also served to estimate the time needed for each subject to fill in the questionnaire.

• A simple random sampling scheme was adopted when choosing participants for the current study. The sampling frame was constructed using data of all diabetic patients attending specialist diabetes clinics. Random tables were used to identify whether a particular parent would be included in the study. All included patients were approached by a member of the research team and invited to participate.

• Data was collected by the researcher by interviewing each patient to clarify the questions. Each interview lasted from 15-30 minutes.

• Data collection started from the mid of Feb to April 2021.

Statistical analysis: The data were coded and introduced to the Statistical Package of Social Sciences (SPSS, version 22). The data were analyzed to present the findings in descriptive and inferential statistics. The descriptive statistics include frequencies and percentages for categorical variables, while means, median and standard deviations were used to summarize numerical data. The significant associations between demographic and background variables were detected at < 0.05 significance level.

Ethical considerations: The researcher described the aim and objectives of the study for the residents and asked them to provide written consent. No names were required to assure confidentiality of data, and all information was kept confidential only for this study's purposes.

Results

The total number of participants who agreed to participate in the survey was (n = 570). For a detailed account of demographic results, see Table 1.

Among those who agreed to participate, there were (n = 252, 44.2%) men and (n = 318, 55.8%) women, most of whom had a family history of DM (n = 385, 67.5%), with more than 10 years duration of Diabetes Mellitus (n= 282, 49.5%).

The mean age for the participating individuals was 59.8 years (SD = 13.9 years). The age variable ranged between 18 and 95 years. The median age was 60 years old.

As per Table 2, the majority (n = 436, 76.5%) of the participants reported being told by their doctors about potential DM complications, compared to (n = 134, 23.5%) who did not. Information given by diabetologists was the most frequent source of diabetes complications knowledge as indicated by (n = 187, 32.8%), followed by family physicians (n = 147, 25.8%). Social media played a tiny part as a knowledge source about diabetes complications (n = 42, 7.4%), followed by books and papers (n = 14, 2.5%).

This table revealed that the majority of study participants have general knowledge about complications of DM, complications due to hyperglycemia, and complications due to hypoglycemia.

The most heard of complications were poor wound healing (n = 552, 96.8%), amputation (n = 531, 93.2%), and vision loss (n = 529, 92.8%). The least heard of complications were heart disease (n = 444, 77.9%) and stroke (n = 391, 68.6%).

Knowledge about hyperglycaemia symptoms was quite good, (n = 537, 94.2%) identifying increased urination frequency and (n = 398, 69.8%) recognized weight loss as important symptoms.

The knowledge of the symptoms of hypoglycemia was less impressive. Loss of consciousness was recognized by (n = 450, 78.9%) and dizziness by (n = 509, 89.3%).
Table 3 gives a comprehensive display of the effect on knowledge about diabetes complications for participants' sociodemographic and clinical factors.

Living in Taif was associated with better knowledge about diabetes complications than living in Makkah (OR = 1.88, p = 0.011). See Figure 1. Also, older age was linked to better knowledge about diabetes complications among the participants (OR = 1.025, p = 0.033). See Figure 2.

Additionally, sub-college education was associated with worse knowledge about diabetes complications among our participants. For illiterate individuals it was (OR = 0.150, p < 0.001), for primary school graduates (OR = 0.234, p < 0.0001), and for high school graduates (OR = 0.255, p < 0.001). See Figure 3.

In terms of employment, we found retired individuals lacking considerably in their knowledge about diabetes (OR = 0.324, p = 0.004) compared to employed individuals. See Figure 4.

Individuals with a family history of diabetes were far more knowledgeable than individuals without. OR = 1.726, p = 0.016. See Figure 5.

Table 1: Baseline demographics of the study participants

Factor	Count (n)/ mean	Percentage /SD
Age	59.8 years	13.9 years
Gender		
Male	252	44.2%
Female	318	55.8%
Nationality		
Saudi	548	96.1%
Yemeni	22	3.9%
Residence		
Makkah	307	53.9%
Taif	263	46.1%
Education		
University	117	20.5%
High School	97	17%
Illiterate	182	31.9%
Intermediate	70	12.3%
Primary	104	18.2%
Occupation		
Employee	91	16%
Freelancer	11	1.9%
Retired	180	31.6%
Unemployed	285	50%
Marital Status		
Divorced	34	6.0%
Married	443	77.7%
Widowed	69	12.1%
Single	24	4.2%
DM Family History	385	67.5%
DM Duration		
Under one year	11	1.9%
one-five years	147	25.8%
six to ten years	130	22.8%
Over ten years	282	49.5%

Table 2: Description of the knowledge level about diabetes complications among the study participants.

Knowledge about DM Complications	Count	Percentage
Told by doctor	436	76.5%
Source of information		
Books and papers	14	2.5%
Diabetologist	187	32.8%
Family physicians	147	25.8%
Other doctors	28	4.9%
Relatives	63	11.1%
Social media	42	7.4%
Stroke	391	68.6%
Heart disease	444	77.9%
Vision loss	529	92.8%
Renal disease	510	89.5%
Peripheral neuropathy	477	83.7%
Amputation	531	93.2%
Poor wound healing	552	96.8%
Dental problems	474	83.2%
Sexual impairment	220	38.6%
Symptomatology of hyperglycaemia		
Increased thirst	522	91.6%
Increased urination	537	94.2%
Blurred vision	510	89.5%
Fatigue	525	92.1%
Weight loss	398	69.8%
Symptoms of hypoglycaemia		
Palpitations	471	82.6%
Tremors	504	88.4%
Sweating	495	86.8%
Dizziness	509	89.3%
Hunger	500	87.7%
Loss of consciousness	450	78.9%

Table 3: Adjusted impact of sociodemographic variables on the knowledge level of diabetes complications among the study participants.

	Estimate	OR	95% CI	P value
Town: Taif	0.631	1.880	1.159 to 3.049	0.0105861 *
Age in Years	0.024	1.025	1.002 to 1.048	0.0327235 *
Sex: Male	-0.089	0.915	0.399 to 2.096	0.8333408
Marital Status: Married	0.800	2.226	0.932 to 5.320	0.0717068
Marital Status: Single	1.486	4.418	0.915 to 21.324	0.0643310
Marital Status: Widow	0.267	1.306	0.494 to 3.452	0.5897613
Nationality: Saudi	0.873	2.393	0.875 to 6.547	0.0892335
Education: High School	-1.368	0.255	0.113 to 0.573	0.0009388 ***
Education: Illiterate	-1.899	0.150	0.061 to 0.367	3.318e-05 ***
Education: Intermediate	-1.059	0.347	0.141 to 0.856	0.0215741 *
Education: Primary	-1.453	0.234	0.102 to 0.538	0.0006226 ***
Employment: Freelancer	0.173	1.189	0.206 to 6.865	0.8469494
Employment: Retired	-1.126	0.324	0.150 to 0.700	0.0041515 **
Employment: Student	12.442	2.5*10³	0.000 to Infinity	0.9799176
Employment: Unemployed	-0.026	0.974	0.382 to 2.485	0.9561145
Family History	0.546	1.726	1.105 to 2.695	0.0163606 *
DM Duration: Over ten years	0.901	2.461	0.602 to 10.064	0.2100728
DM Duration: one to five	0.122	1.129	0.278 to 4.590	0.8649839
DM Duration: six to ten	0.573	1.774	0.422 to 7.460	0.4343107

Figure 1: Town Effect on knowledge about diabetes complications

Figure 1 shows that living in Taif was associated with better knowledge about diabetes complications than living in Makkah (OR = 1.88, p = 0.011).

Figure 2: Age Effect on knowledge about diabetes complications

Age.Years effect plot
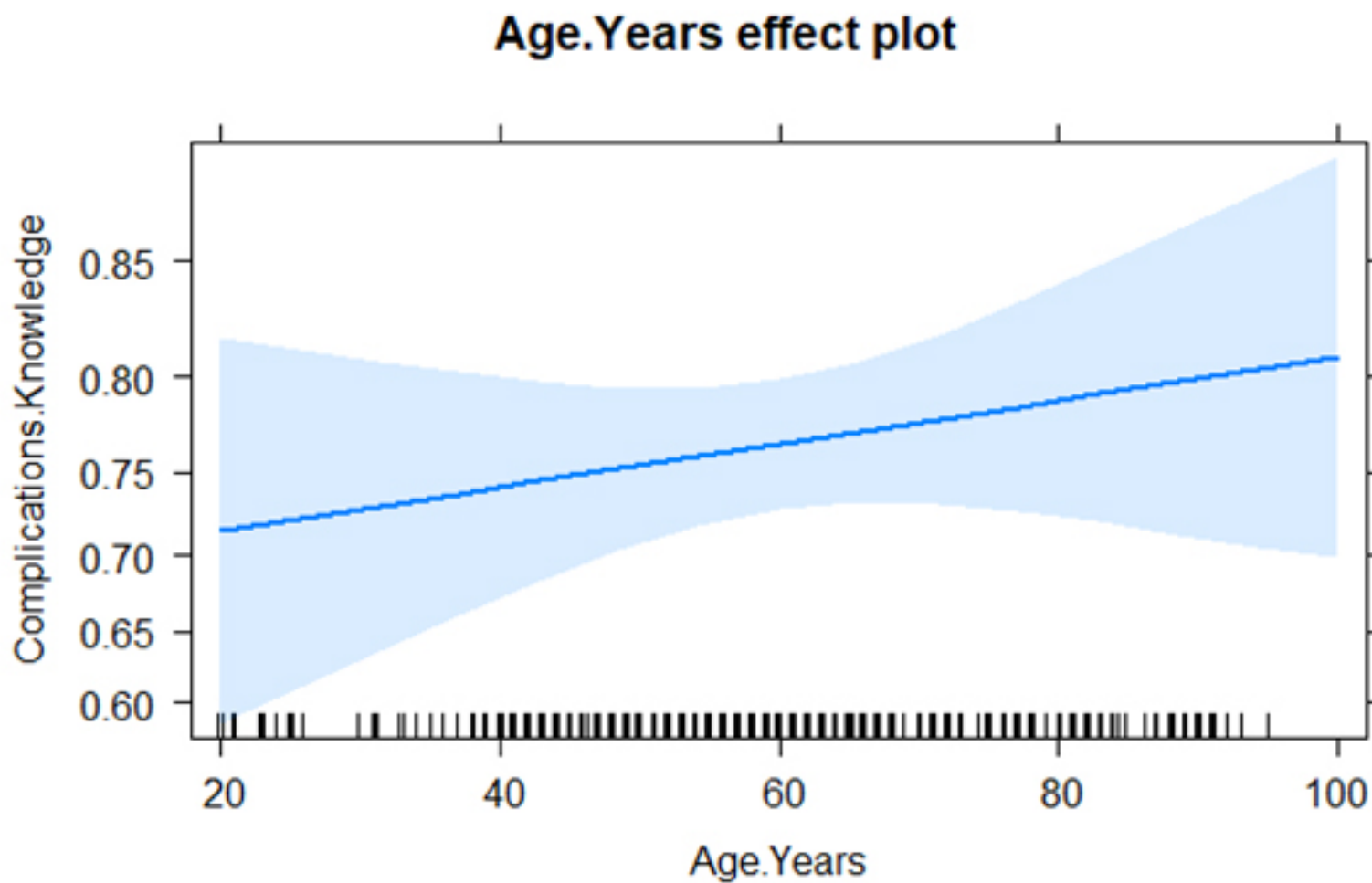
Figure 2 indicates that older age was linked to better knowledge about diabetes complications among the participants (OR = 1.025, p = 0.033).

Figure 3: Education Effect on knowledge about diabetes complications
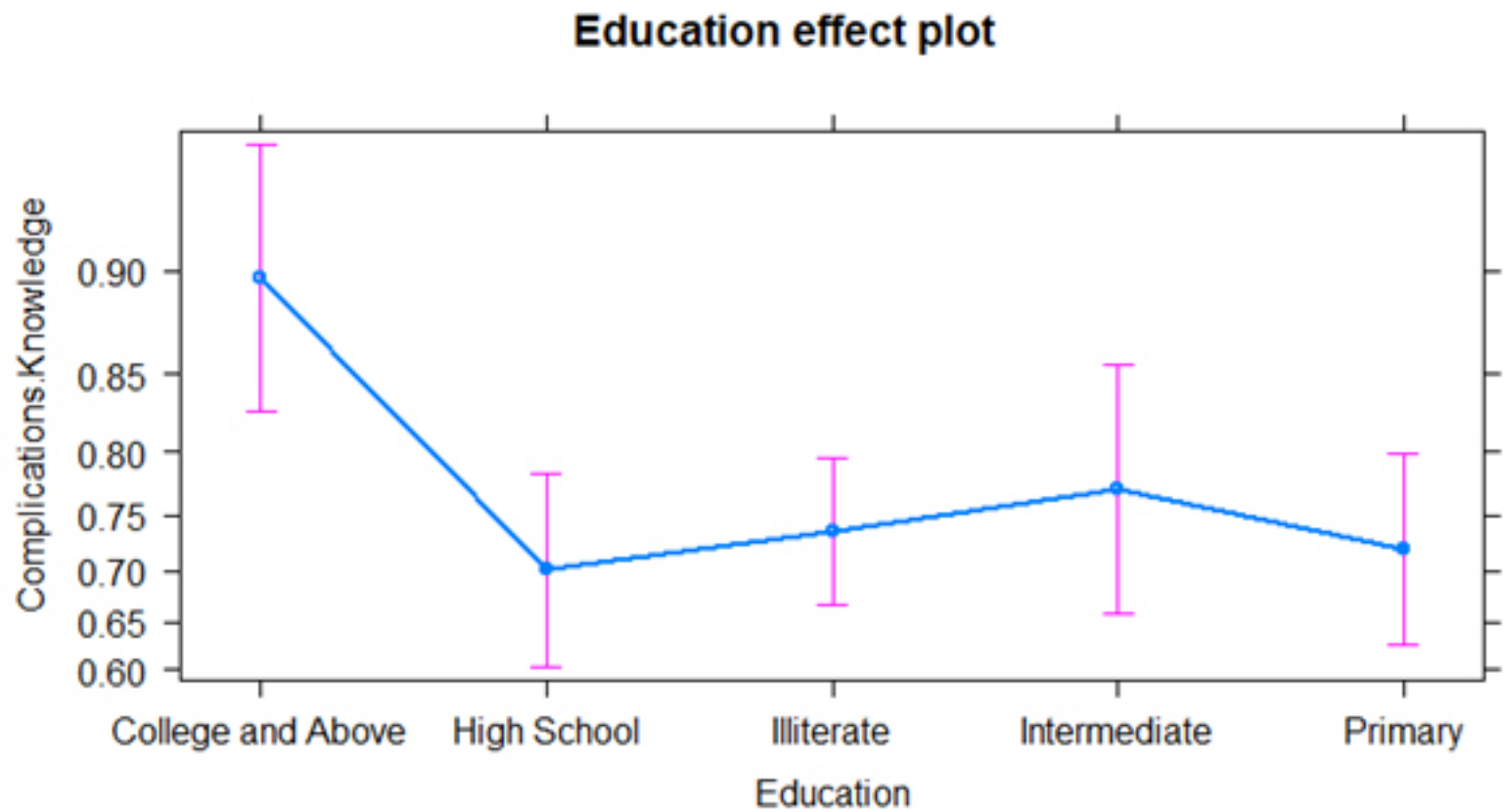
Figure 3 displays that sub-college education was associated with worsening knowledge about diabetes complications among our participants. For illiterate individuals (OR = 0.150, p < 0.001), for primary school graduates (OR = 0.234, p < 0.0001), and for high school graduates it was (OR = 0.255, p < 0.001).

Figure 4: Employment effect on knowledge about diabetes complications

Employment.Category effect plot
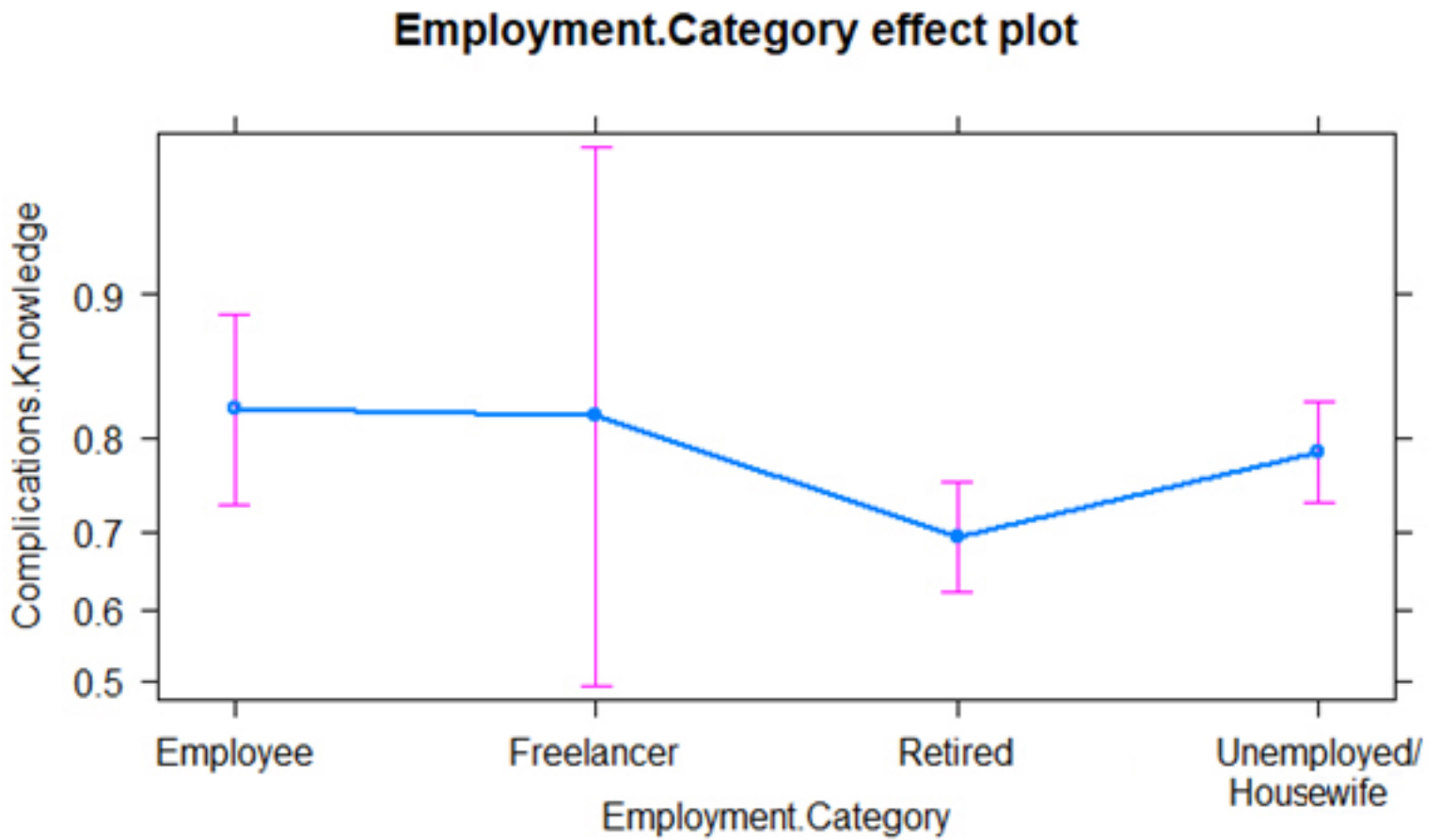
Figure 4. In terms of employment, we found retired individuals lacking considerably in their knowledge about diabetes (OR = 0.324, p = 0.004) compared to employed individuals.

Figure 5. Family history effect on knowledge about diabetes complications

FH effect plot
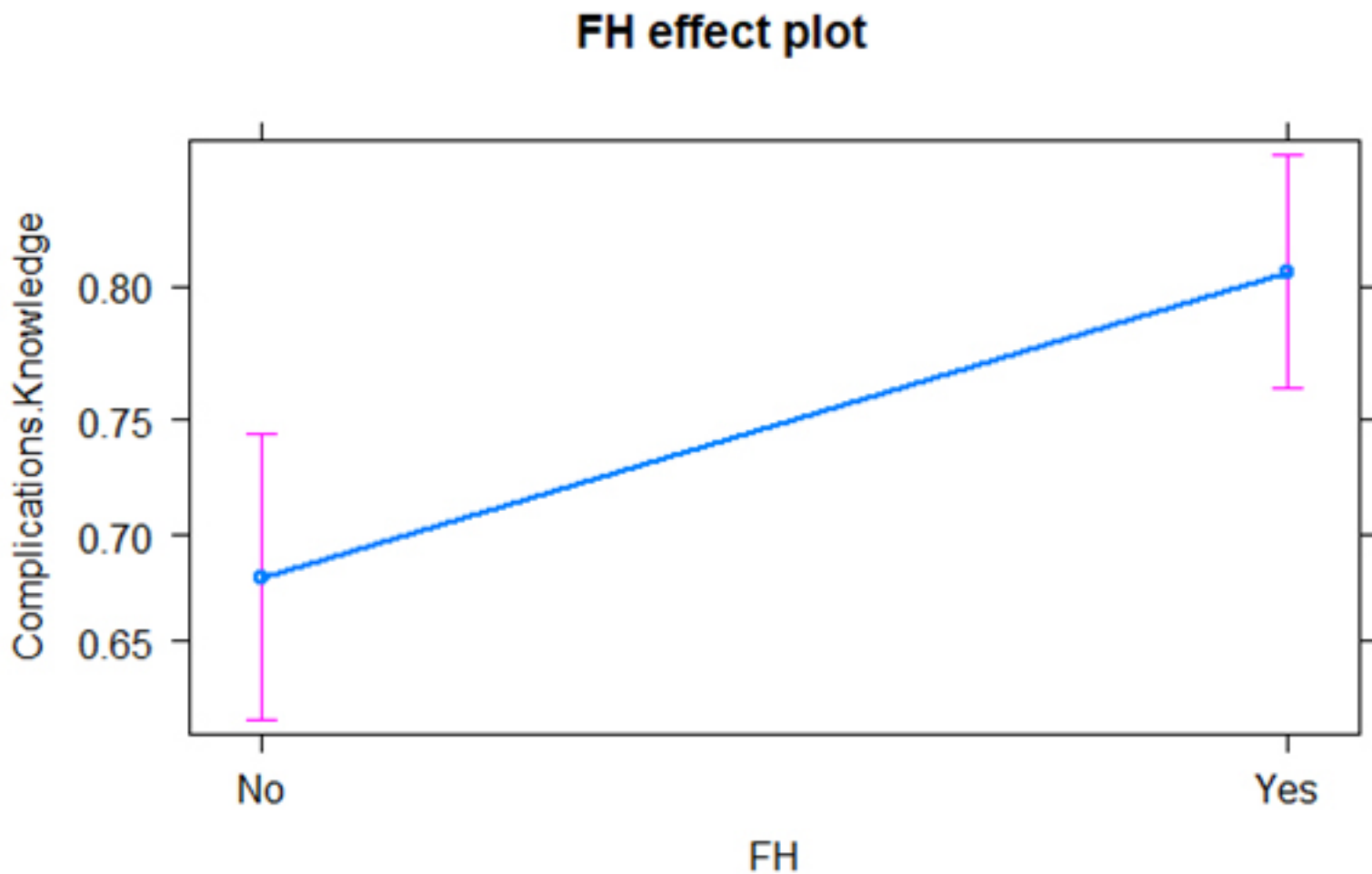
Figure 5. Individuals with a family history of diabetes were far more knowledgeable than individuals without. (OR = 1.726, p = 0.016

Discussion

The current investigation surveyed a large number of participants, namely, five hundred and seventy participants, in order to estimate the current level of knowledge about diabetes complications in the western part of Saudi Arabia.

Although the prevalence of diabetes mellitus (DM) is high among populations in the Middle East and Gulf countries, patients often lack the knowledge and skills to self-manage their condition (Almalki et al., 2018).

Almost three decades ago, the population of the Kingdom of Saudi Arabia had considerable changes in lifestyle, primarily leading to decreased physical activity and unhealthy eating habits. These changes have had a considerable negative impact on the health of society. Indeed, this lifestyle transformation is believed to be responsible for the epidemic of non-communicable diseases and their complications in the country. It is thought that effective diabetes education and knowledge can improve self-management skills and glycemic control for patients with type 2 diabetes mellitus (T2DM) and positively affect the health system. However, there is still a lack of studies that have assessed awareness and

knowledge among diabetic patients in Saudi Arabic despite the high prevalence. Cross-sectional studies have suggested that the prevalence of T2DM in Saudi ranges from 10% to 30% (Almalki et al., 2018).

These governmental efforts are explained in our study finding that showed a high level of general knowledge, knowledge about the complications due to hyperglycemia and hypoglycemia among the study population. These results are not in line with (Almalki et al., 2018 and Rahaman et al., 2017), who found that the majority of the screened T2DM patients had poor knowledge about diabetes.

We found a majority of over seventy-six percent of the participants were knowledgeable about diabetes complications, as conveyed by their treating physician. This estimate agrees with previous research results in the region and somewhat exceeds estimates from some under-developed countries (Afaya et al., 2020). This is partly reassuring. It meant nearly a quarter of subjects living in the western part of Saudi Arabia could be ignorant of the vast majority of debilitating complications of diabetes. This highlights that diabetic patients in Saudi Arabia were only partially aware of diabetes complications' extent. Such superficial awareness

about diabetes complications was replicated among surveys conducted in many other developing countries and was shown to be unhelpful in ensuring adherence to the management of diabetes (Obirikorang et al., 2016).

As per our findings, patients' own diabetologist was the primary source of diabetes complications knowledge, as indicated by nearly a third of participants. A further quarter of participants' source of information was their family physician. This is indeed reassuring. It nonetheless adds responsibility for proper training of family physicians and diabetologists on effective communication with Saudi patients to dispense accurate knowledge about diabetes complications. However, social desirability bias may have been contributing to such results.

It was reassuring to see that unofficial social media played a tiny part as a knowledge source about diabetes complications in just over seven percent of all participants in the current survey.

A recent survey found that over half of Facebook posts in specialized groups about diabetes foot were unhelpful (Abedin et al., 2017). Also, a third of Youtube videos regarding diabetic complications of the foot were found to be misleading and useless (Smith et al., 2019).

The most heard of complications, as per our findings, were poor wound healing, amputation, and vision loss. The results we found are indeed consistent with published estimates from past surveys. Three-quarters of the patients surveyed by (Al Zarea 2016) were aware of eye-related diabetes complications. Two-thirds of diabetic patients in Saudi Arabia were found to have excellent eye care (Al-Alawi et al., 2016). The knowledge about other complications of diabetes, however, was found to be suboptimum in recent surveys, with Saudi patients harboring many myths about the etiology and management of diabetes (Alanazi et al., 2017). On the other hand, the least heard of complications were heart disease and stroke. This should be particularly worrying as proper knowledge about potential complications would lead to a better lifestyle and stringent adherence to management regimes (Christie et al., 2009; Murugesan et al., 2007). A clear link was established between individuals who were illiterate about the complications of diabetes and heightened risk of getting those complications (Yeh et al., 2018).

Although knowledge about hyperglycemia symptoms was quite good among our participants, their knowledge about hypoglycemia symptoms was less impressive. Limited knowledge about hypoglycemia was shown to be rife among diabetic patients, particularly in developing countries (Chu et al., 2021).

Knowledge about diabetes complications was affected positively by a range of factors, including living in Taif, college education, and family history of diabetes. Many previous studies showed a link between tertiary level education and better knowledge about diabetes complications (Obirikorang et al., 2016; Rahaman et al., 2017; Afaya et al., 2020). Indeed, a college education will help self-directed learning and will open multiple avenues for the acquisition of knowledge about disease course and disease complications (Belsti et al., 2016). It remains that knowledge should be obtained from the right resources, such as reliable health education sites and materials.

Based on specific diabetic complications such as diabetic neuropathy, a study done by (Almalki et al., 2018) found that almost two-thirds of screened T2D were considered to have good knowledge about diabetic neuropathy. The excellent knowledge group tends to have a longer duration of T2D, is more likely to have a college degree, and tends to have non -significantly better A1c control. These results are supported by our study findings.

It is difficult to explain why residents in Taif were more knowledgeable than residents of Makkah in terms of diabetes complications. Previous studies showed that urban centers residents have superior knowledge of diabetes complications than their rural counterparts (Hoque et al., 2009; Afaya et al., 2020).

Clearly caring for a family member with diabetes in a cohesively knit society like Saudi Arabia would improve the experience with complications first-hand. This is not ideal, however!

There was no substantial difference between men and women in Saudi Arabia with regards to their diabetes complications' knowledge level. This was an unexpected finding, as previous studies carried out in similar cultural contexts indicated that men's knowledge outperformed women's knowledge because of men's ability to get outside the house more freely and obtain more knowledge (Belsti et al., 2019; Nisar et al., 2008; Gulabani et al., 2008). This could point to the overall technological changes that allow Saudi women to acquire knowledge even when staying at home.

Another study was done by (Amankwah-Poku, M 2019) and concluded that knowledge and awareness were higher about diabetes, with females having more knowledge and awareness than males. Significant differences were also found in the level of knowledge and awareness of students based on their discipline of study but not the number of years of study in the university. Also, students who engaged in physical exercise showed a higher level of general knowledge and awareness of type 2 diabetes.

We note many strengths to the current survey. We included an extensive data set that included information from over 570 participants.

One significant limitation in the current research is the cross-sectional design that gives only a snapshot of the levels of knowledge about diabetes complications among the surveyed individuals. Also, better results would have been obtained by running a knowledge test rather than asking participants to rate themselves in terms of their knowledge level.

Future research should attempt to investigate knowledge levels using multiple-choice items at different time points. Also, assessment of how effective educational intervention

(preferably nurse-led!) is in boosting knowledge level is an important avenue to explore. There is a clear knowledge gap of how awareness about diabetes complications affects diabetes care and the chronic course of the disease. Such a gap requires focused longitudinal research.

Conclusion

In conclusion, almost the majority of screened T2D were considered to have a good level of knowledge of complications due to hyperglycemia, hypoglycemia, and overall knowledge of diabetes complications. The excellent knowledge group tends to be females, single, highly educated, has a longer duration of T2D, is more likely to have a positive family history of DM, and has previous knowledge from the doctor.

Recommendations

Other educational programs are to be established in order to increase public awareness and diabetic patient information in order to enhance positive attitudes and maximize the level of compliance.

1. Knowledge about diabetes complications remains suboptimum among Saudi individuals.
2. Makkah city needs to be targeted by effective educational interventions to help improve the knowledge level about diabetes complications among its residents.
3. Educational interventions should focus on systematic complications of diabetes, particularly highlighting how diabetes causes cerebrovascular accidents and neurological problems.
4. Future research should be longitudinal and attempt to assess the link between better knowledge of diabetes complications and their preventability.
5. Better results would have been obtained by running a knowledge test rather than asking participants to rate themselves in terms of their knowledge level.
6. Health educational programs should focus on hypoglycemia symptomatology and susceptibility as these are clearly lacking among the majority of diabetic patients.

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Evaluation of outcome of distal humerus fracture fixation by two-locked plates

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Abstract

Objective: The objective of the study was to evaluate the results of operative management of distal humerus fracture fixation by two-locked plates. Materials and method:

This was a retrospective study involving 72 patients with distal humeral fractures who were managed surgically by fixation with two-locked parallel plates at Al- Gamhoria Teaching Hospital, and two private hospitals, in Aden, Yemen, between January 2018 and December 2020.

The data was entered into a computer and analyzed using SPSS program version 17. For variables difference, chi-square tests, and P values were calculated. A p- value of < 0.05 was considered statistically significant.

Results: The total study patients were 72 and they were (79.2%) males and (20.8%) with a ratio of male to female of 3.8:1.

The mean age of the patients was 37.8 ± 15.3 years and the age ranged between 11 and 75 years.

Most of the patients (69.4%) were of age ≤ 40 years, while more than 40 years old represented (30.6%). Causes of fractures were gunshots (56.9%) followed by road traffic accidents (37.5%). Left side was predominant with (62.5%). Type of injuries were open with (73.6%) and closed with (26.4%).

Partially articular fractures were in (86.1%) of cases and complete articular fractures were in (13.9%) cases. Transpositions of ulnar nerve were found in (65.3%) cases. Ulnar nerve neuropraxia was found in (5.6%) cases and the Range of Motion (ROM) was limited (pron. – sup 30-45/flex – exten 30 – 130) in (29.2%) cases and no range of motion in (9.7%) cases. Non-union was found in (4.2%) cases while superficial infection was in (5.6%) cases. Stiffness was found in (9.7%) cases.

Conclusion: This study revealed that managing the distal humeral fractures by internal fixation of two Parallel-Plates gives satisfactory results.

Key words: distal humerus, fracture, internal fixation, locking plate, outcome

Introduction

Fractures of the distal humerus are complex and challenging injuries to treat. Humeral shaft and extra-articular supracondylar humerus fractures in adults comprise 16 % of humeral shaft and 10 % of distal humerus fractures [1]. Most of these are either simple spiral diaphyseal fractures or are complicated by extension into the articular surface. The main goal of treatment of extra-articular distal humerus fractures is to restore alignment and achieve stable fixation to allow for early elbow range of motion (ROM), which is crucial for a good functional outcome [2].

Severe comminution, bone loss, and osteopenia predispose distal humeral fractures to unsatisfactory results due to inadequate fixation. Poor outcomes include contracture, secondary to prolonged immobilization thought to be necessary to protect the fixation, and nonunion. In an effort to reproducibly obtain stable fixation in the presence of osteoporosis or comminution, we have developed an improved fixation technique for fractures of the distal part of the humerus based on principles that enhance fixation in the distal fragments and provide compression at the supracondylar level [3,4,5,6].

Treatment recommendations for this injury have been adopted primarily from studies of intra-articular distal humerus fractures. Many authors have advocated managing these fractures surgically with open reduction and internal fixation (ORIF) and immediate elbow motion [7]. Double-plating techniques using two 3.5-mm plates in orthogonal (90–90) or parallel (180°) patterns are generally accepted [8].

Objective: The objective of the study was to evaluate the results of operative management of distal humerus fracture fixation by two-locked plates, and the complications.

Materials and Method

This was a retrospective study involving 72 patients with distal humeral fractures who were managed surgically by fixation with two-locked parallel plates at Al- Gamhoria Teaching Hospital, and two private hospitals, in Aden, Yemen, between January 2018 and December 2020.

The technique was specifically designed to satisfy two principles: (1) fixation in the distal fragments should be maximized and (2) screw fixation in the distal segment should contribute to stability at the supracondylar level.

The medical records of the patients were retrospectively reviewed to acquire demographic data, mechanism of injury, distal humerus fractures characteristics, postoperative outcome and complications.

The data was entered into a computer and analyzed using SPSS program version 17. For variables difference, chi-square tests, and P values were calculated. A p- value of < 0.05 was considered statistically significant.

Results

The total study patients were 72 and they were 57 (79.2%) males and 15 (20.8%) with a ratio male to female of 3.8:1; as appears in Figure 1.

The mean age of the patients was 37.8 ± 15.3 years and the age ranged between 11 and 75 years. The mean age of male patients was 37.7 ± 15.0 years and the age ranged between 11 and 75 years, while the mean age of females was 38.1 ± 16.9 years and the age ranged between 19 and 70 years; as shown in Table 1.

Table 2 illustrates the distribution of age groups of patients and the distal humerus fracture characteristics. Most of the patients 50 (69.4%) were of age ≤ 40 years, while more than 40 years old represented 22 (30.6%). Causes of fractures were gunshots 41 (56.9%) followed by road traffic accidents 27 (37.5%) and falls 4 (5.6%). Left side was predominant with 45 (62.5%). Type of injuries were open with 53 (73.6%) and closed with 19 (26.4%). Skin loss was found in 10 (13.9%) cases distributed as follows: extensive 2 (2.8%), minimal 5 (6.9%) and moderate 3 (4.2%).

Partially articular fractures were in 62 (86.1%) cases and complete articular fractures were in 10 (13.9%) cases. Transpositions of ulnar nerve were found in 47 (65.3%) cases.

Table 3 and Figure 2 summarize the postoperative outcomes and the complications.

Ulnar nerve neuropraxia was found in 4 (5.6%) cases and the Range of Motion (ROM) was limited (pron. – sup 30-45/flex – exten 30 – 130) in 21 (29.2%) cases and no range of motion in 7 (9.7%) cases. Non-union was found in 3 (4.2%) cases while superficial infection was in 4 (5.6%) cases. Stiffness was found in 7 (9.7%) cases.

Figure 1: Distribution of study patients related to sex
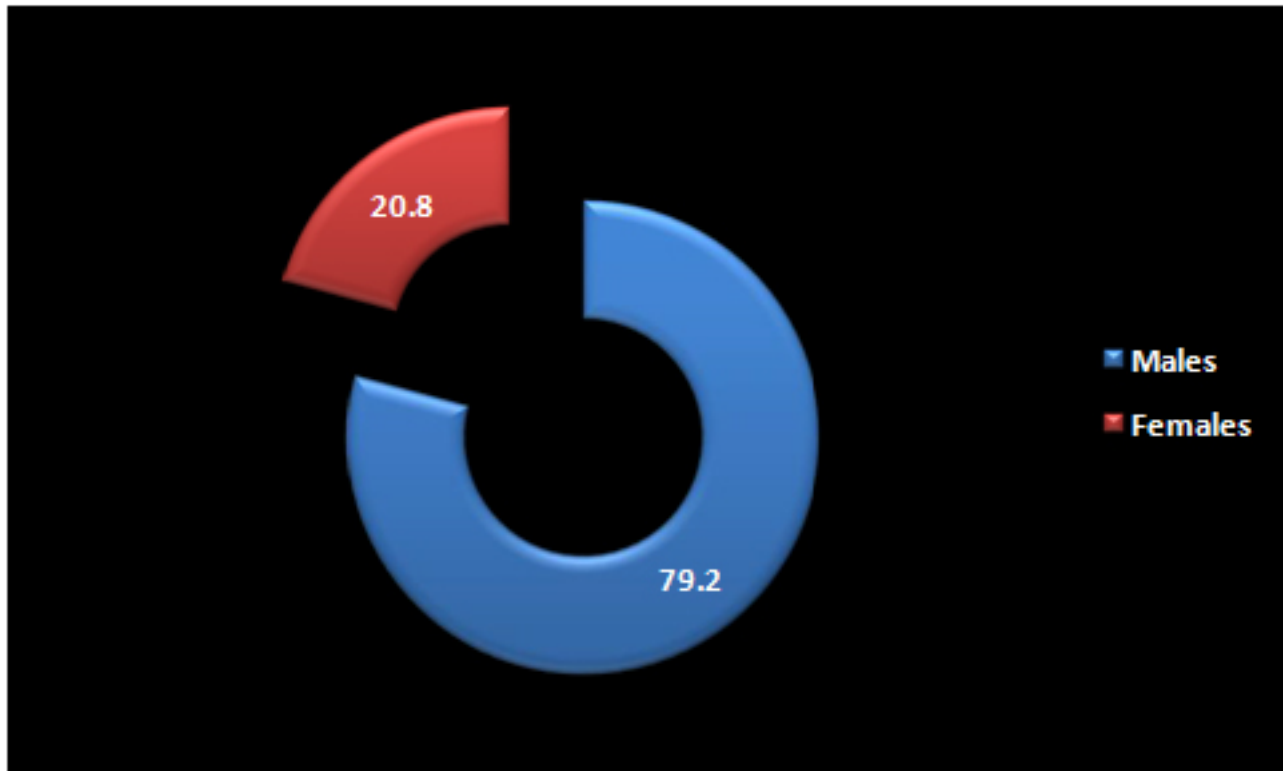
Table 1: Mean age of patients related to sex

Sex	No	(%)	Mean age (years)	SD* (years)	Minimum (years)	Maximum (years)
Female	15	(20.8)	38.1	±16.9	19	70
Male	57	(79.2)	37.7	±15.0	11	75
Total	72	(100)	37.8	±15.3	11	75

* SD = Standard deviation; P = 0.000

Table 2: Distribution of age groups and the distal humerus fracture characteristics (n=72)

Variables	No	%
Age group:		
≤ 20	10	13.9
21-30	12	16.7
31-40	28	38.9
41-50	9	12.5
51-60	5	6.9
≥ 61	8	11.1
Cause:		
Falls	4	5.6
Gunshots	41	56.9
Road traffic accidents	27	37.5
Side:		
Left	45	62.5
Right	27	37.5
Type:		
Closed	19	26.4
Open	53	73.6
Skin loss:		
Extensive	2	2.8
Minimal	5	6.9
Moderate	3	4.2
None	62	86.1
Partially articular:		
No	10	13.9
Yes	62	86.1
Complete articular:		
No	62	86.1
Yes	10	13.9
Transposition of ulnar nerve		
No	25	34.7
Yes	47	65.3

Table 3: Distribution of postoperative outcome and complications (n=72)

Variables	No	%
Ulnar nerve neuropraxia:		
Yes	4	5.6
No	68	94.4
Range Of Motion (ROM):		
Yes	44	61.1
Limited (pron – sup 30-45/flex – exten 30 – 130)**	21	29.2
No	7	9.7
Non-union:		
None	69	95.8
Yes	3	4.2
Infection:		
None	68	94.4
Yes	4	5.6
Stiffness:		
None	65	90.3
Yes	7	9.7

** (pron – sup 30-45/flex – exten 30 – 130) = (pronation – supination 30o – 45o/flexion – extension 30o – 130o)

Figure 2: Percentage of postoperative outcome and complications
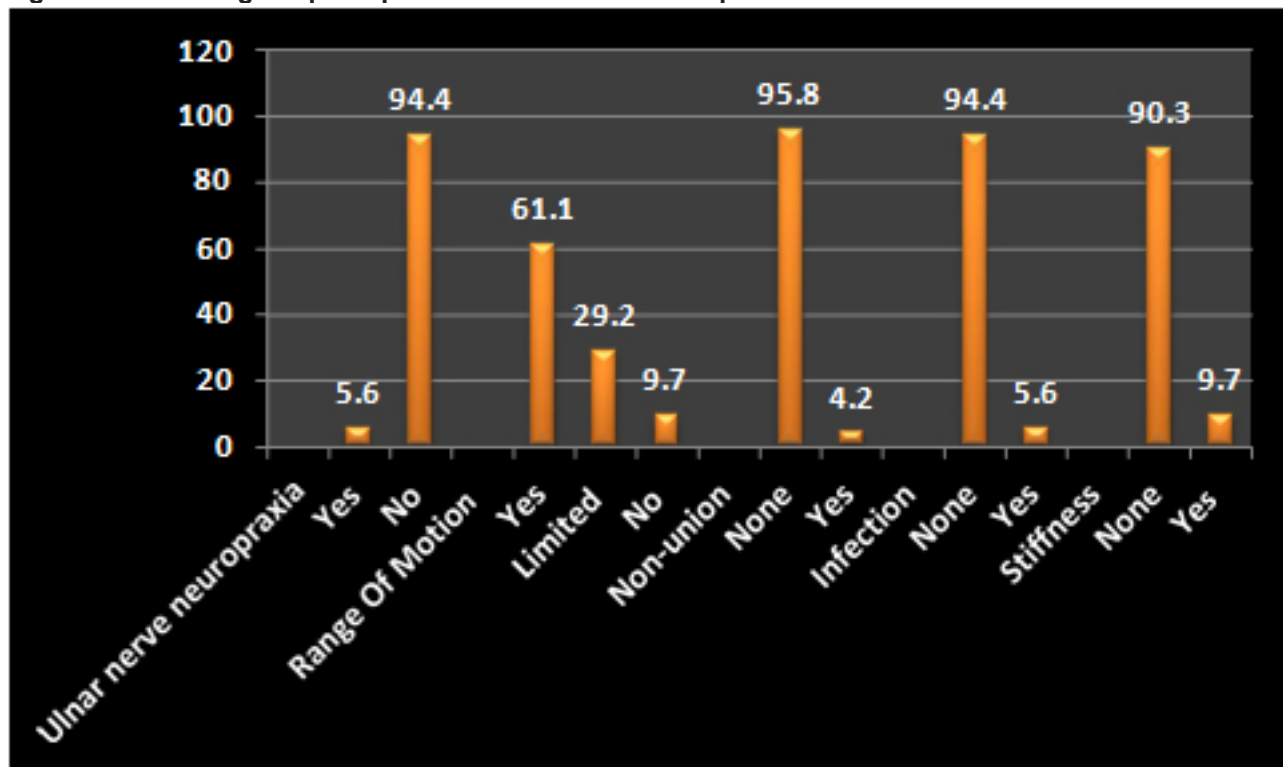
Discussion

Distal humeral fractures are difficult management problems on account of the complex anatomy of the elbow, small sized fracture fragments and the limited amount of subchondral bone [9,10].

The risk of functional impairment following a displaced distal humeral fracture is high, and it is now generally accepted that the most favorable outcome of displaced intraarticular fractures is provided by surgical reconstructive procedure [10,11].

Open reduction and internal fixation (ORIF) is the treatment of choice for these fractures [7,12]. Achieving rigid internal fixation and anatomical reconstruction by restoring the two columns and the articular surface is essential for allowing early motion, adequate bone healing and avoiding future cartilage degeneration [13]. In young patients, open reduction and internal fixation with plate fixation of both columns is the gold standard.

Precontoured anatomical locking plates, orthogonal plates (90°:90°), or parallel plates (medial and lateral supracondylar ridges) are currently the most popular choices of treatment for distal humerus fractures [14].

However, despite evolution of ORIF techniques for distal humerus fractures, an overall complication rate up to 35% has been reported [7,15].

In our current study the total study patients were 72 and they were (79.2%) males and (20.8%) with a ratio male to female of 3.8:1. Trikha et al [16] reported in their study that male patients were 66.7% and the female patients were 33.3%, with a ratio male to female of 2:1.

To some extent, similar to our findings was reported by Gupta et al [17] in their study where there were (72.5%) males and (27.5%) females with a ratio male to female of 2.6 : 1.

In our study the mean age of the patients was 37.8 ± 15.3 years and the age ranged between 11 and 75 years.
This finding was in agreement with that result reported by Gupta et al [17] in which the mean age of their study patients was 38.4 years and the age ranged between 18 – 73 years.

In our study we found that the most of the patients (69.4%) were of age ≤ 40 years, while more than 40 years old represented (30.6%).

Prakashappa et al [18] found in their study that the mean age of the study patients was 39.7 and the age range was between 21 to 80 years.

In our present study we found the left side involvement of fractures was predominant with (62.5%).

Similar to our finding was that reported by Trikha et al [16] in which left limb involvement was (61.1%).

Prakashappa et al [18] found that out of 30 patients there were 19 (63.3%) fractures in the left side and 11 (36.7%) fractures in the right side.

In our study the causes of fractures were gunshots 41 (56.9%) followed by road traffic accidents 27 (37.5%) and falls 4 (5.6%). Gunshots injuries in our country are the result of the spread of weapons and violence as a result of the ongoing war. Gupta et al [17] mentioned in their study that the majority of cases were due to road traffic accidents in the younger age group and direct fall onto elbow was a common mode of injury in the older age group.

Prakashappa et al [18] found in their study the causes of injuries were 15 (50%) cases due to Road traffic accidents and 15 (50%) cases due to falls.

In our current study we found the transpositions of ulnar nerve were in 47 (65.3%) cases.

Ilyasi et al [19] reported in their study that due to the characteristic intra-articular involvement, displacement, and poor control of fracture fragments with closed treatment, we typically treat these fractures operatively. They added, pre-operative evaluation begins with assessment of the neurovascular status. The ulnar nerve function in particular is documented. If the injury occurred through a high-energy mechanism a full trauma evaluation is warranted and attention is given to all organ systems.
Ulnar neuropathy as a complication of distal humerus fractures, preoperatively and/or postoperatively, has been reported with a magnitude ranging from 0% to 51% with an average of 13% [7,20,21,22]. This can occur either at the time of the injury, intraoperatively, secondarily to postoperative immobilization, due to swelling, to scar tissue development and thickening in the fibro-osseous tunnel, or due to hardware irritation [21].

In our current study we found postoperatively the forearm rotation was normal in 40 (61.1%) patients except for 21 (29.2%) who had limited ROM (pronation – supination 30° – 45°/flexion – extension 30° – 130°) and no range of motion in 7 (9.7%) cases.

Sanchez-Sotelo et al [23] mentioned that in treating elbow fractures, if postoperative motion of elbow fails to progress as expected, a program of patient- adjusted static splinting is instituted as soon as the soft tissues are healed. They also, reported that 8 (23.5%) of the elbows in their study were treated with such a program, which was commenced after the third or fourth week. The torque across the elbow that was applied with such a patient adjusted splint was low enough to cause discomfort but not pain and therefore was not of concern with regard to the security of the fracture fixation.

In our present study there were 3 (4.2%) non-union cases.

Nonunion after ORIF of distal humerus fractures has been reported to be between 2% and 10% [54dam] with many cases involving the supracondylar region.

Modern studies of dual plate fixation have demonstrated union rates ranging from 89% to 100% [13,24].
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In other cases, high-energy trauma, high comminution and poor bone stock in geriatric patients were cited as reasons for nonunion. Particularly in elderly patients, fracture union rather than motion is the first priority, because motion can be restored by later contracture release if the fracture heals [25].

Helfet et al [26] analyzed the results of 52 surgically treated nonunions and they noticed that 75% of these were the result of unsuccessful internal fixation.

Furthermore, they suggested that elbow stiffness which frequently accompanies nonunions must be addressed during the revision surgery [26].

Jupiter reported that in cases with nonunion after surgically treated distal humerus fractures, ulnar nerve dysfunction can be significant due to scar formation encasing the ulnar nerve. Therefore, ulnar nerve exploration and transposition was recommended [27].

We found in our study superficial infection in 4 (5.6%) cases.

The incidence of wound complications after fixation of distal humerus fractures is substantial, with significant morbidity. The elbow is at risk for serious wound complications after surgery because of significant soft tissue damage, its relatively thin soft tissue envelope, postoperative swelling, and shear forces occurring when early motion is commenced [28].

Infection should be suspected in any patient with persistent drainage and delayed union or nonunion of the fracture. Furthermore, in a review of fractures fixed with parallel plates, Sanchez-Sotelo et al [29] identified three patients (9%) who underwent additional surgical procedures for wound-related complications.

In another study, Kundel et al documented minor wound complications in 8 of 99 patients (8%) and more serious infections in 10% [30].

In the current study there was stiffness in 7 (9.7%) cases. Stiffness is the most common sequelae after open reduction and internal fixation humeral fractures and is often observed even after optimal stable fixation and proper rehabilitation. Sanchez-Sotelo et al [29] treated complex distal humeral fractures with the parallel plate technique and reported only 41% of elbows obtained at least 30° of extension and 130° of flexion.

While some authors reported that about one-third of patients failed to regain functional arc of motion after open reduction and internal fixation of intercondylar fractures, most patients can expect to have good to excellent results [31,32].

Conclusion

This study revealed that managing the distal humeral fractures by performing the surgical intervention using the internal fixation of two Parallel-Plate gives satisfactory results.

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Familial Mediterranean fever may actually be a persistent inflammatory process on vascular endothelium all over the body

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Abstract

Background: We tried to understand whether or not there is a persistent inflammatory process in Familial Mediterranean Fever (FMF).

Methods: Consecutive patients with the FMF and controls were studied.

Results: The study included 39 patients with the FMF (18 females) and 39 controls. Mean age of the FMF patients was 27.5 ± 11.9 (11-58) years. Although the body weight and body mass index (BMI) were retarded in the FMF patients (64.6 versus 71.7 kg and 24.1 versus 25.7 kg/m2, respectively), the differences were nonsignificant probably due to the small sample size of the study (p>0.05). The mean body heights were similar in both groups (163.4 versus 166.8 cm, p>0.05). As negative acute phase reactants (APR), low density lipoproteins (LDL) (99.0 versus 114.3 mg/dL) and high density lipoproteins (HDL) (37.5 versus 44.5 mg/dL) were suppressed whereas triglycerides (TG) increased (110.2 versus 105.1 mg/dL) as positive APR, but the differences were nonsignificant probably due to the small sample size of the study, again (p>0.05). On the other hand, systolic blood pressures (BP) (115.0 versus 124.8 mmHg, p= 0.047) and diastolic BP (79.2 versus 88.9 mmHg, p= 0.001) were suppressed parallel to the suppressed body weight and BMI, significantly.

Conclusion: Although the FMF is described as intermittent attacks of painful inflammation, probably there is a persistent vascular endothelial inflammation all over the body. The suppressed body weight, BMI, LDL, HDL, and systolic and diastolic BP and the increased TG levels probably play roles of positive and negative APR in the systemic inflammatory process.

Key words: Familial Mediterranean fever, chronic endotelial damage, atherosclerosis, metabolic syndrome, acute phase reactants, triglycerides, blood pressure.

Introduction

Chronic endothelial damage may be the major underlying cause of aging and death by causing end-organ insufficiencies in human being (1, 2). 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 of 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 natures, those eventually reduce blood supply to the terminal organs, and increase systolic BP further. Some of the well-known accelerating factors or indicators 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, aging, and death (3, 4). 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 can not be reversed completely due to their fibrotic natures. 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 (5, 6). Although their normal limits could not been determined clearly yet, plasma triglycerides (TG) may be significant positive acute phase reactants (APR) of the metabolic syndrome (7). Due to the significant association between high plasma TG values and CHD, Adult Treatment Panel (ATP) III adopts lower cutpoints for TG abnormalities than did ATP II (8, 9). Although ATP II determined the normal upper limit of TG as 200 mg/dL in 1994, World Health Organisation in 1999 (10) and ATP III in 2001 reduced the normal upper limit as 150 mg/dL (9). Although these cutpoints are usually used to define borders of the metabolic syndrome, there are suspicions about the safest upper limit of the TG in the plasma. On the other hand, Familial Mediterranean fever (FMF) is the most frequent hereditary inflammatory disease characterized by self-limited recurrent attacks of fever and serositis. It affects certain ethnic groups mainly Jews, Turks, Arabs, and Armenians (11-14). It is characterized with intermittent attacks of painful inflammation, abdominal pain, fever, and arthritis (15, 16). Although the FMF is described as intermittent attacks of systemic inflammation, we tried to understand whether or not there is a persistent vascular endothelial inflammation all over the body in the FMF.

Material and Methods

The study was performed in the Medical Faculty of the Mustafa Kemal University on consecutive patients with the FMF and routine check up cases between March 2007 and June 2016. The FMF is diagnosed with Tel-Hashomer clinical criteria (17). Two or more major or one major plus two minor criteria are required for the diagnosis. The major criteria include recurrent febrile episodes with serositis (peritonitis, synovitis or pleuritis), amyloidosis of AA type without a predisposing disease, and favorable response to regular colchicine treatment. The minor criteria include recurrent febrile episodes, erysipelas-like erythema, and FMF in a first-degree relative. Medical histories of the FMF patients were learnt. A complete physical examination was performed by the Same Internist. Body mass index (BMI) of each case was calculated by the measurements of the Same Internist instead of the verbal expressions. Weight in kilogram is divided by height in meter squared (9). Systolic and diastolic BP were checked after a 5-minute of rest in seated position by using the mercury sphygmomanometer (ERKA, Germany), and no smoking was permitted during the previous 2 hours. Cases with 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 fasting plasma glucose (FPG), low density lipoproteins (LDL), high density lipoproteins (HDL), and TG were performed. Eventually, the mean body weight, height, BMI, FPG, LDL, HDL, TG, and systolic and diastolic BP were detected in each group, and compared in between. Mann-Whitney U Test, Independent-Samples t Test, and comparison of proportions were used as the methods of statistical analyses.

Results

The study included 39 patients with the FMF (18 females) and 39 age- and sex-matched control cases. Interestingly, 53.8% of the FMF patients were male. Mean age of the FMF patients was 27.5 ± 11.9 (11-58) years. Although the mean body weight and BMI were retarded in the FMF patients (64.6 versus 71.7 kg and 24.1 versus 25.7 kg/m2, respectively), the differences were nonsignificant probably due to the small sample size of the study cases (p>0.05). The mean body heights were similar in both groups (163.4 versus 166.8 cm, p>0.05). As some significant negative APR, LDL (99.0 versus 114.3 mg/dL) and HDL (37.5 versus 44.5 mg/dL) were suppressed whereas as a positive APR, TG increased (110.2 versus 105.1 mg/dL) in patients with the FMF, but the differences were nonsignificant probably due to the small sample size of the study cases, again (p>0.05). On the other hand, systolic BP (115.0 versus 124.8 mmHg, p= 0.047) and diastolic BP (79.2 versus 88.9 mmHg, p= 0.001) were suppressed parallel to the suppressed mean body weight and BMI the in the FMF patients, significantly (Table 1).

Table 1: Characteristic features of the study cases

Variables	Patients with FMF*	p-value	Control cases
Number	39		39
Mean age (year)	27.5 ±11.9 (11-58)	Ns†	27.8 ± 8.8 (17-58)
Female ratio	46.1% (18)	Ns	46.1% (18)
Weight (kg)	*64.6 ± 16.6 (34-117)*	*Ns*	*71.7 ± 15.1 (46-105)*
Height (cm)	163.4 ±9.7 (140-187)	Ns	166.8 ±10.2 (150-188)
BMI‡ (kg/m²)	*24.1 ± 5.4 (14.7-41.9)*	*Ns*	*25.7 ± 5.3 (18.4-41.2)*
FPG§ (mg/dL)	92.3 ±9.7 (73-114)	Ns	91.4 ±8.8 (70-108)
LDL¶ (mg/dL)	99.0 ±33.4 (48-177)	Ns	114.3 ±30.5 (59-177)
HDL** (mg/dL)	37.5 ±12.8 (12-68)	Ns	44.5 ±11.0 (27-65)
TG*** (mg/dL)	110.2 ±52.8 (31-246)	Ns	105.1 ±50.4 (39-287)
*Systolic BP**** (mmHg)*	*115.0 ± 18.3 (90-170)*	*0.047*	*124.8 ± 20.5 (100-200)*
Diastolic BP (mmHg)	*79.2 ± 12.1 (60-110)*	*0.001*	*88.9 ± 9.8 (70-120)*

*Familial Mediterranean fever   †Nonsignificant (p>0.05)   ‡Body mass index   §Fasting plasma glucose   ¶Low density lipoproteins   **High density lipoproteins   ***Triglycerides   ****Blood pressures

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Discussion

FMF is an autosomal recessive hereditary disease commonly observed around the Mediterranean basin presenting as recurrent febrile episodes. But the fever may even be absent in some cases in the literature (18). Most patients with FMF have their first attack before the age of 20 years. Whereas more patients than expected may have late-onset FMF in Japan (19). They may have a milder form of the disease with less frequent peritonitis and pleuritis, and the response to colchicine therapy may also be better (19). FMF is associated with genetic mutations in the MEFV gene located on the short arm of Chromosome 16 encoding pyrin (20), and is characterized by recurrent, often stress-provoked attacks of fever and serositis, but sometimes also with chronic subclinical inflammation (21). This protein is expressed mainly in myeloid/monocytic cells and modulates IL-1 beta processing, NF-kappaB activation, and apoptosis (22). A mutated pyrin results in excessive production of proinflammatory cytokines thereby evoking inflammatory attacks. The most devastating complication of FMF is amyloidosis, leading to CRD (22). M694V homozygocity, male gender, and the alpha/alpha genotype of serum amyloid A1 gene are currently established risk factors for amyloidosis (22). Daily colchicine is the mainstay of the therapy for the disease, resulting in complete remission or marked reduction in the frequency and duration of attacks in most cases (22). It is also effective in preventing and arresting renal amyloidosis. Lifelong treatment with colchicine is required for homozygotes for the p.Met694Val mutation or compound heterozygotes for p.Met694Val and another disease-causing allele; this prevents the inflammatory attacks and the deposition of amyloid (23).

Cholesterol, TG, and phospholipids are the major lipids of the body. Cholesterol is an essential structural component of animal cell membrane, bile acids, adrenal and gonadal steroid hormones, and vitamin D. TG are fatty acid esters of glycerol, and they are the major lipids transported in the blood. The bulk of fat tissue deposited all over the body is in the form of TG. Phospholipids are TG that are covalently bound to a phosphate group. Phospholipids regulate membrane permeability, remove cholesterol from the body, provide signal transmission across the membranes, act as detergents, and help in solubilization of cholesterol. Cholesterol, TG, and phospholipids do not circulate freely in the plasma instead they are bound to proteins, and transported as lipoproteins. There are five major classes of lipoproteins including chylomicrons, very low density lipoproteins (VLDL), intermediate density lipoproteins (IDL), LDL, and HDL in the plasma. Chylomicrons carry exogenous TG from intestine to liver via the thorasic duct. VLDL are produced in the liver, and carry endogenous TG from the liver to the peripheral organs. In the capillaries of adipose and muscle tissues, 90% of TG is removed by a specific group of lipases. So VLDL are converted into IDL by removal of TG. Then IDL are degraded into LDL by removal of more TG. So VLDL are the main sources of LDL in the plasma. LDL deliver cholesterol from the liver to other parts of the body. Although the liver removes majority of LDL from the circulation, a small amount is uptaken by scavenger receptors on macrophages those may migrate into arterial walls and become the foam cells of atherosclerotic plaques. HDL remove fats and cholesterol from cells, including within arterial wall atheroma, and carry the cholesterol back to the liver and steroidogenic organs including adrenals, ovaries, and testes for excretion, reutilization, and disposal. All of the carrier lipoproteins in the plasma are under dynamic control, and are readily affected by diet, illness, drug, body weight, and BMI. Thus lipid analysis should be performed during a steady state. But the metabolic syndrome alone is a low-grade inflammatory process on vascular endothelial cells all over the body. Thus the metabolic syndrome alone may be a cause of the abnormal lipoproteins levels in the plasma. On the other hand, although HDL are commonly called as 'the good cholesterol' due to their roles in removing excess cholesterol from the blood, and protecting the arterial

walls against atherosclerosis (24), recent studies did not show similar results, and low plasma HDL levels may alert clinicians about searching of additional metabolic or inflammatory pathologies in the body (25, 26). Normally, HDL may show various anti-atherogenic properties including reverse cholesterol transport and anti-oxidative and anti-inflammatory properties (26). However, HDL may become 'dysfunctional' in pathological conditions which means that relative compositions of lipids and proteins, as well as the enzymatic activities of HDL are altered (25). For instance, properties of HDL are compromised in patients with DM due to the oxidative modification and glycation as well as the transformation of HDL proteomes into proinflammatory proteins. Additionally, the highly effective agents of increasing HDL levels such as niacin, fibrates, and cholesteryl ester transfer protein inhibitors did not reduce all cause mortality, CHD mortality, myocardial infarction, or stroke (27). While higher HDL levels are correlated with cardiovascular health, medications used to increase HDL did not improve the health (27). In other words, while high HDL levels may correlate with better cardiovascular health, specifically increasing one's HDL values may not increase cardiovascular health (27). So they may just be some indicators instead of being the main actors of the process. Beside that, HDL particles that bear apolipoprotein C3 are associated with increased risk of CHD (28). Similarly, BMI, FPG, DM, and CHD were the lowest between the HDL values of 40 and 46 mg/dL, and the prevalence DM was only 3.1% between these values against 22.2% of outside of these limits (29). In another definition, the moderate HDL values may also be the results instead of the causes of the better health parameters. The lower mean body weight, BMI, LDL, HDL, and systolic and diastolic BP and the higher mean TG values in patients with the FMF can be explained by definition of the metabolic syndrome in the present study (30, 31).

Probably excess weight may be the most common cause of vasculitis, worldwide, and the leading cause of major health problems in this century. It leads to structural and functional abnormalities in many organ systems of the body (32). Adipose tissue produces leptin, tumor necrosis factor-alpha, plasminogen activator inhibitor-1, and adiponectin-like cytokines, all of those behave as APR in the plasma (33). Excess weight induced chronic low-grade vascular endothelial inflammation may play a significant role in the pathophysiology of disseminated atherosclerosis all over the body (1, 2). On the other hand, excess weight may cause an increased blood volume as well as an increased cardiac output thought to be the result of an increased oxygen need of the excessive fat tissue. The prolonged increase in the blood volume may lead to myocardial hypertrophy, terminating with a decreased cardiac compliance. FPG and total cholesterol (TC) values increased parallel to the increased BMI values in the literature (34). Combination of these cardiovascular risk factors will eventually terminate with an increased left ventricular stroke work and higher risks of arrhythmias, cardiac failure, and sudden death. Additionally, the prevalences of CHD and stroke increased parallel to the increased BMI values in another study (35), and risk

of death from all causes including cancers increased throughout the range of moderate to severe excess weight in all age groups (36). The relationships between excess weight, increased BP, and higher plasma TG values were described in the metabolic syndrome, extensively (37), and clinical manifestations of the syndrome include obesity, hypertriglyceridemia, hyperbetalipoproteinemia, HT, insulin resistance, and proinflammatory and prothrombotic states (37). Similarly, prevalences of smoking (42.2% versus 28.4%, p<0.01), excess weight (83.6% versus 70.6%, p<0.01), DM (16.3% versus 10.3%, p<0.05), and HT (23.2% versus 11.2%, p<0.001) were all higher in the hypertriglyceridemia group in another study (38). On the other hand, the prevalences of hyperbetalipoproteinemia were similar both in the hypertriglyceridemia (200 mg/dL and higher) and control groups (18.9% versus 16.3%, p>0.05, respectively) in the above study (38). Similarly, plasma LDL values increased just up to the plasma TG value of 200 mg/dL but no more in another study (39). Beside that, the mean BMI values increased just up to the plasma TG value of 150 mg/dL, significantly (p<0.05 for each step) (39). On the other hand, the greatest number of deteriorations in the metabolic parameters was observed just above the plasma TG value of 60 mg/dL (39). According to our opinion, although excess weight does not affect each individual with the same severity, overweight, obesity, severe obesity, and morbid obesity histories of years should be added into the calendar age with various degrees during calculation of physiological age of the individuals.

Although the obvious consequences of excess weight on health, nearly three-quarterss of cases above the age of 30 years have excess weight (40). The prevalence of excess weight increases by decades, particularly after the third decade, up to the eighth decade of life (40). So 30th and 70th years of age may be the breaking points of life for body weight, and aging may be the major determining factor of excess weight. Relatively decreased physical and mental stresses after the age of 30 years, and debility and comorbid disorders induced restrictions after the age of 70 years may be the major causes for the changes of BMI at these ages. Interestingly, the mean age and BMI increased just up to the plasma TG values of 200 mg/dL and 150 mg/dL in the above study, respectively (39). So smoking remained as the major underlying factor for the hypertriglyceridemia above the plasma TG value of 200 mg/dL. Beside that, the mean BMI values were 24.6, 27.1, 29.4, 29.9, and 30.0 kg/m2 in the five study groups, respectively (39). In other words, only cases with the plasma TG values lower than 60 mg/dL had a normal mean BMI value (39). On the other hand, the mean age and TG value of the first group were 35.6 years and 51.0 mg/dL, respectively (39). They were 43.6 years and 78.3 mg/dL in the second, 47.7 years and 122.2 mg/dL in the third, and 51.2 years and 174.1 mg/dL in the fourth groups, respectively (39). In another definition, TG values increased about 7.8 mg/dL for each year of aging up to 200 mg/dL in the plasma (39). So aging alone may be another risk factor for chronic low-grade inflammation on vascular endothelium all over the body.

Although ATP III reduced the normal upper limit of plasma TG as 150 mg/dL in 2001 (9), whether or not much lower limits provide some additional benefits for human body remains unclear (41). Similar to the recent study (42), prevalence of smoking was the highest in the highest TG having group in the above study (39) that may also indicate inflammatory role of smoking on vascular endothelium in the metabolic syndrome, since TG may behave as positive APR in the plasma. BMI, FPG, HT, DM, COPD, and CRD increased parallel to the increased plasma TG values from the first up to the fifth groups, continuously in the above study (39). Just as an opinion of us, significantly increased mean age by the increased plasma TG values may be secondary to aging induced decreased physical and mental stresses, which eventually terminates with excess weight and its consequences. Interestingly, although the mean age increased from the lowest TG having group up to TG value of 200 mg/dL, then it decreased (39). The similar trend was also seen with the mean LDL values (39). These trends may be due to the fact that although the borderline high TG values (150-199 mg/dL) is seen together with physical inactivity and overweight, the high TG (200-499 mg/dL) and very high TG values (500 mg/dL or higher) may be secondary to genetic factors, smoking, and terminal consequences of the metabolic syndrome including obesity, DM, HT, COPD, cirrhosis, CRD, PAD, CHD, and stroke (9). But although the underlying causes of the high and very high plasma TG values may be a little bit different, probably risks of the terminal endpoints of the metabolic syndrome do not change in them. For example, prevalences of HT, DM, and COPD were the highest in the highest TG having group in the above study (39). Eventually, although some authors reported that lipid assessment can be simplified by measurements of TC (43), most of the others indicated a causal relationship between higher TG values and irreversible end-points of the metabolic syndrome (44).

As a conclusion, although the FMF is described as intermittent attacks of painful inflammation, probably there is a persistent vascular endothelial inflammation all over the body. The suppressed body weight, BMI, LDL, HDL, and systolic and diastolic BP and the increased TG levels probably play roles of positive and negative APR in the systemic inflammatory process.

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Assessment of Epidemic and Pandemic Events Preparedness in Ministry of Health Hospitals, Jazan, Saudi Arabia, 2021: A Cross-Sectional Study

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Abstract

Background: Hospital preparedness planning for natural and man-made disasters has become the pressing necessity of hospitals being the principal habitat of disaster victims. One of the most critical areas of consideration is hospital preparedness for epidemic and pandemic events.

Objectives: To assess concerns, perceived impacts and preparedness of health care workers for epidemic and pandemic events in Ministry of Health (MOH) hospitals, Jazan, 2021.

Methods: An analytical cross-sectional study was conducted from May 1st, to August 31st, 2021 in three Ministry of Health hospitals in Jazan city. All health care workers (HCWs) working at the three hospitals were eligible to participate if they were direct clinical care providers. A valid questionnaire consisting of five parts was used; including demographic data, work-related concerns of health care workers, non-work related concerns of health care workers, perceived impact of health care workers on personal life and work and preparedness of health care workers for epidemic and pandemic events.

Results: The study included 307 healthcare workers. The age of 39.7% of them ranged between 31 and 40 years. Almost two-thirds (62.2%) were males. The total score of work-related concern of COVID-19 among the participants ranged between 7 and 28, out of a possible maximum of 35, with a median (IQR) of 18 (15-22). HCWs in the age group 31-40 years, master holders, and doctors expressed the highest concerns score. The total score of non-work-related concern of COVID-19 ranged between 7 and 35, out of a possible maximum of 35, with a median ("interquartile range "IQR") of 28 (22-28). HCWs who hold a master degree and doctors expressed the highest concerns. The total score of perceived impact on personal life and work health professionals ranged between 6 and 44, out of a possible maximum of 50, with a median (IQR) of 25 (21-30). HCWs in the age group 31-40, and Master holders had the highest score. The total score of preparedness for Coronavirus (COVID-19) pandemic ranged between 15 and 75, out of a possible maximum of 75, with a median (IQR) of 56 (48- 61). The highest score was observed among HCWs aged over 50 years.

Conclusion: Some work-related and non-work-related concerns of HCWs in Jazan regarding COVID-19 pandemic have been identified. Also, perceived impact of the pandemic on HCWs` work and professional life has been documented. Their preparedness as well as that of the health care system to the COVID-19 pandemic was satisfactory in most aspects.

Key words: COVID-19, concerns, preparedness, healthcare workers, Saudi Arabia

Introduction

Epidemic and pandemic events are significant challenges which pose threats to health security globally. In the past recent years, world countries have been exposed to various epidemic and pandemic events which would disrupt all economic, social and health aspects of life. Emerging infectious diseases substantially have been growing in recent years, particularly H1N1, H5N1, H7N9 and recently Middle East Respiratory Syndrome (1). During the past century, 4 influenza pandemics have occurred. In the 21st century, the first pandemic incident appeared in 2009 in Mexico where the novel strain H1N1 emerged (2).

Subsequently, it continued to spread rapidly over the world, and within a few weeks all World Health Organization (WHO) regions were affected (3). Accordingly the WHO declared a pandemic event (4). The WHO reported more than 18,449 deaths at the end of the 2009 H1N1 pandemic(5). In late December 2019, a new (novel) coronavirus was identified in China causing severe respiratory disease including pneumonia. It was originally named Novel Coronavirus. The virus causing the infection has been named "severe acute respiratory syndrome coronavirus 2" (SARS-CoV-2) [6].

During the past 20 years, a number of infectious diseases have emerged and re-emerged in Saudi Arabia, such as Rift Valley Fever (RTV) in 2000 (7), Alkumra virus infection (8), and dengue fever reported the earlier cases in the late 1990s (9). Between the period from 2004 to 2013, nearly 20,034 dengue fever cases were reported in Saudi Arabia; the majority of cases were in Jeddah city. The epidemic of dengue that occurred in 2013 was the biggest one (10). Recently, Middle East Respiratory Syndrome coronavirus (MERS-CoV) is an emerging infectious disease first reported in 2012 in Saudi Arabia (11). Excess numbers of cases of MERS-CoV infection occurred in one hospital in Jeddah city, where 20.9% of cases were medical staff and 97.3% of these cases had contact with a health care facility (12). An outbreak of 38 MERS-CoV infection cases was reported in a multi facility in Taif and 13 cases were health care workers (13). In Saudi Arabia, on 14 January 2022, there have been 604,672 confirmed cases of COVID-19 with 8,903 deaths (14). The majority of patients were related to a health care facility. This emphasizes an ill-prepared environment for epidemic events in the health care system.

Hospital preparedness planning for natural and man-made disasters has become the pressing necessity of being hospitals the principal habitat of disaster victims. One of the most critical areas is hospital preparedness for epidemic and pandemic events. An epidemic and pandemic preparedness is a critical matter in responding to an expected infectious disease outbreaks. From this standpoint, responding to the existing epidemic events and preparing for future ones requires functional planning. Accordingly, the World Health Organization (WHO) issued International Health Regulations after revision (IHR) (2005) to provide a framework for public health response to the international spread of disease.(15) WHO provides guidance of the essential elements of preparedness to helps countries in developing national pandemic preparedness plans though capacity building activities.(16)

Eight Central American countries did evaluation of their pandemic preparedness in three stages in 2008, 2010 and 2012. The United States of America provided funding and technical assistance to those eight countries. The results concluded improvements in pandemic preparedness across consecutive intervals and a positive association between preparedness outcome and donor funding (17). Six countries of the Asia-Pacific region processed a rapid situation analysis of health system preparedness for a pandemic as a part of the Asia Flu Cap project. A rapid analysis shows a strong association between a functional health system capacity and pandemic preparedness. Therefore, a pandemic preparedness plan has contributed to an improvement in health system surveillance, communications and laboratory capacity. Despite the previous preparation, low-income countries evidence an inadequate preparedness (18). Therefore, low and middle-income countries have a more fragile preparation for pandemic influenza than high-income countries. A study predicted that 96% of the expected deaths in a future pandemic would occur in low-income countries (19). During 2005–2009, national pandemic preparedness was assessed in 43 European countries. As result of this preparation, the response to the 2009 pandemic was beneficial in most planning aspects except for some troubles in communication, surveillance, response resilience, health care workers participation and vaccination (20-22).

The evolution of pandemic may be restricted by an early rapid response, non- pharmaceutical interventions and hospital surge capacity until a vaccine becomes available (23, 24). Many studies show an early alarm system, compliance with infection control practice, empowering human resources by continuous education and training, national and hospital preparedness planning and incorporating health workers into preparedness planning would prevent infection risks to healthcare workers (25, 26).

Over the past few years, humans have constantly encountered threats from many infectious pathogens. Outbreaks of severe acute respiratory syndrome (SARS), bird flu, swine flu, MERS corona and recently COVID-19 highlight the importance of hospitals and healthcare systems being prepared for potential threats and the consequences that occur when a community is not well-prepared.

Aim of Study
To assess concerns, perceived impacts and preparedness of health care workers for epidemic and pandemic events in Ministry of Health hospitals, Jazan, 2021.

Subjects and Methods

This study followed an analytical cross-sectional design during May 1st till August 31st, 2021 in two general MOH hospitals of Jazan City (i.e., King Fahad and Mohamed Bin Naser hospitals) and El-Erada Psychiatry Hospital.

The study population comprised all health care workers (HCWs) at the three study hospitals, i.e., physicians, nurses, pharmacists, laboratory technicians and other clinical support staff. The study sample was calculated using the Open Epi Info software (version 3.03a), for an α of 0.05 and a power (1-β) of 0.80, 95% confidence interval, and prevalence information from a comparable study which was 71.6% (27). The minimum sample size was estimated to be 305.

Multistage sampling was conducted to select the study sampling of health care workers. In each hospital included in this study, we selected the health care workers sampling in two stages, as follows:
• A stratified sampling technique for health care workers. The stratification was according to job titles (e.g., doctors, nurses, or clinical support staff).
• A simple random sample in each stratum.

Data collection tools
The study questionnaire was adapted from the original survey of concerns and preparedness of an avian influenza pandemic in Singapore 2006 (28). It consists of five sections, as follows:
1. Demographic data.
2. Work- related concerns of health care workers.
3. Non-work-related concerns of health care workers.
4. Perceived impact of health care workers on personal life and work.
5. Preparedness of health care workers for epidemic and pandemic events.

Data collection technique:
The hospitals' structural preparedness was assessed by a checklist interview of disaster management directors and infection control department chiefs across the MOH Jazan hospital. Participants with responsibility for emergency management particularly involved in pandemic and epidemic events preparedness planning were selected to complete the checklist from every hospital in Jazan city. Then, the investigators distributed the anonymous self-administered questionnaire sheets to participants after briefly and clearly explaining the purpose of the survey. The command-and-control center decision makers in Jazan city and disaster management directors in each hospital were interviewed based on the Core Capabilities for Pandemic Influenza Preparedness and Response checklist (29).

A pilot study was conducted to test the clarity of the study questionnaire and the time needed to fill in the questionnaire. The questionnaire contents were clear, well-understood and required about 12 minutes to be completed. Participants' data in the pilot study were not included in the final analysis.

The study data were analyzed using the Statistical Package for Social Sciences (IBM, SPSS version 26). The quantitative data were reported as a mean and standard deviation (SD), and the qualitative data were reported as frequencies and percentages. Kolmogorov–Smirnov test was applied to assess normality of data distribution. Accordingly, non- parametric statistical tests were applied, i.e., Mann-Whitney to compare two groups and Kruskal-Wallis to compare more than two groups. P-values less than 0.05 were considered as statistically significant.

This study was approved by an Ethics Review Committee. Verbal informed consent was obtained from all participants. All collected data were kept confidential and were not used except for study purposes.

Results

Demographic characteristics
Table 1 presents participants' demographic characteristics. The age of 39.7% ranged between 31 and 40 years whereas that of 8.8% exceeded 50 years. Almost two-thirds (62.2%) were males and most of them (72.6%) were married. More than half of them (53.7%) were Bachelor Degree holders whereas 24.5% were postgraduates. Physicians and nurses represented 39.7% and 21.9% of the respondents, respectively.

Work- related concerns
Table 2 shows that most HCWs (72%) either agreed or strongly agreed that they are confident that their employer would look after their medical needs if they were to fall ill with Covid-19 and the risk of contracting COVID-19 is part of their job (67.5%) while only 13.3% either agreed or strongly agreed that they would consider it acceptable if their colleagues resign because of their fear of COVID-19; they might look for another job or consider resigning because of the risk of contracting COVID-19 (6.6%) and they feel that they should not be looking after patients with COVID-19 (8.1%).

The total score of work-related concern of Covid-19 among the participants ranged between 7 and 28, out of a possible maximum of 35, with a mean ±SD of 18.3±4.6 and median (IQR) of 18 (15-22). Regarding education, the highest work-related concerns score was reported among master holders (mean rank=172.45), while the lowest was reported among Diploma holders (mean rank=90.95), p<0.001. Concerning job title, doctors expressed the highest concerns (mean rank=141.58), whereas pharmacists expressed the lowest concerns (mean rank=93.90), p=0.029, as shown in Table (3).

Non-work-related concerns
The majority of the HCWs either agreed or strongly agreed that they would be most concerned about themselves (85.7%), their families (81.7%), close friends (81.4%), and work colleagues (62.5%). More than half of them (57%) either agreed or strongly agreed that people close to them would be worried for their health while 30% either agreed or strongly agreed that people close to them would be worried as they may get infected by them (Table 4).

The total score of non-work-related concern of COVID-19 among the participants ranged between 7 and 35, out of a possible maximum of 35, with a mean±SD of 25.1±4.9 and median (IQR) of 28 (22-28). The highest non-work-related concern score was observed among HCWs who hold master degrees (mean rank=162.92) while the lowest was reported among Diploma holders (mean rank=113.75), p=0.009. Concerning job title, doctors expressed the highest concerns (mean rank=142.98) whereas pharmacists expressed the lowest concerns (mean rank=82.24), p=0.003, as shown in Table 5.

Perceived impact on personal life and work health professional

More than half of HCWs either agreed (43.6%) or strongly agreed (8.5%) that there would be adequate staff at their workplace to handle the increased demand as a result of covid-19 pandemic, 41.7% would have to work overtime, 36.1% said I would have an increase in workload whereas 30% would be afraid of telling their family about the risk they are exposed to. On the other hand, only 13.7 of HCW either agreed or strongly agreed that people would avoid their family members because of his/her job and 12% of them would avoid telling other people about the nature of their job, as shown in Table 6.

The total score of perceived impact on personal life and work health professional among the participants ranged between 6 and 44, out of a possible maximum of 50, with a mean ±SD of 25.2±7.3 and median (IQR) of 25 (21-30). The highest score of perceived impact of covid-19 on personal life and work health professional was observed among HCWs in the age group 31-40 (mean rank=162.55) while the lowest was reported among those aged over 50 years (mean rank=90.08), p=0.001. Regarding education, the highest score of perceived impact of covid-19 on personal life and work health professional was reported among master holders (mean rank=189.87) while the lowest was reported among Diploma holders (mean rank=120.59), p<0.001, as shown in Table 7.

Preparedness for Coronavirus (COVID-19) pandemic

The majority of healthcare workers either agreed or strongly agreed regarding the statements of "Over the last 6 months, I bought masks" (92.5%), "I have been recommended by my clinic to receive coronavirus vaccination" (90.5%), "Over the last 6 months, I have received coronavirus vaccination " (87.2%), "I received adequate personal protective equipment training" (86.9%), "I have received training for infection control at my clinic" (82.1%), "I have seen the plan to combat COVID-19 infection in my hospital" (76.9%), "I am personally prepared for COVID-19 outbreak" (75.8%), "I have someone to turn to if unsure of use of personal protective equipment" (74.2%) and "My clinic has a preparedness plan for COVID-19 outbreak" (73.3%), as shown in Table 8.

The total score of preparedness for COVID-19 pandemic among health professionals ranged between 15 and 75, out of a possible maximum of 75, with a mean ±SD of 53.7±11.1 and median (IQR) of 56 (48-61). The highest score of hospital and HCWs preparedness for COVID-19 pandemic was observed among HCWs aged over 50 years (mean rank=213.81) while the lowest was reported among those aged between 31 and 40 years (mean rank=141.13), p<0.001, as shown in Table 9.

Table 1: Demographic characteristics of the participants (n=307)

Characteristics	No.	%
Age (years)		
• ≤30	103	33.6
• 31-40	122	39.7
• 41-50	55	17.9
• >50	27	8.8
Sex		
• Male	191	62.2
• Female	116	37.8
Marital status		
• Single	69	22.5
• Married	223	72.6
• Divorced/Widow	15	4.9
Educational level		
• Diploma	67	21.8
• Bachelor	165	53.7
• Master	49	16.0
• PhD/MD/Fellowship	26	8.5
Job title		
• Doctor	122	39.7
• Nurse	67	21.9
• Laboratory personnel	30	9.8
• Pharmacist	28	9.1
• Other	60	19.5

Table 2: Work related concerns of the participants regarding COVID-19 pandemic

Work-related Concerns	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Not applicable
My job would put me at great risk of exposure to COVID-19	73 (23.8)	66 (21.5)	26 (8.5)	79 (25.6)	57 (18.6)	6 (2.0)
I am afraid of falling ill with COVID-19	72 (23.5)	64 (20.8)	34 (11.1)	95 (30.9)	24 (7.8)	18 (5.9)
I should not be looking after patients with COVID-19	150 (48.9)	97 (31.6)	24 (7.8)	16 (5.2)	9 (2.9)	11 (3.6)
I accept the risk of contracting COVID-19 as part of my job	39 (12.7)	25 (8.1)	24 (7.8)	134 (43.7)	73 (23.8)	12 (3.9)
I might look for another job or consider resigning because of the risk of contracting COVID-19	177 (57.6)	81 (26.3)	22 (7.2)	14 (4.6)	6 (2.0)	7 (2.3)
I would consider it acceptable if my colleagues resign because of their fear of COVID-19	136 (44.3)	78 (25.4)	42 (13.7)	40 (13.0)	1 (0.3)	10 (3.3)
I am confident that my employer would look after my medical needs if I were to fall ill with COVID-19	20 (6.5)	12 (3.9)	42 (13.7)	154 (50.2)	67 (21.8)	12 (3.9)

Table 3: Factors associated with work-related concerns of healthcare workers about COVID-19 pandemic

Personal characteristics	Score of work-related concerns of COVID-19			P-value
	Median	Interquartile Range	Mean rank	
Age (years)				
• ≤30 (n=87)	18	15-21	121.90	
• 31-40 (n=97)	20	17-23	146.61	
• 41-50 (n=45)	17	14-19.5	104.88	
• >50 (n=21)	14	11.5-21.5	87.07	<0.001‡
Sex				
• Male (n=152)	19	15-22	130.97	
• Female (n=98)	18	15-21	117.01	0.135†
Marital status				
• Single (n=52)	19.5	16-22.75	140.47	
• Married (n=185)	18	15-22	122.17	
• Divorced/Widow (n=13)	18	14.5-21.5	113.0	0.221‡
Educational level				
• Diploma (n=50)	15.5	11-19.5	90.95	
• Bachelor (n=142)	18	15-21	121.61	
• Master/equivalent (n=38)	22	17.75-24	172.45	
• PhD/Equivalent (n=20)	21	17.25-22	150.33	<0.001‡
Job title				
• Doctor (n=98)	20	16-23	141.58	
• Nurse (n=53)	18	15-21	118.12	
• Laboratory personnel (n=26)	18	16-20.25	118.33	
• Pharmacist (n=26)	16	14.75-19.25	93.90	
• Other (n=47)	18	14-22	121.73	0.029‡

†Mann-Whitney test   ‡Kruskal Wallis test

Table 4: Non-work-related concerns of the participants regarding COVID-19 pandemic

Work related concerns Health Professional	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Not applicable
People close to me would be at high risk of getting COVID-19 because of my job	20 (6.5)	63 (20.5)	51 (16.6)	106 (34.5)	57 (18.6)	10 (3.3)
I would be most concerned for myself	5 (1.6)	15 (4.9)	21 (6.8)	163 (53.1)	100 (32.6)	3 (1.0)
My family	8 (2.6)	19 (6.2)	27 (8.8)	183 (59.6)	68 (22.1)	2 (0.7)
My close friends	9 (2.9)	19 (6.2)	23 (7.5)	181 (58.9)	69 (22.5)	6 (2.0)
My work colleagues	6 (2.0)	27 (8.8)	74 (24.1)	139 (45.2)	53 (17.3)	8 (2.6)
People close to me would be worried for my Health	5 (1.6)	45 (14.7)	73 (23.8)	141 (45.9)	34 (11.1)	9 (2.9)
People close to me would be worried as they may get infected by me	55 (17.9)	100 (32.6)	32 (10.4)	77 (25.1)	15 (4.9)	28 (9.1)

Table 5: Factors associated with non-work-related concerns of healthcare workers about COVID-19 pandemic

Personal characteristics	Score of non-work-related concerns of COVID-19			P value
	Median	Interquartile Range	Mean rank	
Age (years)				
• ≤30 (n=87)	25	22-28	127.59	
• 31-40 (n=97)	26	22-28.25	135.34	
• 41-50 (n=45)	25	21-27	113.24	
• >50 (n=21)	26	22.75-28.5	138.08	0.392‡
Sex				
• Male (n=152)	26	22-29	135.81	
• Female (n=98)	25	21-28	118.65	0.069†
Marital status				
• Single (n=52)	26	22-28.25	136.05	
• Married (n=185)	26	22-28	129.31	
• Divorced/Widow (n=13)	24	21-25.5	93.08	0.167‡
Educational level				
• Diploma (n=50)	25	21-27	113.75	
• Bachelor (n=142)	25	22-28	124.08	
• Master/equivalent (n=38)	27	25-30	162.92	
• PhD/equivalent (n=20)	26	21.5-29	130.91	0.009‡
Job title				
• Doctor (n=98)	26	23.25-29	142.98	
• Nurse (n=53)	26	22-28	138.13	
• Laboratory personnel (n=26)	25.5	21-27.25	118.21	
• Pharmacist (n=26)	22	20-25	82.24	
• Other (n=47)	25	21-28	119.04	0.003‡

†Mann-Whitney test   ‡Kruskal Wallis test

Table 6: Perceived impact of COVID-19 pandemic on personal life and work health professional of healthcare workers

Perceived impact on personal life and work health professionals	Strongly disagree	Disagree	Not Sure	Agree	Strongly agree	Not applicable
I would be afraid of telling my family about the risk I am exposed to	55 (17.9)	100 (32.6)	32 (10.4)	77 (25.1)	15 (4.9)	28 (9.1)
People would avoid me because of my job	57 (18.6)	72 (23.5)	94 (30.6)	56 (18.2)	3 (1.0)	25 (8.1)
People would avoid my family members because of my job	72 (23.5)	82 (26.7)	90 (29.3)	36 (11.7)	6 (2.0)	21 (6.8)
I would avoid telling other people about the nature of my job	99 (32.2)	110 (35.8)	34 (11.1)	32 (10.4)	5 (1.6)	27 (8.8)
There would be adequate staff at my workplace to handle the increased demand	28 (9.1)	28 (9.1)	74 (24.1)	134 (43.6)	26 (8.5)	17 (5.5)
There would be more conflict amongst colleagues at work	30 (9.8)	95 (30.9)	79 (25.7)	56 (18.2)	6 (2.0)	41 (13.4)
I would feel more stressed at work	26 (8.5)	131 (42.7)	51 (16.6)	64 (20.8)	20 (6.5)	15 (4.9)
I would have an increase in workload	26 (8.5)	107 (34.8)	41 (13.4)	85 (27.6)	26 (8.5)	22 (7.2)
I would have to work Overtime	44 (14.3)	74 (24.1)	47 (15.3)	111 (36.2)	17 (5.5)	14 (4.6)
I would have to do work not normally done by me	52 (16.9)	103 (33.7)	63 (20.5)	68 (22.1)	16 (5.2)	5 (1.6)

Table 7: Factors associated with perceived impact of COVID-19 on personal life and work health professional of healthcare workers

Personal characteristics	Score of perceived impact of Covid-19 on personal life and work health professional			P value
	Median	Interquartile Range	Mean rank	
Age (years)				
• ≤30 (n=87)	26.5	22-30	161.81	
• 31-40 (n=97)	26	21.5-31	162.55	
• 41-50 (n=45)	24	21-29	139.65	
• >50 (n=21)	18	13.75-25.5	90.08	0.001‡
Sex				
• Male (n=152)	25	20-30	149.68	
• Female (n=98)	26	21-29.25	155.85	0.553†
Marital status				
• Single (n=52)	27	21-31.75	166.74	
• Married (n=185)	25	21-29	147.83	
• Divorced/Widow (n=13)	25.5	19-29	146.32	0.288‡
Educational level				
• Diploma (n=50)	22	15-28.75	120.59	
• Bachelor (n=142)	25	21-28.75	148.36	
• Master/equivalent (n=38)	29	24.5-32.5	189.87	
• PhD/equivalent (n=20)	26.5	23.75-33	180.90	<0.001‡
Job title				
• Doctor (n=98)	26	22-30	156.86	
• Nurse (n=53)	26	21-34.5	166.50	
• Laboratory personnel (n=26	25.5	22-27	138.73	
• Pharmacist (n=26)	23.5	19.5-27	126.95	
• Other (n=47)	25	17.75-29.75	144.28	0.234‡

†Mann-Whitney test   ‡Kruskal Wallis test

Table 8: Hospital and healthcare workers preparedness for COVID-19 among health professionals

Preparedness for COVID-19 pandemic health professionals	Strongly disagree	Disagree	Not Sure	Agree	Strongly agree	Not applicable
There is an infection control committee in my clinic	15 (4.9)	45 (14.7)	23 (7.5)	139 (45.2)	41 (13.4)	44 (14.3)
I have received training for infection control at my clinic	6 (2.0)	13 (4.2)	25 (8.1)	187 (60.9)	65 (21.2)	11 (3.6)
I received adequate personal protective equipment training	8 (2.6)	6 (2.0)	19 (6.2)	173 (56.3)	94 (30.6)	7 (2.3)
I have someone to turn to if unsure of use of personal protective equipment	9 (2.9)	14 (4.6)	45 (14.7)	175 (56.9)	53 (17.3)	11 (3.6)
I have been recommended by my clinic to receive coronavirus vaccination	7 (2.3)	3 (1.0)	14 (4.6)	138 (45.0)	140 (45.5)	5 (1.6)
There is infection control staff in my clinic	12 (3.9)	51 (16.6)	22 (7.2)	130 (42.4)	52 (16.9)	40 (13.0)
My clinic has a preparedness plan for COVID-19 outbreak	15 (4.9)	5 (1.6)	40 (13.0)	141 (45.9)	84 (27.4)	22 (7.2)
I have seen the plan to combat COVID-19 infection in my hospital	15 (4.9)	13 (4.2)	29 (9.4)	156 (50.8)	80 (26.1)	14 (4.6)
I am personally prepared for COVID-19 outbreak	20 (6.5)	10 (3.3)	37 (12.1)	138 (44.9)	95 (30.9)	7 (2.3)
Over the last 6 months, I have attended infection control training sessions	18 (5.9)	27 (8.8)	22 (7.2)	171 (55.6)	30 (9.8)	39 (12.7)
Over the last 6 months, I have participated in infection control audits	17 (5.5)	56 (18.2)	34 (11.1)	132 (43.0)	19 (6.2)	49 (16.0)
Over the last 6 months, I have attended infection control related meetings	21 (6.8)	30 (9.8)	22 (7.2)	167 (54.3)	30 (9.8)	37 (12.1)
Over the last 6 months, I have received coronavirus vaccination	10 (3.3)	16 (5.2)	10 (3.3)	130 (42.2)	138 (45.0)	3 (1.0)
Over the last 6 months, I bought anti-COVID-19 medication	41 (13.4)	96 (31.3)	27 (8.8)	100 (32.5)	24 (7.8)	19 (6.2)
Over the last 6 months, I bought masks	4 (1.3)	5 (1.6)	11 (3.6)	108 (35.2)	176 (57.3)	3 (1.0)

Table 9: Factors associated with preparedness of hospital and healthcare workers for COVID-19 pandemic

Personal characteristics	Score of preparedness for COVID-19 pandemic			P Value
	Median	Interquartile Range	Mean rank	
Age (years)				
• ≤30 (n=87)	56	47-60	150.03	
• 31-40 (n=97)	54	45-60.25	141.13	
• 41-50 (n=45)	58	50-62	160.62	
• >50 (n=21)	62	56-64	213.81	<0.001‡
Sex				
• Male (n=152)	56	47-61	152.0	
• Female (n=98)	57	48-62	157.29	0.613†
Marital status				
• Single (n=52)	54	44.5-60	136.20	
• Married (n=185)	57	50-62	159.02	
• Divorced/Widow (n=13)	56	44-66	161.23	0.166‡
Educational level				
• Diploma (n=50)	56	45-62	152.58	
• Bachelor (n=142)	57	49.5-62	164.30	
• Master/equivalent (n=38)	56	45-60	138.96	
• PhD/equivalent (n=20)	53	50-56.25	120.62	0.062‡
Job title				
• Doctor (n=98)	56.5	47-62	155.69	
• Nurse (n=53)	57	48-62	157.05	
• Laboratory personnel (n=26)	54	49.5-60.25	149.12	
• Pharmacist (n=26)	55.5	50.25-60.75	150.63	
• Other (n=47)	57	45-61	151.17	0.989‡

†Mann-Whitney test   ‡Kruskal Wallis test

Discussion

Since the time of declaring COVID-19 outbreak as a pandemic, by the World Health Organization (WHO), authorities in many countries all over the world, including Saudi Arabia considered it as a serious concern for both public and health care workers (64). Health care workers (HCWs) work closely in contact with infected individuals which put them under higher risk of infection.(65, 66). Additionally, the preparedness of the health care systems to the covid-19 pandemic on a national level has become essential in evaluating risks, and after that monitoring and limiting the viral spread (65). Therefore, the present study was carried out mainly to assess concerns, perceived impacts and preparedness of health care workers for epidemic and pandemic events in MOH hospitals in Jazan, Southern Saudi Arabia.

In the current survey, most of the HCWs were confident that their employer would look after their medical needs if they were to fall ill with COVID-19 and they agreed that the risk of contracting COVID-19 is part of their job. On the other hand, only a minority of them (13.3%) agreed that they would consider it acceptable if their colleagues resign because of their fear of COVID-19 and only 6.6% might look for another job or consider resigning because of the risk of contracting COVID-19 and 8.1% feel that they should not be looking after patients with COVID-19. In a recent study carried out in Italy (67), half of the HCWs were extremely worried about being infected with COVID-19.

Also, over 50% of HCWs in other places were afraid of being infected during the current pandemic (68, 69). A previous study reported that concerns of HCWs about being infected were a vital factor associated their unavailability to work during an epidemic(70). In the present study, only 13.7% of HCWs were afraid of falling ill with COVID-19. This could be attributed to receiving sufficient training. Furthermore, Muller et al reported that concerns of HCWs about being infected were among the commonest factors associated with higher risk of psychological health problems among them(71).

Regarding non-work related concerns, the majority of the HCWs in the present study (>80%) would be most concerned about themselves, their families, close friends, and to a lesser degree work colleagues. Additionally,

more than half of them agreed that people close to them would be worried for their health while 30% agreed that people close to them would be worried as they may get infected by them. In Italy (67), over 60% of the HCWs were concerned about infecting their family, friends and patients. The higher concern among our population could reflect a cultural difference between Saudi Arabia and Italy in this regards. Other studies carried out on the SARS and Avian flu outbreaks reported quite similar findings (72, 73).

Therefore, the quarantine of HCWs who deal with COVID-19 patients is mandatory to assure a safety sense for the HCWs and their families.

In the present study, relatively younger HCWs (31-40), and Master holders were more concerned about COVID-19. This might be explained by their lesser experience. Concerning job title, doctors expressed the highest concerns whereas pharmacists expressed the lowest concerns. This is quite logical as a result of the nature of their job in dealing directly and closely with infected patients. About half of HCWs reported that there would be adequate staff at their workplace to handle the increased demand as a result of the COVID-19 pandemic. Almost one-third of them would be afraid of telling their family about the risk they are exposed to. On the other hand, only 13.7% saw that people would avoid their family members because of their job and 12% would avoid telling other people about the nature of their job. In Italy (67) , "social ostracism" for HCWs and their families was reported by about 10% of HCWs. On the other hand, over 60% of HCWs during SARS epidemic reported "social ostracism" (74, 75). In another Italian study, discrimination was reported by almost a quarter of HCWs (76). This discrepancy between studies could be explained by the fact that the Italian study was carried out early in the pandemic (first wave) and in our community, we did not face an outbreak as happened in Italy, while in other communities, the studies were carried out during the later waves of the epidemic where the fear and concerns of people towards HCWs increased.

In the current study, a considerable proportion of HCWs (between 27.3% and 41.7%) would feel more stressed at work, have an increase in workload, have to work overtime, and have to do work not normally done by them. Other studies reported that about half of HCWs had to change their job demands and duties and increase workload during pandemics (67, 74, 77).

In the present study, it seems that on a personal level, HCWs were sufficiently prepared for the COVID-19 pandemic as above 80% of them bought masks and have received coronavirus vaccination, and had adequate personal protective equipment training and training for infection control at their clinics. Furthermore, about three-quarters of them have seen the plan to combat COVID-19 infection in their hospitals, have personally prepared for COVID-19 outbreak, had someone to turn to if unsure of use of personal protective equipment, and their clinic has a preparedness plan for COVID-19 outbreak.

These findings are not in line with those reported from a similar study carried out in Italy as 90% of the HCWs claimed that they were not prepared well from a professional point of view for this pandemic and above 80% of them described the training regarding COVID-19 and the use of PPE as inadequate (67). In Japan (78), hospital preparedness in the early phase of the pandemic was inadequate.

This difference could be due to the fact that the pandemic exploded extensively first in Italy and Japan, while other countries, including Saudi Arabia prepared themselves much better for the pandemic. Sufficient training and PPE availability with proper training on its utilization play an essential role in perception of safety at workplace. It has been shown previously that training and the provision of PPE were the two most important factors associated with preparedness of HCWs to work during pandemics (70).

The present study has some few limitations. Causal association between dependent and independent variables cannot be assured due to the cross-sectional nature of the study design. Self-administered nature of the study tool is subjected to bias in trying of the participants to over- or under-estimate the situation. Despite those limitations, the study could have important implications in exploring the concerns of physicians regarding the COVID-19 pandemic as well as to investigate their preparedness and the whole healthcare system in facing such pandemics.

Conclusion

Some work-related and non-work-related concerns of HCWs in Jazan regarding COVID-19 pandemic have been identified. Also, perceived impact of the pandemic on HCWs` work and professional life has been documented. Younger HCWs (31-40), and Master holders were more concerned about COVID-19. Regarding job title, doctors expressed the highest concerns whereas pharmacists expressed the lowest concerns. Their preparedness as well as the preparedness of the health care system to the COVID-19 pandemic was satisfactory in most aspects. Older HCWs were more satisfied with preparedness of hospitals to face the pandemic.

Therefore, to reduce the HCWs` concerns of epidemics and pandemics, stress management courses should be applied to them. Providing psychological support to HCWs during epidemics and pandemics is essential to help them in facing such situations. Improvement of preparedness of both HCWs and healthcare settings to epidemics and pandemics through more training and provision of PPE and organizing plans to face these situations efficiently will assist.

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Strategies For Enhancing the Quality of Pediatric Emergency Care: Addressing Overcrowding and Patients' Length of Stay

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Abstract

Background: High quality healthcare is an essential factor in maintaining and preserving the lives of people in Emergency departments. There are some factors that affect the level of care in the emergency departments, of which overcrowding and long Length of Stay (LOS) are prime causes Both these factors affect patients' satisfaction, cause delay in receiving the necessary treatment and cause the mortality rate to surge.

Aim: The current research aims to reveal how to address problems such as long length of stay and overriding in emergency departments. This was achieved through studying the literature and picking the appropriate solutions in evidence- based practice.

Methods: a review of the past literature to identify the strategies that can be used to overcome crowding and LOS in pediatric emergency departments. Scopus, Web of Science, Medline, PubMed, Science Direct, and Wiley online library were used. These databases were searched by the following key words "Emergency Department", "Emergency Room", "Crowding", "Overcrowding", "Length of Stay" and "Emergency Services". There were more than 100 articles that met the above-mentioned criteria. Papers that are theoretical or conceptual in nature, as well as comments, letters, and correspondence and observational study in which no intervention is used, were excluded.

Results: According to the ideal patient journey model, this model should be used, as mentioned in the literature section, in order to improve the level of health care in pediatric emergency departments. In our results, those strategies will be commented on in terms of their disadvantages and advantages according to our point of view.

Conclusion: Overcrowding in the emergency department is one of the current challenges, according to the studies mentioned, as in order to improve the care of children and patients, different strategies of high quality must be followed in order to reduce overcrowding and achieve effectiveness and efficiency.

Key words:
Quality, enhancement, strategies, pediatric, emergency, care

Introduction

There must be creative problems that mitigate overcrowding and long lengths of stay at our hospitals, especially public hospitals as they are more prone to these two factors than private ones. Rabin et al [1]. offered some solutions for the overcrowded conditions of patients and for improving the quality of care in the EDs; they include conducting studies to identify and / or project the gap between the real supply of health services and the existing demand; and establishing strategies to overcome the existing deficiencies in human resources, infrastructure, and equipment. The study also argued that some strategies must be designed, formulated, and implemented to optimize and increase the supply capacity of public hospitals. It is necessary to implement work plans aimed at optimizing the operational-benefit processes and to support the execution of the benefit processes that are carried out in the EDs, to guarantee the quality of care and safety of both patients and health and administrative personnel [2].

Any reduction of overcrowding in the emergency services will mainly benefit patients, as they will improve the healthcare quality. Mentzoni et al. [3] conducted a survey for healthcare personnel in charge of the emergency services and asked them about how to solve the problem of overcrowding. Faced with this, they indicated their desire for the emergency units to be able to efficiently and effectively attend to patients who are in real emergencies. The study also projected the idea of a differentiated cost since this can act as a negative incentive for potential patients and for unnecessary long LOS.

According to Barata, Brown, Fitzmaurice, Griffin, Snow, American Academy of Pediatrics Committee on Pediatric Emergency Medicine, & Emergency Nurses Association Pediatric Committee [4], employing best practices at all stages of the process can enhance emergency department treatment and flow. A number of factors can help to decrease emergency department crowding, enhance pediatric patient safety, and promote effective, efficient, timely, and patient-centered treatment. The 5-level triage system and nurse-initiated emergency care pathways at the point of initial assessment without delay in seeing a provider, fast tracking and cohorting of patients, clinical pathways, and responsive staffing as patients progress through the emergency department system are examples of these points of impact. While awaiting treatment for an emotional disease or a drug addiction problem, any patient may have specific plans in place. To develop and implement innovative ideas and techniques to both avoid and manage emergency department crowding, interdisciplinary collaboration research and education are required. All health care practitioners participating in the delivery of pediatric emergency care are actively involved in defining what pediatric quality care is and how to translate best practices into widely distributed and simple to follow recommendations [4].

Another study was conducted in 2013, under a title of "Challenges for the management of emergency care from the perspective of nurses" with the goal to look at the issues of managing care in a hospital emergency department from the perspective of nurses. They found that management of overcrowding, preserving quality of care, and using leadership as a management tool were the key concerns for nurses in managing care in emergency rooms. Reorganization of the health system to focus on emergencies, modifications in the flow of patient care, and introduction of nurse management training were all considered as solutions. This showed that the creation of new practices through collaborative and coordinated engagement with the emergency care network was aided by such challenges and tactics [5].

In addition to this, a study which focused on the influence of overcrowding in pediatric emergency rooms on patient and health-care system outcomes, and was conducted in 2019. It aimed to discover if there's a link between crowding and the risk of a variety of negative outcomes in children who visit a pediatric emergency room. The results showed, hospital admission within 7 days after an emergency department visit or death in children were not substantially linked to emergency room congestion. However, it was linked to higher hospital admissions for the sickest children at the index visit, as well as return trips to the emergency department for those who were not as ill. Over the 5-year research period, a total of 1 931,465 index visits occurred across study sites, with no variance in index visit hospital admission or median duration of stay. Hospital admission within seven days of release and 14-day mortality were also low across provinces (0.8% −1.5 % and <10 per 100 000 visits, respectively), and their relationship with mean departmental length of stay varied by triage categories and between locations but was not significant. At some sites, increasing departmental crowding increased the odds of hospital admission at the index visit among visits triaged to Canadian Triage and Acuity Scale (CTAS) score 1–2 (odds ratios [ORs] ranged from 1.01 to 1.08) and return visits among patients with a CTAS score of 4–5 discharged at the index visit (odds ratios [ORs] ranged from 1.00 to 1.06) [6].

Providers typically act as well-intentioned agents who recommend care only in the interest of patients. The demand on emergency care services is based on 4 factors; the first type of factor is related to the client (age, sex, education and occupation), the second is related to environmental factors (the social, physical and economic environment), the third is related to health care resources (supply, acceptability) and the fourth factor is related to payment (private insurance co., national health system, etc.).

CONCEPTUAL MODEL, THEORY, OR FRAMEWORK

Individual client factors
(e.g. age, sex, education, occupation)

Environmental factors   → **Demand** ←   Health care resource factors
(e.g. physical, economic,   (e.g. supply, access,
social, cultural)   acceptability)

Prepayment factors
(e.g. Private insurance, tax-based health insurance,
national health system, managed care, co-payment)
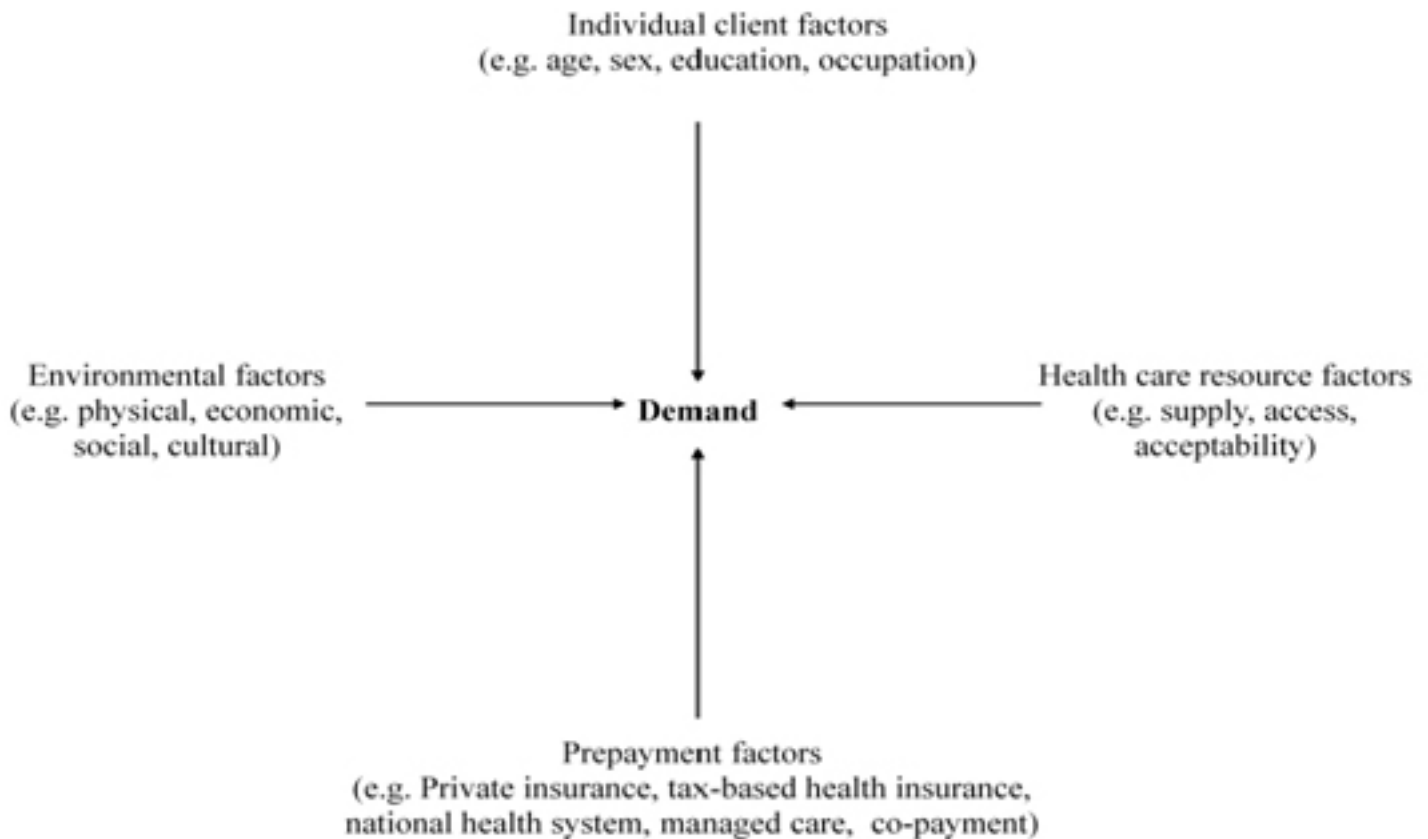
Figure 1: factors in the demand of health services

To improve the level of healthcare in the pediatric emergency departments, Ideal Patient Journey Model can be used. This model consists of the following strategies:

Strategy	Patient	Advantage
Streaming	Patient with minor injuries	Reducing crowding Improve the efficiency
Fast track	Non-emergency patients	Reducing the total number of patients
Team triage	Patients with complex situation	Increasing accuracy and efficiency in the initial process of patient evaluation
POC-US (Point of care ultrasonography)	High-risk patients	Improvement of nurses' ability to incorporate testing into their existing clinical care [7].

The procedures of Ideal Patient Journey Model include the following:

● Getting the right patient to the right place for their care that is supported by the right resources to ensure the smooth flow of patients through the ED.
● Early assessment and streaming to an appropriate MOC both within the ED and outside the ED. Designated specialty MOC for patient cohorts.
● A team approach to patient care.
● Ensuring tasks are performed by the provider who can most efficiently perform the task (where 'efficiency' balances quality, cost, and minimizing duplication of work).
● Coordinated patient care including between specialist consultants, diagnostics services and community care.
● Strong monitoring and evaluation measures.
● Adherence to the principles of the new models of care.

Figure 2: Ideal Patient Journey Model (2017)
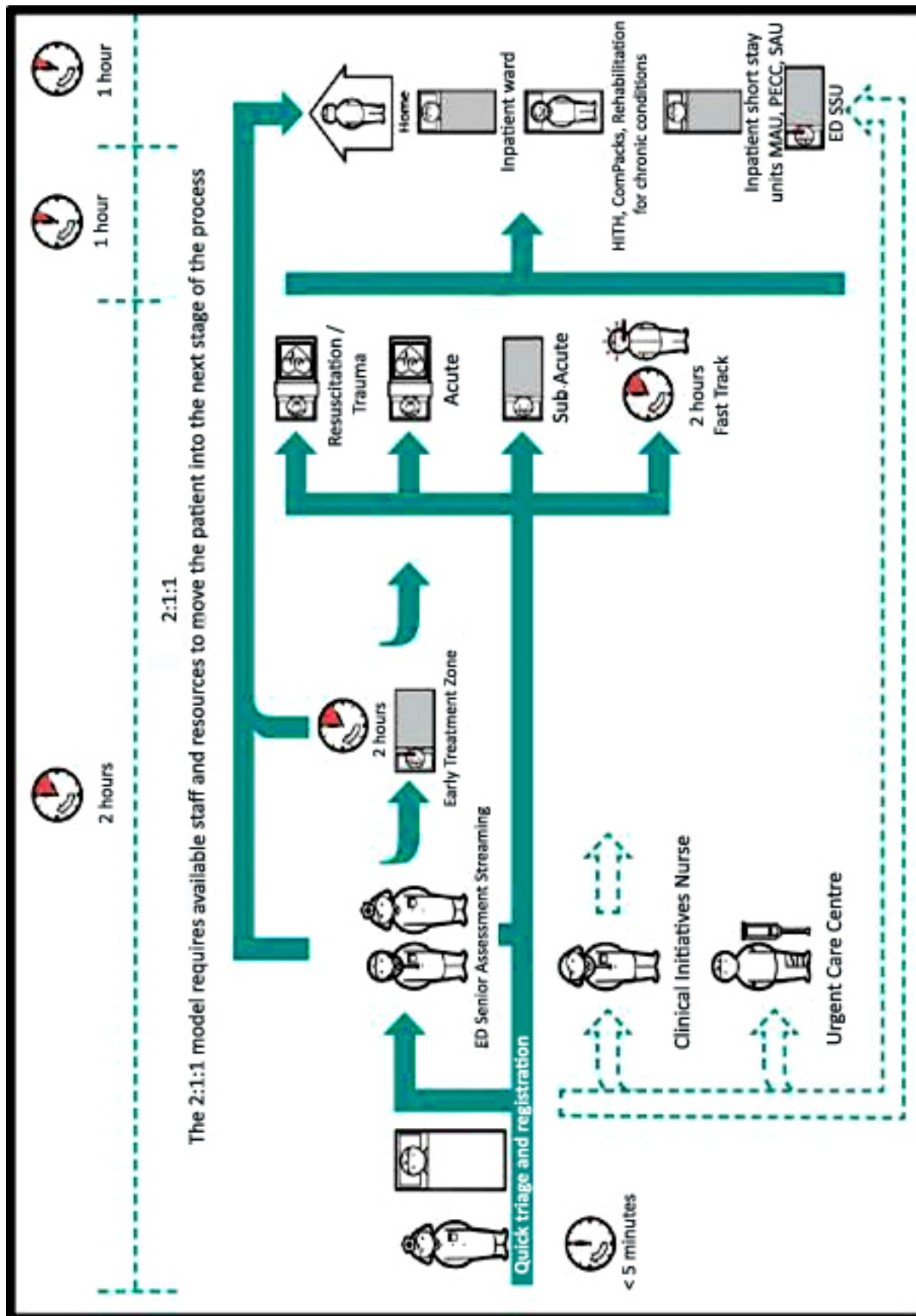
Another way to improve pediatric emergency care through eliminating crowding and LOS is using reverse triage [8]. According to Pollaris et al. [9], Reverse triage is "a way to rapidly create inpatient surge capacity by identifying hospitalized patients who do not require major medical assistance for at least 96 hours and who only have a small risk for serious complications resulting from early discharge".

Evaluation of evidence
The ideal patient journey model can be evaluated by ED leaders who can apply this model's strategies without deeply depending on external services. Both Ideal Patient Journey Model and Reverse Triage could be evaluated through experimental investigation. Both models were applied in past research and proved to be effective [7, 9].

Methodology

The study design was a review of the past literature to identify the strategies that can be used to overcome crowding and LOS at pediatric emergency departments. Scopus, Web of Science, Medline, PubMed, Science Direct, and Wiley online library were used. These databases were searched by the following key words "Emergency Department", "Emergency Room", "Crowding", "Overcrowding", "Length of Stay" and "Emergency Services".   There were more than 100 articles that met the above-mentioned criteria.

The following inclusion/exclusion criteria was applied:

● **Inclusion criteria**
▪ Studies Published between 2012-2021.
▪ Studies which were conducted in English.
▪ Research based on experimental or quasi-experimental studies or assessments of measures to avoid modern slavery, as well as observational studies that contain an intervention, that has been peer or non-peer reviewed. Cohort, longitudinal, case/control, cross-sectional studies/evaluations, qualitative studies or case studies (featuring interviews or focus groups), including post-evaluation only assessments and participatory approaches, are all examples of quantitative and qualitative observational research studies that are eligible for inclusion.

● **Exclusion criteria**
·Papers that are theoretical or conceptual in nature, as well as comments, letters, and correspondence.
• Observational study in which no intervention is used.

Data extraction
A reviewer looked through the databases and websites such as Scopus, Web of Science, Medline, PubMed, Science Direct, and Wiley online library. The reviewer examined downloaded titles and abstracts for possible inclusion in the Evidence Map after the first electronic search; the same reviewer also assessed the full text of possibly eligible studies against the inclusion criteria. We did not undertake duplicate screening of abstracts and full texts since reviewers individually examined abstracts

and full texts. A second reviewer evaluated reviewer study allocation at random to ensure uniformity of screening at the abstract stage. There were no noteworthy discrepancies discovered.

Data management
Abstracts from database searches were obtained, and the abstracts were de-duplicated. These submissions were evaluated to see if they should be included or not. Following the screening of all abstracts and the identification of relevant abstracts, the reviewer obtained the full text articles, which were then rescreened against the inclusion criteria.

Plan and implementation process
The used strategies depicted in the literature were surveyed and studied for identifying the best solutions for overcoming crowding and long LOS. A table depicting the advantages and disadvantages of each solution or strategy was charted.

Study limitations
▪ We could only include publicly available papers that could be accessed electronically, therefore internal hospital reports, older non-scanned hardcopies of documents like those in archives, and audio-visual materials were excluded.
▪ Different operational definitions of overcrowding and length of stay may have made it difficult to understand the results. We did not conduct our own assessments, instead relying on the authors' comments in their papers about emergency services.

Discussion

This systematic study attempted to give an overview of the studies related to the strategies used to improve the quality of pediatric emergency care by addressing overcrowding and length of patient stay.

These studies are almost identical with each other in terms of the challenges facing emergency departments and the strategies that are followed in order to improve effectiveness and efficiency and reduce overcrowding in order to achieve the safety of pediatric patients. Whereas, the study of Rabin et al. [1] emphasized the design of strategies and formulation of strategies from the deadline for their implementation with regard to improvement and increase in supply in public hospitals. This is done through the implementation of plans aimed at improving operational benefits processes in order to ensure quality [2]. This coincided in terms of the idea with another study conducted by Mentzoni et al [3], and emphasized how to solve the problem of overcrowding, as health care staff have a desire for emergency units to have the ability to care for patients efficiently and effectively.

According to Barata et al [4], indicating that the triage system consisting of 5 levels and emergency care pathways can be considered as the initial evaluation point because there is no delay in service delivery in addition to

Project Outcomes

Strategy	Advantage	Disadvantage
Streaming	Helps improve effectiveness and efficiency and reduces crowding	None
Fast track	This strategy helps to reduce the number of patients by following the correct course of the patient and following the fast course of treatment	None
Team triage	This helps to achieve accuracy and efficiency in patient assessment.	Taking too much time
POC-US (Point of care ultrasonography)	Improvement of nurses' ability to incorporate testing into their existing clinical care (Yarmohammadian, 2017).	None

rapid tracking and grouping of patients, clinical pathways, and responsive staff as patients progress through the emergency department system. Where the study agreed with previous studies that were mentioned was in the same idea in terms of developing innovative techniques and ideas in order to avoid crowding in the emergency department, and distributed recommendations for the participation of all participating health care practitioners in order to provide child care [4]. The study by Kelen et al. [8] agreed with this study in terms of using reverse triage to improve pediatric care in the emergency department, and a study by Polaris et al. [9] concurred with this study. (2016), and considered reverse triage as a method for establishing patient capacity by identifying hospitalized patients who do not require medical assistance significantly for at least 96 hours and who have only a low risk of serious complications from early discharge. It was based on the study conducted in 2013, which agreed with the previously mentioned studies in terms of the importance of managing overcrowding, in addition to maintaining the quality of care [5].

Another study agreed with previous studies in terms of overcrowding in the emergency department and its impact, as the study showed that overcrowding in emergency rooms has an impact on the outcomes of patients and children (Dwan et al., 2019). In my view, it is necessary to take into account the results of previous studies in terms of adopting good strategies and practices in order to solve the problem of overcrowding and reduce overcrowding in the emergency department in order to maintain the care of patients and children.

Conclusions

Overcrowding in the emergency department is one of the current challenges, according to the studies mentioned, as in order to improve the care of children and patients, different strategies of high quality must be followed in order to reduce overcrowding and achieve effectiveness and efficiency. Studies have proven the effectiveness of reverse triage, and the ideal patient journey is one of the good strategies in reducing crowding and overcrowding and achieving optimum patient care.

Implications for Nursing

Nursing and the health care team are among the teams that support the process of developing high quality strategies through their experience in practices in emergency departments. The training of nurses and giving them the opportunity to develop executive procedures in order to achieve high health care and reduce overcrowding in emergency rooms to maintain the safety of patients and children, leads to the development of implementation strategies based on education and experience.

Recommendations

Our study recommends adopting educational executive procedures in order to achieve effective practices in reducing overcrowding and achieving high quality in emergency departments for children and patients. Training of the health care team helps them to think of innovative techniques in terms of making effective strategies to achieve the effectiveness and efficiency of emergency departments and reduce overcrowding, in addition to improving patient care.

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Egg Allergy in Jeddah City – Saudi Arabia

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Abstract

Background: Egg is a major part of daily food. Egg hypersensitivity (EH) is a common problem. It's mainly due to IgE mediated type I hypersensitivity reaction.

Objective: to determine which clinical allergic diseases are associated more with EH.

Methods: This paper was performed on 143 patients during 2021 in Jeddah city. Only positive RAST sIgEs results to egg white or yellow were included. RAST results were taken from patient files retrospectively. Additionally, the associated allergic diseases were taken. RAST machine used was from Mediwiss German company which is an ELISA system. Results were collected in an Excel sheet. RAST results were correlated to clinical symptoms. Four tables were extracted.

Results: EH in adults in Jeddah is more common in males 85 (59.4%) than females 56 (39%), and more common in white egg 54 (37.8%) than yellow egg 28 (19.5%). Additionally, EH in Jeddah city is commonest in age of thirties, 40 (28%) and adulthood, 31 (21.7%). Most common allergic diseases which are associated with EH are: allergic rhinosinusitis, atopic dermatitis, asthma and food allergy respectively. EH class is mostly of mild severity.

Conclusions: EH in Jeddah city has several characteristics. It's more common in adults (especially males) in the age period between 20-40 years, and more common to white than yellow egg. Common allergic diseases associated with EH are allergic rhinosinusitis, atopic dermatitis, asthma and food allergy respectively. EH severity is mostly of mild class; however, this must be correlated with the clinical findings.

Key words: egg white allergy, egg white sensitization, asthma, allergic rhinitis, atopic dermatitis

Introduction

Type I hypersensitivity reaction is dependent on IgE secretion against triggering allergen. This reaction is immediate and may happen after 15 minutes to several hours. Appearance of allergic symptoms shortly after allergen exposure is crucial for this reaction history and considered as the cornerstone. Health professionals must ask about the duration between allergen exposure and the start of allergic symptoms. Patients can link easily as the time is short between the two occasions. This part of information makes the diagnosis of type I hypersensitivity reaction easy. EH is type I immediate hypersensitivity and happens a short time after eating egg (1).

Type I hypersensitivity reaction happens against egg proteins only. Egg white is the major source of egg proteins however, egg yellow has few. That is why type I hypersensitivity may happen with both white and yellow egg part. Egg white proteins are: ovomucoid (Gal d 1), ovalbumin (Gal d 2), ovotransferrin (Gal d 3), lysozyme (Gal d 4). Egg yellow protein is alpha-livetin (Gal d 5). The principal protein amount is ovalbumin, while the key allergenic protein is ovomucoid. That is why EH happens most commonly to ovomucoid. This means that the epitope structure is more important than the protein amount in triggering IgE mediated reactions (2).

High sIgE blood level (or positive skin prick test) to egg proteins without any clinical symptoms is called egg sensitization (not egg allergy). Egg sensitization alone isn't enough to start egg avoidance. Many infants are sensitized to egg proteins (not allergic to egg proteins). That is why detailed history is the key factor not laboratory tests. Health professionals must ask about the allergic symptoms which are associated with egg proteins sensitization. These allergic symptoms associated with egg proteins may appear in any system like skin, lung, GIT and respiratory system. Some mothers of egg sensitization infants do read laboratory results themselves and stop giving egg to their infants needlessly! Health professionals must educate mothers that this is considered as malpractice and may harm the infant's nutrition intake. Mothers must take the advice of stopping egg to their children from health professionals related to this field only (3).

Egg allergy is mainly a disease of infancy. Egg allergy in infants is a significant cause for further allergies in future if not treated early. In a prospective study in the UK, 981 egg allergy children were followed since birth up to four years. It was noticed that most of egg allergy infants will develop respiratory allergies at four years of age especially if they have eczema. Additionally, if not treated early, they will develop sensitization to inhalant allergens at four years. That is why it is essential to advise early egg avoidance in any infant with egg allergy (to sensitization) to prevent future drawbacks. Moreover, it's important to do in vitro RAST blood test to detect high sIgE levels against white or yellow egg proteins in any suspicious child (4).

Methods

This research was performed during the year 2021. It is a retrospective study which included only positive in vitro lab results of high sIgE levels against either white or yellow egg proteins. The sample of this scientific article was 143 positive in vitro lab results to egg proteins. Test used was in vitro RAST food blood test. It is a test of indirect immunofluorescence which measures the radioactivity to egg proteins (white or yellow). High radioactivity to egg proteins means high sIgE level to one of them (white or yellow) and is considered as a positive result. Positive results to either white or yellow egg proteins or to both were included in the study. RAST results were taken from the laboratory of a private allergy center in Jeddah city.

Allergic diseases diagnosis was added to this article's variables. Positive egg proteins in vitro blood results alone are egg sensitization only. Egg sensitization alone is of no clinical importance. That's why it is crucial to add the allergic diseases diagnosis with this research article. The combination of in vitro lab results plus the clinical allergic diagnosis is important to differentiate between atopy and allergy. Any positive egg sensitization result which is associated with any allergic disease diagnosis was considered as egg allergy. All patients were from Jeddah city in Saudi Arabia.

The RAST machine used the indirect immunofluorescence technique. This machine is from MEDIWISS Analytic GmbH company which is run by RIDA® system. It uses an electronic reader which can read the radioactivity level to allergens which will appear on digital picture in RIDA® X-Screen or RIDA® maXi-Screen. Level of radioactivity was measured by the reader. If radioactivity to certain allergens is high over a certain limit this wasconsidered as positive sensitization. This machine mentioned in this article is used to measure the radioactivity level to egg white or egg yellow proteins.

Results of both positive in vitro results to egg proteins plus allergic diseases diagnosis was collected in an Excel sheet. File numbers, age, sex of patients was added to excel sheet also. Four tables were extracted. Table-1 is about the demography of egg allergy in Jeddah city and was extracted from the column of patient's age. Table-2 relates to the age intervals of patients with egg allergy and was taken from the age column. This table will clarify which age interval that egg allergy is most common in. Table-3 is about the common clinical allergic diseases which are associated with egg sensitization. This table is important to define which allergic disease that egg proteins sensitization can trigger. Table-4 is about the different grade levels of egg sensitization severity. This table may reflect the most common level of egg sensitization in Jeddah city; however, this must be correlated with clinical findings.

Results

(Table-1) is about the demography of EH to both (white, yellow). EH in males is double that in females as 85 (59.4%), and 56 (39%) respectively. Egg white hypersensitivity is twice the egg yellow hypersensitivity as (37.8, 19.5%) respectively. Hypersensitivity to both white and yellow is nearly the same as egg white hypersensitivity (41.3%, 37.8%)respectively. These findings show that EH is more in males than females, and more in egg white or both in white and yellow.

Table 1: Gender distribution of egg hypersensitivity (EH)

	Female	Male	Total
White only	23 (16%)	31 (21.7%)	54 (37.8%)
Yellow only	15 (10.5%)	13 (9%)	28 (19.5%)
Both	18 (12.6%)	41 (28.7%)	59 (41.3%)
Total	56 (39%)	85 (59.4%)	

Table-2 shows prevalence of EH throughout age periods. Age of thirties, and age of adulthood which ranges between (20-40 years) are approximately 50% of cases. Commonest age period is age of thirties (30-40 years) and 40 (28%), followed by age of adulthood (20-30 years) as 31 (21.7%). Next common age intervals are middle age (40-50 years) as 23 (16%), infancy (0-1 year) as 16 (11.2%), childhood and early adulthood (10-20) as 14 (9.8%) respectively. EH is rare in late middle age and the elderly. These findings show that age of thirties and adulthood are the commonest for EH.

Table 2: EH distribution according to age periods

Age Periods	Age period name	Number of cases	%
0-10	Infancy	16	11.2
10-20	Childhood, early adult	14	9.8
20-30	Adulthood	31	21.7
30-40	Thirties	40	28
40-50	Middle age	23	16
50-60	Late middle age	10	7
≥60	Elderly	9	6.3

Table-3 is about common allergic diseases which are associated with EH. These diseases are associated with EH in three levels. The first level commonest allergic diseases linked to EH are allergic rhinosinusitis 56 (39.2%) followed by atopic dermatitis 48 (33.6%). Second level is asthma 36 (25.2%) and food allergy 34 (23.8%). Third and last level is urticaria and angioedema 26 (18.2%). Other clinical allergies like drug allergy, contact dermatitis, allergic conjunctivitis and anaphylaxis are rarely linked to EH.

Table 3: Which clinical allergies are more prevalent with EH?

	Number of cases	%	Level of association with EH
Allergic rhinitis, sinusitis	56	39.2	First level
Atopic dermatitis	48	33.6	
Asthma	36	25.2	Second level
Food allergy	34	23.8	
Urticaria, Angioedema	26	18.2	Third level
Drug Allergy	3		Rarely associated with EH
Contact dermatitis	7	11.2	
Allergic conjunctivitis	5		
Anaphylaxis	1		

Table-4 displays score severity of EH results. Positive results for EH are more common in egg white 113 (79%) than egg yellow 78 (60.8%). Commonest grade severity is in the interval of 1-3 as 83 (58%) for egg white, and 61 (42.6%) for egg yellow. This is followed by the grade below 1 as 27 (18.8%) for egg white, and 24 (16.7%) for egg yellow. More severe grades from 3-6 are rare. This means that egg white allergy is more than yellow; most of EH are of mild class. Still history is the cornerstone, and all these data must be connected to clinical findings.

Table-4: What is the link between AH and score severity?

Score Severity	Egg white		Egg yellow	
	Number	%	Number	%
≤1	27	18.8	24	16.7
1-3	83	58	61	42.6
3-5	3	2	2	1.4
5-6	0	0	0	0
Total	113	79	87	60.8

Discussion

Worldwide EH is a problem of infancy. Recent development of EH in adults is less common than infants and if happens it will be severe. However, we find that EH in Jeddah city is common in adults as well as infants. Table-2 show that the commonest age periods in Jeddah city for those who have EH are the age of (thirties, adulthood). This finding can happen because of the huge egg consumption in the age group in Saudi Arabia or because they have had EH since their childhood. This finding in Saudi concludes that adults are commonly sensitized to egg proteins like infants (5).

In Jeddah city, the most common allergic diseases which are associated with EH are rhinosinusitis and atopic dermatitis (Table 3). This result is compatible with the recent evidence, such as British guidelines of egg allergy. Allergic rhinosinusitis which is triggered by egg proteins can prove its relation to food. History is the key here. If allergic rhinosinusitis symptoms start a short time after egg intake this will prove type I IgE mediated hypersensitivity to egg. Rhinitis symptoms are similar to rhinorrhoea, nasal blockage, nose itching and sneezing. Sinusitis symptoms are like postnasal discharge and frontal headache which is aggravated by pending. Mothers are the most important person who can notice this relationship and answer the relevant changes (6).

Children with EH are at a great risk of atopic dermatitis. In a large study done in several European countries, inclusion data was any child between 1-2 years with positive (DBPC) double-blind placebo-controlled egg challenge. 86 infants were positive, and they were matched to 140 controls blindly. Results showed that the connection between EH and atopic dermatitis isn't the only association, but also atopic dermatitis becomes more severe if associated with EH. This means that with any child with atopic dermatitis it is a good idea to search for EH especially if the atopic dermatitis is severe (7).

In Saudi Arabia, atopic dermatitis and EH association is compatible with the European findings. In a retrospective study done in Riyadh city on 421 allergic patients, 60 patients were positive for EH. This means that they have high sIgE level to egg and chicken meat. 55% of positive samples were atopic dermatitis patients. Allergy to egg white was more than yolk. This association between atopic dermatitis and EH is found more in food allergy patients. This means that in any patient with food allergy and atopic dermatitis it is crucial to search for EH (8).

Egg allergy can be diagnosed in several ways. The most important tool is detailed history. The key point in history taking is the appearance of allergy symptoms shortly after egg intake because this is IgE immediate type I hypersensitivity reaction. Lab tests used for egg allergy diagnosis are either in vitro or in vivo tests. In vivo test is a skin prick test for white or yellow eggs. Positive skin prick test is skin wheal and induration to egg drop, 15 minutes after prick. In vitro test is ELISA system which measures sIgE blood level of white or yellow eggs. Definite egg allergy diagnosis can be made with allergy symptoms appearance shortly after eating egg plus either positive in vivo or in vitro tests for white or yellow egg(9).

In most of the cases, egg allergy diagnosis is clear by history and lab tests. However, in a few cases diagnosis is still vague (ex: contradictions between history and tests). In these cases, we need to do oral egg challenge test. Here we admit the patient to a one day care unit which is already prepared with all requirements for anaphylaxis. We used to give the patient gradually increasing oral egg doses and we monitor the response and vital signs. Positive oral egg challenge test is a significant diagnosis. Positive oral egg challenge is allergy symptoms appearance soon after egg eating. If any symptoms of anaphylaxis appear, patient will be given suitable anaphylaxis drugs immediately (10).

Egg avoidance is the primary main treatment of egg allergy especially in eczematous children. In a randomized study performed in the UK, 55 eczematous children were advised to avoid egg. They were randomized against control group with no egg avoidance advice. After 4 weeks of follow up, it was noticed that eczematous areas were decreased in children who avoided egg in comparison to children who didn't. This can give a clear message that egg avoidance advice can benefit most eczematous children. Empirical avoidance for one month and monitoring child eczema is logical thinking(11).

In most of the cases, egg allergy can be relieved on simple egg avoidance. However, in a few cases improvement will not happen and referral to a dietician is needed. Other indications of referral to dietician are severe egg allergy symptoms, multiple food allergies or if there is a plan to reintroduce egg. Dietician roles are to educate mothers about foods which don't contain egg, to clarify which vitamins and minerals are needed with egg avoidance and to supervise the process of egg reintroduction. Egg is present in many foods and nutrients and mothers must be well educated about this issue (12).

Most egg allergy cases will be alleviated by egg avoidance, but in a few resistant cases we will need egg sublingual immunotherapy. It's a new promising treatment modality. When sublingual drops are absorbed, it will go to local lymph nodes, the place where the process of immunological modulation happens. With time, egg tolerance will replace the egg allergy cascade. Egg immunotherapy is given as loading and maintenance doses. Loading doses are frequent daily doses which build up quickly in a few months course. Maintenance doses are distance fixed doses that will continue for several years. Egg tolerance will happen after several years. This means that patients can eat egg without any allergic symptoms (13).

What is the prognosis of egg allergy?
The answer is that most of egg allergy children will tolerate egg gradually with time. In a USA retrospective study, egg tolerance was considered to be if child can tolerate pure oral egg without allergy symptoms. After setting inclusion criteria, many children's files were revised. Children files review showed that as they get older, they will tolerate egg better. However, there are a few resistant cases which will not improve with time like those who have continuous high sIgE levels to egg or those who have concomitant allergic diseases especially food allergies. sIgE levels against egg can be used for monitoring, as a prognostic factor and for parents' education (14).

Are child vaccines which include egg as part of their constituents, advised to be given to a child with egg allergy or not? Is there any risk of anaphylaxis? Child vaccines which include egg are MMR, influenza and yellow fever. Our role as health professionals is to emphasize to parents that their child with egg allergy should take these vaccines in most cases and their conservative avoidance is harmful and should stop. However, any child with severe egg allergy symptoms or who have had previous anaphylaxis should avoid these vaccines. There are some studies which suggest that skin prick test to egg can be done before taking the vaccine (15).

What about breastfeeding of child with egg allergy, is it advisable or not?
The answer is that it's a mistake to avoid breastfeeding and shift to artificial milk just because a child is allergic to egg! Health professionals must clarify this to mothers in clear messages that they must continue breastfeeding. Can egg be secreted in mothers breast milk or not? Mothers who breastfed an egg allergy child must avoid eating egg or not? The point we can emphasize is that mothers should avoid egg eating if their child has atopic dermatitis or if the child has develops=ed any previous reaction to egg or its products (16).

Conclusions

EH in Jeddah city has several characteristics. It's more common in adults (especially males) in the age period between 20-40 years, and more common to white than yellow egg. Common allergic diseases associated with EH are allergic rhinosinusitis, atopic dermatitis, asthma and food allergy respectively. EH severity is mostly of mild class; however, this must be correlated with the clinical findings.

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Prevalence of childhood obesity, its associated risk factors and parental misperception of their child's actual weight among Saudi children in Yanbu city, Saudi Arabia 2021: A cross-sectional study

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Abstract

Aim of Study: To determine prevalence of childhood obesity among attendants of primary health care centers, its associated risk factors, and to identify parental misperceptions regarding their children's actual weight.

Methods: Following a cross-sectional study design, at primary health care centers (PHCC) in Yanbu Al-bahr City, Saudi Arabia, the study sample included 80 parents of Saudi healthy -school children aged 6 to 12 years. The study questionnaire included sociodemographic data of children and their parents, anthropometric data of children, the 1st section of the Arabic version of Comprehensive Feeding Practices Questionnaire (CFPQ), the child's lifestyle behavior assessment and parent's perception regarding their child's weight.

Results: Prevalence of overweight among children was 5%, while 13.8% were obese. Fast foods, sweets and soft drinks were commonly consumed by children, while 36.3% did not practice any sports. Children's BMI grades did not differ significantly according to their or their parents' sociodemographic factors, or their dietary habits, but differed according to their parents' educational level (p=0.038), with highest prevalence of obesity among less educated parents. Only 7.5% of parents perceived their children as overweight, while 1.3% perceived their children as obese. Parents' perception regarding their children's weight did not differ according to how they judge their weight, the way they weigh their weight or their source of information about their children's weight. Most parents (56.3%) incorrectly perceived their children's weight.

Conclusions: Prevalence of obesity among primary school children in Yanbu Albahr City is high. Unhealthy dietary habits, and physical inactivity are common among Saudi children. Most parents misperceive their children's actual body weight. Children's BMI grades differ significantly according to their parents' educational level, with highest prevalence of obesity among less educated parents.

Key Words: Childhood obesity, risk factors, dietary habits, physical activity, parents' perception about children's weight, Saudi Arabia.
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Introduction

Obesity is the abnormal or excessive fat accumulation that may impair health(1). Body mass index (BMI) is a measure used to determine overweight and obesity. For children and teens, BMI is age- and sex-specific. Hence, it is often referred to as BMI-for-age, and the child's weight status is determined using an age- and sex-specific percentile for BMI. Overweight is defined as a BMI > 85th percentile and < 95th percentile for children of the same age and sex, while obesity is defined as a BMI >95th percentile for children of the same age and sex (2).

Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016 (1). Moreover, levels of obesity are growing across the globe and have raised concerns for healthcare professionals and policymakers (3). The World Health Organization recognized childhood obesity as the significant challenge of the 21st century, as the number of overweight children under the age of 5 years is projected to be more than 42 million (4). In Saudi Arabia, overweight and obesity among children are considered serious public health problems. Their prevalence is on the rise, and the need for interventions is becoming urgent(5).

Obesity decreases the quality of life and life expectancy considerably and accounts for billions of dollars in the provision of healthcare (4). Childhood obesity is associated with a higher chance of obesity, premature death and disability in adulthood. In addition to increased future risks, obese children experience breathing difficulties, increased risk of fractures, hypertension, early markers of cardiovascular disease, insulin resistance and psychological effects (1).

The fundamental cause of obesity and overweight is energy imbalance between calories consumed and calories expended. Therefore, it is necessary to study the association between different dietary habits, lifestyle behavior and childhood obesity so that we can under the light of our results, predicate solutions and preventative measures. (1)

It is to be noted that, when parents recognize their child's actual weight status as being unhealthy, they can provide the needed support in achieving a healthy weight. However, a meta-analysis found that 50.7% of parents underestimated their overweight/obese child's weight status (4). This misperception of children's actual weight status is of great significance since parents have the potential to play a vital role in influencing positive behavior and thus curtail weight gain in their children (6). However, only a few studies have explored the underlying factors that influence parental misperception of their children's actual weight status (7-9).

Study rationale:
The researcher has observed that parents frequently misperceive their obese or overweight children as normal. Therefore, the researcher is highly interested in proving that poor health literacy is a factor that affects parents' misperceptions regarding their children's obesity, and in exploring risk factors associated with childhood obesity to be able to recommend effective management measures. Moreover, since data regarding Saudi parents' perception of their children's actual weight in Yanbu city, Saudi Arabia, is lacking, it is important to assess parents' misperception regarding their children's weight.

Aim of Study
To determine prevalence of childhood obesity among attendants of primary health care centers, its associated risk factors, and to identify parental misperceptions regarding their children's actual weight, in Yanbu city, Saudi Arabia, 2021.

Objectives:
1. To determine prevalence of obesity among Saudi children attending primary health care centers in Yanbu city, Saudi Arabia.
2. To assess common dietary habits of children.
3. To explore the association between childhood obesity and socio-demographic characteristics of children and their parents, in addition to children's dietary habits and lifestyle behaviors.
4. To investigate the level of parent's misperception regarding their children's actual body weight.
5. To find out the association of childhood obesity with parents' misperception.
6. To determine the association of parent's misperception about their children's weight with children's and parents' demographic characteristics as well as parents' health literacy.

Methodology

Following a cross-sectional study design, at primary health care centers (PHCC) in Yanbu City (Yanbu Albahr), Saudi Arabia, the study sample included 80 parents of Saudi healthy preschool children aged 6 to 12 years. Non-Saudi parents of children with psychiatric problems or chronic diseases (e.g., diabetes, hypertension, asthma), or those receiving corticosteroids, or immunocompromised children were excluded.

The sample size was determined to be 80 according to Dahiru et al. (10) with:
• 95% confidence interval, with Z_α=1.96
• A 30% anticipated population proportion of obesity among the study group (11)
• An absolute precision of 0.1

All PHCCs in Yanbu Albahr City were chosen (N=7) as the study setting. At each PHCC, we interviewed 10-12 parents of children fulfilling the inclusion criteria. In case we had more than one child who met inclusion criterion, the data of the younger child was included.

After obtaining the ethical approval (No. 115-2021, on 16/6/2021, Al-Madina Al- Monowwarah Region), a paper-based, self-administered, screening questionnaire (in simple Arabic language) was designed by the researcher.

The study questionnaire consisted of the following parts:

A) Sociodemographic data: Child's age, gender, and his/her last scholastic achievement, in addition to parent's age, weight, height, marital status, education level, employment status, family size, average monthly income, and parents' consanguinity.

B) The anthropometric data of children were measured for children attending the Well-Baby Clinic, by the triage nurse. The reliability of measurements was assessed by repeated measurements on the same child with an intra-class correlation coefficient of >0.95. The anthropometric data of children including height, weight and waist circumference were assessed as follows:

• Body weight was measured to the nearest 0.1 kg using a calibrated digital Seca scale, while the children were wearing light clothing with no shoes.

• The standing height was measured to the nearest 0.1 centimeter without shoes using a calibrated stadiometer.

• Waist circumference (WC) was measured horizontally at the navel's level to the nearest 0.1 cm, employing a non-stretchable measuring tape.

• Body mass index (BMI) was calculated as weight in kilograms over the height squared in meters. Child's BMI was classified according to the CDC age- and sex-specific growth chart with plotted percentile rankings. Underweight children are those with ranking less than 5th percentile; ideal weight children are those with a ranking of 5th percentile to less than the 85th percentile; overweight children are those with ranking from 85th to less than the 95th percentile; and obese children are those with ranking equal to or greater than the 95th percentile (2).

C) The WHO recommendation (12) was used for assessment and classification of parents' BMI classification, as follows:

• Underweight, if BMI <18.5 kg/m^2,

• Normal weight, if BMI is 18.5 - 24.9 kg/m^2,

• Overweight if BMI is 25.0-29.9 kg/m^2

• Obese, if is BMI ≥30.0 kg/m^2.

D) The dietary habits were investigated using the 1st section of the Arabic version of Comprehensive Feeding Practices Questionnaire (CFPQ). It comprises 12 questions and it is a reliable and valid instrument for assessing dietary habits and maternal feeding practices of children aged 6-12 years (13).

E) The child's lifestyle behavior was assessed using the physical activity and life style section of a questionnaire adapted from another study, which consists of 14 questions. The reliability of the questionnaire has been shown to be acceptable (14).

F) Parent's perception regarding their child's weight was assessed by the question that has been used by several international studies for the same purpose (15-17): *"I feel that my child is a) underweight, b) slightly underweight, c) about the right weight, d) overweight, or e) obese".* However, due to the limited sample size in the present study and that the literature demonstrating that parental underestimation is more problematic among normal and overweight/obese children (4), the category 'slightly underweight' was omitted by the researcher. Moreover, in the light of literature review, two questions were added

to assess health literacy as a factor effecting parents' misperception of their children's actual weight. We defined misperception as: Parents incorrectly recognizing their child's weight in both normal weight and overweight groups (18).

A pilot study was conducted to test the clarity of the study questionnaire and the time needed to fill in the questionnaire. The questionnaire contents proved to be clear, well-understood and required about 15 minutes to be completed. Participants' data in the pilot study were not included in the final analysis.

Copies of the study questionnaire were distributed to potential participant parents, accompanied by a consent form, which also included study objectives, confidentiality of collected data, voluntary participation, all responses are anonymous, and their right to withdraw without any effect on received healthcare. Data were kept in a personal computer with password protection, and after its completion, data were kept in safe storage media which is in a safe locker.

The study data were analyzed using the Statistical Package for Social Sciences (IBM, SPSS version 26). The data were reported as frequencies and percentages. Kolmogorov–Smirnov test was applied to assess normality of data distribution. Non-parametric statistical tests were applied, i.e., Mann-Whitney to compare two groups and Kruskal-Wallis to compare more than two groups. P-values less than 0.05 were considered as statistically significant.

There was no conflict of interest or financial support. This study was completely funded by the researcher.

Results

Table (1) shows that about one-third of children (38.8%) were aged 9-12 years and almost two-thirds (62.5%) were girls. About two-thirds of children's academic achievements were excellent (67.5%). Age of 48.8% of participant parents was 29-37 years and the majority (95%) were currently married. Almost half of participant parents (47.5%) were university educated, while 55% had governmental jobs. Almost half of participants (47.5%) had a family monthly income of 5000-10000 SR. One quarter of children's parents were relatives.

Table 1: Demographic characteristics participant parents and their children (n = 80)

Personal characteristics	No.	%
Age groups (in years)		
• <6-9	49	61.3
• >9	31	38.8
Gender		
• Boys	30	37.5
• Girls	50	62.5
Academic achievement		
• Good	6	7.5
• Very good	20	25.0
• Excellent	54	67.5
Age group of child's parent (in years)		
• 29-37	39	48.8
• 38-46	30	37.5
• 47-56	11	13.8
Parents' current marital status		
• Married	76	95.0
• Divorced	3	3.8
• Widow	1	1.3
Parent's educational status		
• Illiterate	2	2.5
• Primary	8	10.0
• Elementary	2	2.5
• Secondary	16	20.0
• Diploma	14	17.5
• University	38	47.5
Parents' occupation		
• Governmental job	44	55.0
• Private sector employee	9	11.3
• Retired	2	2.5
• Housewife	25	31.3
Family monthly income (SR)		
• <5000	18	22.5
• 5000-10000	38	47.5
• >10000	24	30.0
Parents' degree of consanguinity		
• None	60	75.0
• Cousins	15	18.7
• Other	5	6.3

Figure 1: Distribution of children's body mass index
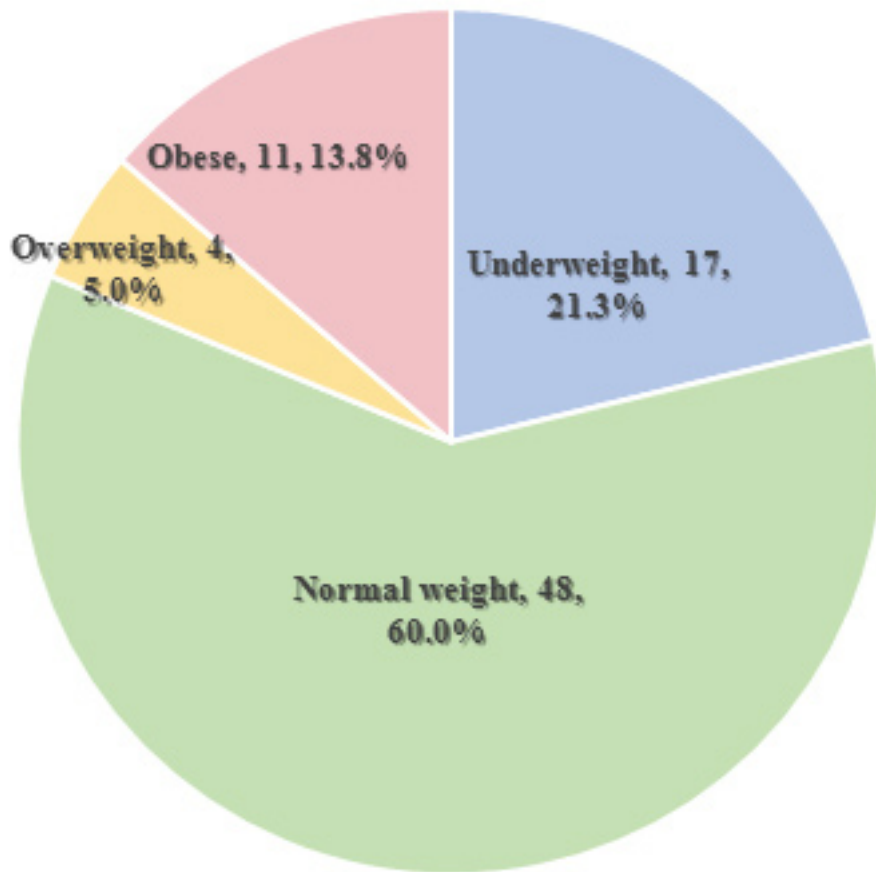
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Figure 1 demonstrates that 5% of children were overweight, while 13.8% were obese.

Table 2: Dietary habits of children

Dietary habits of children	Responses	No.	%
Weekly consumption of fast foods (e.g., burger, broast, pizza, French fries)	Once	48	60.0
	Twice	18	22.5
	Three times	9	11.3
	> three times	5	6.3
Weekly consumption of sweets (e.g., donuts, pancakes, basbousa, chocolate, ice cream, cake)	Once	32	40.0
	Twice	20	25.0
	3 times	14	17.5
	> 3 times	14	17.5
Weekly consumption of soft drinks (e.g., Pepsi, 7-Up, Merinda, Shani) by your child	Once	66	82.5
	Twice	7	8.8
	3 times	5	6.3
	> 3 times	2	2.5
Weekly consumption of fatty foods (chicken skin, fried foods, kabsa)	Once	50	62.5
	Twice	19	23.8
	3 times	6	7.5
	> 3 times	5	6.3
To what extent do you monitor the quantities of sweets that the child consumes (e.g., cakes, ice cream, chocolate, candies)?	Never	2	2.5
	Usually	7	8.8
	Often	28	35.0
	Always	13	16.3
	Sometimes	30	37.5
To what extent do you monitor the quantities of snacks that the child consumes (e.g., chips, Al-Durra chips).	Never	1	1.3
	Usually	8	10.0
	Often	26	32.5
	Always	20	25.0
	Sometimes	25	31.3
To what extent do you monitor the amounts of fatty (high-fat) foods the child consumes?	Never	4	5.0
	Usually	10	12.5
	Often	22	27.5
	Always	20	25.0
	Sometimes	24	30.0
To what extent do you monitor the quantities of drinks rich in sugar that the child consumes powdered juices? (e.g., Pepsi, Tang, 7-Up)?	Never	6	7.5
	Usually	5	6.3
	Often	18	22.5
	Always	20	25.0
	Sometimes	31	38.8

Table 2 continued: Dietary habits of children

Dietary habits	Responses	No.	%
Do you let the child eat anything he wants?	Never	11	13.8
	Usually	21	26.3
	Often	30	37.5
	Always	10	12.5
	Sometimes	8	10.0
When a child is upset, is giving him something to eat the first thing you do?	Never	32	40.0
	Usually	22	27.5
	Often	17	21.3
	Always	8	10.0
	Sometimes	1	1.3
Do you give the child food if the child is upset or bored even if the child is not hungry?	Never	37	46.3
	Usually	27	33.8
	Often	9	11.3
	Always	5	6.3
	Sometimes	2	2.5

Table (2) shows that fast foods were consumed more than three times weekly by 6.3% of children. Sweets were consumed more than 3 times weekly by 17.5% of children. Soft drinks were consumed more than 3 times weekly by 2.5% of children. Fatty foods were consumed more than 3 times weekly by 6.3% of children. Only 16.3% of parents always monitor the quantities of sweets consumed by their children, while 25% of parents monitor the quantities of snacks, fatty foods or drinks rich in sugar consumed by their children. Only 13.8 never let their children eat anything they want. When the child is upset, 10% of parents start giving their children something to eat, while 6.3% of parents always give their children food when they feel upset or bored even if the children were not hungry.

Table (3) shows that more than one-third of children (36.3%) do not practice any sports, mainly as a result of being not used to (25%), or due to the lack of a suitable place for its practice (8.8%). Running, football and swimming were the most commonly practiced sports (20%, 10% and 8.8%, respectively), in addition to other kinds of sport practiced by children (16.3%). About one-third of children (36.3%) practice sports only for 30 minutes, and the main places for practicing sports were their homes or in the street (33.8% and 16.3%, respectively). Most children had bicycles (68.8%), which were being ridden by children mainly for about an hour (41.3%). Most children go to their schools by car (76.3%). Their usual walking pace was either slow or medium (32.5% or 45%, respectively). Their home activity is mainly active (40%), but most of them spend about two hours or more daily watching TV (33.8% and 32.5%, respectively), and more than two hours daily using their computers (47.5%). Playing was the activity being spent by most children (72.5%).

Table 3: Children's lifestyle behaviors

Lifestyle behaviors	Responses	No.	%
Does the child do any sports?	Yes	51	63.7
	No	29	36.3
Why doesn't your child practice any sports?	Laziness	3	3.8
	Not used to doing sports	20	25.0
	No available place	7	8.8
	Other	6	7.5
What kind of sport is being practiced by your child?	Football	8	10.0
	Running	16	20.0
	Swimming	7	8.8
	Table tennis	1	1.3
	Karate	1	1.3
	Several games	6	7.5
	Other	13	16.3
How many hours of daily practice?	30 minutes	29	36.3
	60 minutes	10	12.5
	90 minutes	9	11.3
	120 minutes	5	6.3
Where does your child practice sports?	At home	27	33.8
	In the street	13	16.3
	In the club	12	15.0
Does your child have a bicycle?	Yes	55	68.8
	No	25	31.3
How long does he spend riding a bike per day	15 minutes	3	3.8
	30 minutes	15	18.8
	60 minutes	33	41.3
	90 minutes	2	2.5
How does the child go to school?	Walking	7	8.8
	By car	61	76.3
	Other	12	15.0
What is the child's usual walking pace?	Slow	26	32.5
	Medium	36	45.0
	Fast	15	18.8
	Very fast	3	3.8

Table 3 Continued: Children's lifestyle behaviors

Lifestyle behaviors	Responses	No.	%
What is the child's activity rate at home and with the family?	Lazy	3	3.8
	Acceptable	18	22.5
	Medium	27	33.8
	Active	32	40.0
How long does a child spend watching TV per day?	0 minutes	9	11.3
	60 minutes	18	22.5
	120 minutes	27	33.8
	>120 minutes	26	32.5
How many hours does the child spend using the computer per day?	0 minutes	21	26.3
	60 minutes	14	17.5
	120 minutes	7	8.8
	>120 minutes	38	47.5
How many hours does a child spend in electronic games per day?	0 minutes	16	20.0
	60 minutes	28	35.0
	120 minutes	12	15.0
	>120 minutes	24	30.0
How does the child spend most of his time?	Sitting	16	20.0
	Walking	6	7.5
	Playing	58	72.5

Table 4: Association between childhood obesity with children's socio- demographic factors

Socio-demographic Factors	Responses	Body mass index (BMI)				Mean Rank	P value
		Underweight No. (%)	Normal No. (%)	Overweight No. (%)	Obese No. (%)		
Child age	5-8	16/49(32.7)	23/49(47)	3/49(6.1)	7/49(14.2)		
	9-12	1/31(3.3)	25/31(80.6)	1/31(3.2)	4/31(12.9)	37.27	0.075
Child gender	Boys	7/30(23.3)	16/30(53.3)	1/30(3.3)	6/30(20)		
	Girls	10/50(20)	32/50(64)	3/50(6)	5/50(10)	39.91	0.739
Child's last academic achievement	Good	2/6(33.3)	4/6(66.7)	0/6(0.0)	0/6(0.0)		
	Very good	4/20(20)	12/20(60)	1/20(5)	3/20(15)	41.29	0.471
	Excellent	11/54(20.4)	32/54(59.3)	3/54(5.6)	8/54(14.8)		

Table 4 shows that children's BMI grades did not differ significantly according to their sociodemographic factors.

Table 5: Association between childhood obesity and parent's socio- demographic factors

Parents' socio-demographic factors	Responses	Body mass index (BMI)				Mean Rank	P value
		Underweight No. (%)	Normal No. (%)	Overweight No. (%)	Obese No. (%)		
Parent's age (in years)	29-37	9/39(23.1)	19/39(48.7)	4/39(10.3)	7/39(17.9)	42.68	0.541
	38-46	7/30(23.3)	20/30(66.7)	0/30(0.0)	3/30(10)		
	47-56	1/11(9.1)	9/11(81.8)	0/11(0.0)	1/11(9.1)		
Marital status	Married	15/76(19.7)	47/76(61.8)	4/76(5.3)	10/76(13.2)	40.86	0.051
	Divorced	2/3(66.7)	1/3(33.3)	0/3(0.0)	0/3(0.0)		
	Widow	0/1(0.0)	0/1(0.0)	0/1(0.0)	1/1(100)		
Educational level	Illiterate	0/2(0.0)	1/2(50)	0/2(0.0)	1/2(50)	43.68	0.038
	Primary	1/8(12.5)	3/8(37.5)	0/8(0.0)	4/8(50)		
	Intermediate	0/2(0.0)	2/2(100)	0/2(0.0)	0/2(0.0)		
	Secondary	5/16(31.2)	11/16(68.8)	0/16(0.0)	0/16(0.0)		
	Diploma	6/14(42.8)	6/14(42.8)	1/14(7.2)	1/14(7.2)		
	University	5/38(13.2)	25/38(65.8)	3/38(7.9)	5/38(13.1)		
Occupation	Government	11/44(25)	27/44(61.4)	0/44(0.0)	6/44(13.6)	37.94	0.209
	Private	4/9(44.5)	3/9(33.3)	1/9(11.1)	1/9(11.1)		
	Retired	0/2(0.0)	2/2(100)	0/2(0.0)	0/2(0.0)		
	Housewife	2/25(8)	16/25(64)	3/25(12)	4/25(16)		
Monthly income (in SR)	<5000	4/18(22.2)	9/18(50)	0/18(0.0)	5/18(27.8)	41.09	0.591
	5000-10000	7/38(18.4)	24/38(63.2)	3/38(7.9)	4/38(10.5)		
	>10000	6/24(25)	15/24(62.5)	1/24(4.2)	2/24(8.3)		
Parents' consanguinity	Cousins	3/15(20)	11/15(73.3)	1/15(6.7)	0/15(0.0)	41.34	0.838
	None	13/60(21.7)	34/60(56.7)	3/60(5)	10/60(16.6)		
	Others	1/5(20)	3/5(60)	0/5(0.0)	1/5(20)		

Table 5 shows that children's BMI grades differed significantly according to their parents' educational level (p=0.038), with highest prevalence of obesity among less educated parents (i.e., illiterate or primary education). However, children's BMI grades did not differ significantly according to other parents ' characteristics.

Table 6: Association between childhood obesity and dietary habits

Dietary Habits	Responses	Body mass index (BMI)				Mean Rank	P value
		Underweight No. (%)	Normal No. (%)	Overweight No. (%)	Obese No. (%)		
Weekly consumption of fast foods	Once	14/48(29.2)	27/48(56.3)	1/48(2.1)	6/48(12.5)	36.75	0.078
	Twice	3/18(16.7)	12/18(66.7)	2/18(11.1)	1/18(5.6)		
	3 times	0/9(0.0)	6/9(66.7)	0/9(0.0)	3/9(33.3)		
	>3 times	0/5(0.0)	3/5(60)	1/5(20)	1/5(20)		
Weekly consumption of sweets	Once	8/32(25)	21/32(65.6)	1/32(3.13)	2/32(6.25)	36.28	0.424
	Twice	5/20(25)	10/20(50)	2/20(10)	3/20(15)		
	3 times	2/14(14.3)	9/14(64.3)	0/14(0.0)	3/14(21.4)		
	>3 times	2/14(14.3)	8/14(57.1)	1/14(7.1)	3/14(21.5)		
Weekly consumption of your child's intake of soft drinks	Once	17/66(25.9)	27/66(40.9)	3/66(4.6)	9/66(13.6)	38.88	0.327
	Twice	0/7(0.0)	5/7(71.4)	1/7(14.3)	1/7(14.3)		
	3 times	0/5(0.0)	5/5(100)	0/5(0.0)	0/5(0.0)		
	>3 times	0/2(0.0)	1/2(50)	0/2(0.0)	1/2(50)		
Weekly consumption of fatty foods	Once	13/50(26)	28/50(56)	1/50(2)	8/50(16)	38.93	0.424
	Twice	4/19(21.1)	11/19(57.8)	3/19(15.9)	1/19(5.2)		
	3 times	0/6(0.0)	6/6(100)	0/6(0.0)	0/6(0.0)		
	>3 times	0/5(0.0)	3/5(60)	0/5(0.0)	2/5(40)		
To what extent do you monitor the quantities of sweets that the child consumes?	Never	0/2(0.0)	1/2(50)	0/2(0.0)	1/2(50)	40.12	0.711
	Usually	2/7(28.6)	3/7(42.8)	0/7(0.0)	2/7(28.6)		
	Often	6/28(21.5)	19/28(67.8)	0/28(0.0)	3/28(10.7)		
	Always	2/13(15.4)	8/13(61.5)	2/13(15.4)	1/13(7.7)		
	Sometimes	7/30(23.3)	17/30(56.7)	2/30(6.7)	4/30(13.3)		
To what extent do you monitor the quantities of snacks that the child consumes	Never	0/1(0.0)	1/1(100)	0/1(0.0)	0/1(0.0)	40.15	0.933
	Usually	2/8(25)	3/8(37.5)	0/8(0.0)	3/8(37.5)		
	Often	6/26(23.1)	15/26(57.7)	1/26(3.8)	4/26(15.4)		
	Always	2/20(10)	16/20(80)	1/20(5)	1/20(5)		
	Sometimes	7/25(28)	13/25(52)	2/25(8)	3/25(12)		
To what extent do you monitor the amounts of fatty foods the child consumes?	Never	1/4(25)	3/4(75)	0/4(0.0)	0/4(0.0)	39.77	0.925
	Usually	2/10(20)	5/10(50)	1/10(10)	2/10(20)		
	Often	5/22(22.8)	13/22(59.1)	0/22(0.0)	4/22(18.1)		
	Always	2/20(10)	16/20(80)	1/20(5)	1/20(5)		
	Sometimes	7/24(29.2)	11/24(45.8)	2/24(8.33)	4/24(16.66)		

Table 6 Continued: Association between childhood obesity and dietary habits

Dietary Habits	Responses	Body mass index (BMI)				Mean Rank	P value
		Underweight No. (%)	Normal No. (%)	Overweight No. (%)	Obese No. (%)		
To what extent do you monitor quantities of drinks rich in sugar that the child consumes?	Never	1/6(16.7)	3/6(50)	1/6(16.7)	1/6(16.6)		
	Usually	2/5(40)	3/5(60)	0/5(0.0)	0/5(0.0)		
	Often	4/18(22.2)	10/18(55.6)	1/18(5.6)	3/18(16.6)	42.32	0.614
	Always	3/20(15)	16/20(80)	0/20(0.0)	1/20(5)		
	Sometimes	7/31(22.6)	16/31(51.6)	2/31(6.4)	6/31(19.4)	42.32	0.614
Do you let the child eat anything he wants?	Never	1/11(9.1)	8/11(72.7)	0/11(0.0)	2/11(18.2)		
	Usually	6/21(28.6)	11/21(52.4)	3/21(14.3)	1/21(4.7)		
	Often	6/30(29)	18/30(60)	1/30(3.3)	5/30(16.7)	41.45	0.894
	Always	2/10(20)	7/10(70)	0/10	1/10(10)		
	Sometimes	2/8(25)	4/8(50)	0/8(0.0)	2/8(25)		
When a child is upset, is giving him something to eat the first thing you do?	Never	3/32(9.4)	21/32(65.6)	2/32(6.25)	6/32(18.8)		
	Usually	6/22(27.3)	12/22(54.5)	1/22(4.5)	3/22(13.7)		
	Often	6/17(35.3)	9/17(52.9)	1/17(5.9)	1/17(5.9)	46.36	0.123
	Always	1/8(12.5)	6/8(75)	0/8(0.0)	1/8(12.5)		
	Sometimes	1/1(100)	0/1(0.0)	0/1(0.0)	0/1(0.0)		
Do you give the child food when upset or bored even if not hungry?	Never	7/37(18.9)	22/37(59.5)	2/37(5.4)	6/37(16.2)		
	Usually	5/27(18.5)	17/27(63)	1/27(3.7)	4/27(14.8)		
	Often	4/9(44.4)	5/9(55.6)	0/9(0.0)	0/9(0.0)	42.19	0.322
	Always	4/5(80)	1/5(20)	0/5(0.0)	0/5(0.0)		
	Sometimes	1/2(50)	0/2(0.0)	1/2(50.0)	0/2(0.0)		

Table 6 shows that children's BMI grades did not differ significantly according to their dietary habits.

Table 7: Association between childhood obesity and lifestyle behaviors

Lifestyle behaviors	Responses	Body mass index (BMI)				Mean Rank	P value
		Underweight No. (%)	Normal No. (%)	Overweight No. (%)	Obese No. (%)		
Does the child do any sports?	Yes	13 (25.5)	30 (58.8)	2 (3.9)	6 (11.8)		
	No	4 (13.8)	18 (62.1)	2 (6.9)	5 (17.2)	38.18	0.177
If the child does not do any sports, why?	No	11 (25.0)	26 (59.1)	2 (4.5)	5 (11.4)		
	Laziness	0 (0.0)	2 (66.7)	0 (0.0)	1 (33.3)		
	Not used to do sports	2 (10.0)	14 (70.0)	1 (5.0)	3 (15.0)	19.10	0.699
	No suitable place	2 (28.6)	4 (57.1)	0 (0.0)	1 (14.3)		
	Other	2 (33.3)	2 (33.3)	1 (16.7)	1 (16.7)		
What kind of sport?	No	5 (17.9)	16 (57.1)	2 (7.1)	5 (17.9)		
	Football	1 (12.5)	6 (75.0)	0 (0.0)	1 (12.5)		
	Running	2 (12.5)	11 (18.3)	1 (6.3)	2 (12.5)		
	Swimming	3 (42.9)	3 (42.9)	0 (0.0)	1 (14.3)		
	Table tennis	0 (0.0)	0 (0.0)	0 (0.0)	1 (100)	29.44	0.440
	Karate	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)		
	Several	2 (33.3)	3 (50.0)	0 (0.0)	1 (16.7)		
	Other	4 (30.8)	8 (61.5)	1 (7.7)	0 (0.0)		
How long?	0 minutes	3 (12.0)	17 (68.0)	2 (8.0)	5 (20.0)		
	30 minutes	8 (27.6)	17 (58.6)	0 (0.0)	4 (13.8)		
	60 minutes	2 (20.0)	5 (50.0)	2 (20.0)	1 (10.0)	26.62	0.577
	90 minutes	3 (33.3)	6 (66.7)	0 (0.0)	0 (0.0)		
	120 minutes	1 (20.0)	3 (60.0)	0 (0.0)	1 (20.0)		
Where does your child practice sports?	No	3 (10.7)	18 (64.3)	2 (7.1)	5 (17.9)		
	At home	9 (33.3)	13 (48.1)	1 (3.7)	4 (14.8)		
	In the street	1 (7.7)	11 (84.6)	0 (0.0)	1 (7.7)	25.72	0.673
	In the club	4 (33.3)	6 (50.0)	1 (8.3)	1 (8.3)		
Does your child have a bicycle?	Yes	11 (20.0)	32 (58.2)	3 (5.5)	9 (16.4)		
	No	6 (24.0)	16 (64.0)	1 (4.0)	2 (8.0)	41.90	0.363
How long does your child spend riding a bike per day?	0 minutes	16 (59.3)	6 (22.2)	2 (7.4)	3 (11.1)		
	15 minutes	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)		
	30 minutes	5 (33.3)	9 (60.0)	0 (0.0)	1 (6.7)	31.24	0.021
	60 minutes	3 (9.1)	21 (63.6)	2 (6.1)	7 (21.2)		
	90 minutes	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)		

Table 7: Association between childhood obesity and lifestyle behaviors (continued)

Lifestyle behaviors	Responses	Body mass index (BMI)				Mean Rank	P value
		Underweight No. (%)	Normal No. (%)	Overweight No. (%)	Obese No. (%)		
How does the child go to school?	Walking	1 (14.3)	4 (57.1)	0 (0.0)	2 (28.6)	41.75	0.165
	By car	12 (19.7)	36 (59.0)	4 (6.6)	9 (14.8)		
	Other	4 (33.3)	8 (66.7)	0 (0.0)	0 (0.0)		
What is the child's usual walking pace?	Slow	4 (15.4)	20 (76.9)	0 (0.0)	2 (7.7)	42.96	0.764
	Medium	8 (22.2)	18 (50.0)	3 (8.3)	7 (19.4)		
	Fast	4 (26.7)	9 (60.0)	1(6.7)	1(6.7)		
	Very fast	1 (33.3)	1 (33.3)	0 (0.0)	1 (33.3)		
What is the child's activity rate at home and with the family?	Lazy	0 (0.0)	2 (66.7)	0 (0.0)	1 (33.3)	38.41	0.518
	Acceptable	3(16.7)	10 (55.6)	2(11.1)	3(16.7)		
	Medium	5(18.5)	19 (70.4)	1(3.7)	2 (7.4)		
	Active	9 (28.1)	17 (53.1)	1(3.13)	5 (15.6)		
How long does your child spend watching TV per day?	0 minutes	1 (11.1)	6 (66.7)	0 (0.0)	2 (22.2)	37.52	0.701
	60 minutes	4 (22.2)	11 (61.1)	1 (5.6)	2 (11.1)		
	2 hours	8 (29.6)	14 (51.9)	2 (7.4)	3 (11.1)		
	> 2 hours	4 (15.4)	17 (65.4)	1(3.8)	4(15.4)		
How long does your child spend using the computer per day?	0 minutes	2 (9.5)	11(52.4)	2 (9.5)	6 (28.6)	37.79	0.072
	60 minutes	5 (35.7)	7 (50.0)	0 (0.0)	2 (14.3)		
	2 hours	2 (28.6)	4 (57.1)	0/7 (0.0)	1 (14.3)		
	> 2 hours	8 (21.1)	26 (68.4)	2 (5.3)	2 (5.3)		
How long does your child spend on electronic games per day?	0 minutes	2 (12.5)	9 (56.3)	2 (12.5)	3 (18.8)	38.13	0.438
	60 minutes	6 (21.4)	19 (67.9)	0 (0.0)	3 (10.7)		
	2 hours	4 (33.3)	6 (50.0)	1 (8.3)	1 (8.3)		
	> 2 hours	5 (20.8)	14 (58.3)	1 (4.2)	4 (16.7)		
How does your child spend most of his/her time?	Sitting	2 (12.5)	10 (62.5)	0 (0.0)	4 (25.0)	39.47	0.475
	Walking	2 (33.3)	3 (50.0)	0 (0.0)	1 (16.7)		
	Playing	13 (22.4)	35 (60.3)	4 (6.9)	6 (10.3)		

Table 7 shows that children's BMI grades differed significantly according to their duration of riding their bikes (p=0.021), with no prevalence of obesity or overweight among children riding their bikes for 15 or 90 minutes.

Table 8: Parents' perception regarding their children's actual body weight

Parent's perception regarding their children's weight	No.	%
How would you describe your child's weight?		
• Underweight	22	27.5
• Normal weight	51	63.7
• Overweight	6	7.5
• Obese	1	1.3
How do you judge your child's weight?		
• The opinion of those around him	9	11.3
• As stated by his treating doctor	26	32.5
• Body mass index calculator	11	13.8
• External body shape	34	42.5
How do you weigh your child?		
• Weight with a scale	45	56.3
• Weighing with a scale without shoes	16	20.0
• Using a body mass index calculator	3	3.8
• Calculate the body mass index and put it on a growth chart	16	20.0
What is your main source for information about ideal body weight?		
• Books and magazines	2	2.5
• Internet	16	20.0
• Social media	9	11.3
• Doctors	33	41.3
• Others	20	25.0

Table 8 shows that only 7.5% of parents perceived their children as overweight, while 1.3% perceived their children as obese. The commonest way for parents to judge their children's weight was by their external body shape (42.5%). Only 56.3% of parents used a scale to weigh their children. Doctors were the main source of information about children's ideal body weight for only 41.3% of parents.

Table 9: Association between childhood obesity and their parents' perception

Parents' Perception	Responses	Body mass index (BMI)				Mean Rank	P value
		Underweight No. (%)	Normal No. (%)	Overweight No. (%)	Obese No. (%)		
How would you describe your child's weight?	Underweight	5/22(22.7)	16/22(72.8)	0/22(0.0)	1/22(4.5)	40.62	0.154
	Normal	11/51(21.6)	30/51(58.8)	3/51(5.9)	7/51(13.7)		
	Overweight	1/6(16.7)	1/6(16.7)	1/6(16.6)	3/6(50)		
	Obese	0/1(0.0)	1/1(100)	0/1(0.0)	0/1(0.0)		
How do you judge your child's weight?	His treating doctor	8/26(30.8)	13/26(50)	3/26(11.5)	2/26(7.7)	42.47	0.776
	BMI calculator	1/11(9.1)	9/11(81.8)	0/11(0.0)	1/11(9.1)		
	External body shape	7/34(20.6)	19/34(55.9)	1/34(2.9)	7/34(20.6)		
	Opinion of those around him	1/9(11.1)	7/9(77.8)	0/9(0.0)	1/9(11.1)		
How do you weigh your child?	Balance weight measure	7/45(15.6)	28/45(62.2)	3/45(6.6)	7/45(15.6)	43.39	0.501
	Using a scale without shoes	5/16(31.3)	8/16(50)	0/16(0.0)	3/16(18.7)		
	BMI calculator	0/3(0.0)	3/3(100)	0/3(0.0)	0/3(0.0)		
	Plot BMI on a growth chart	5/16(31.3)	9/16(56.3)	1/16(6.2)	1/16(6.2)		
What is your main source for information about health?	Books and magazines	0/2(0.0)	2/2(100)	0/2(0.0)	0/2(0.0)	38.08	0.863
	Internet	2/16(12.5)	11/16(68.7)	0/16(0.0)	3/16(18.8)		
	Social media	2/9(22.2)	6/9(66.7)	0/9(0.0)	1/9(11.1)		
	The doctor	10/33(30.3)	16/33(48.5)	3/33(9.1)	4/33(12.1)		
	Others	3/20(15)	13/20(65)	1/20(5)	3/20(15)		

Table 9 shows that parents' perception regarding their children's weight did not differ significantly according to how they judge their weight, the way they weigh their weight or their source of information about their children's weight.

Table 10: Association between parents' perception and their educational level

Parents' perception	Responses	Parents Education level					
		Illiterate No. (%)	Primary No. (%)	Intermediate No. (%)	Secondary No. (%)	Diploma No. (%)	University No. (%)
How would you describe your child's weight?	Underweight	0/22(0.0)	1/22(4.5)	1/22(4.5)	5/22(22.7)	5/22(22.7)	10/22(45.6)
	Normal	2/51(3.9)	6/51(11.8)	1/51(2)	10/51(19.6)	9/51(17.6)	23/51(45.1)
	Overweight	0/6(0.0)	1/6(16.7)	0/6(0.0)	1/6(16.7)	0/6(0.0)	4/6(66.6)
	Obese	0/1(0.0)	0/1(0.0)	0/1(0.0)	0/1(0.0)	0/1(0.0)	1/1(100)
Mean Rank		42.24					
P – value		0.648					
How do you judge your child's weight?	His treating doctor	0/26(0.0)	2/26(7.7)	1/26(4.5)	4/26(15.4)	6/26(23.1)	13/26(50)
	BMI calculator	0/11(0.0)	1/11(9.1)	1/11(9.1)	3/11(27.3)	2/11(18.2)	4/11(36.3)
	External body shape	1/34(2.9)	5/34(14.7)	0/34(0.0)	5/34(14.7)	6/34(17.7)	17/34(50)
	Opinion of those around him	1/9(11.2)	0/9(0.0)	0/9(0.0)	4/9(44.4)	0/9(0.0)	4/9(44.4)
Mean Rank		40.37					
P – value		0.301					
How do you weigh your child?	Balance weight measure	2/45(4.4)	7/45(15.6)	1/45(2.2)	7/45(15.6)	9/45(20)	19/45(42.2)
	Using a scale without shoes	0/16(0.0)	1/16(6.3)	0/16(0.0)	3/16(18.7)	4/16(25)	8/16(50)
	BMI calculator	0/3(0.0)	0/3(0.0)	0/3(0.0)	1/16(33.3)	1/16(33.3)	1/16(33.3)
	Plot BMI on a growth chart	0/16(0.0)	0/16(0.0)	1/16(6.3)	5/16(31.3)	0/16(0.0)	10/16(62.4)
Mean Rank		43.50					
P – value		0.135					
What is your source of information about your child's weight?	Books and magazines	0/2(0.0)	0/2(0.0)	0/2(0.0)	0/2(0.0)	1/2(50)	1/2(50)
	Internet	0/16(0.0)	1/16(6.3)	0/16(0.0)	3/16(18.8)	1/16(6.3)	11/16(68.6)
	Social media	0/9(0.0)	1/9(11.1)	0/9(0.0)	1/9(11.1)	2/9(22.2)	5/9(55.6)
	The doctor	0/33(0.0)	1/33(3)	1/33(3)	8/33(24.2)	6/33(18.2)	17/33(51.6)
	Others	2/20(10)	5/20(25)	1/20(5)	4/20(20)	4/20(20)	4/20(20)
Mean Rank		33.21					
P – value		0.032					

Table 10 shows that parents' sources of information about their children's weight differed significantly associated with their educational levels (p=0.032), with books and magazines being the main sources for information among highly educated parents (Diploma or University educated).

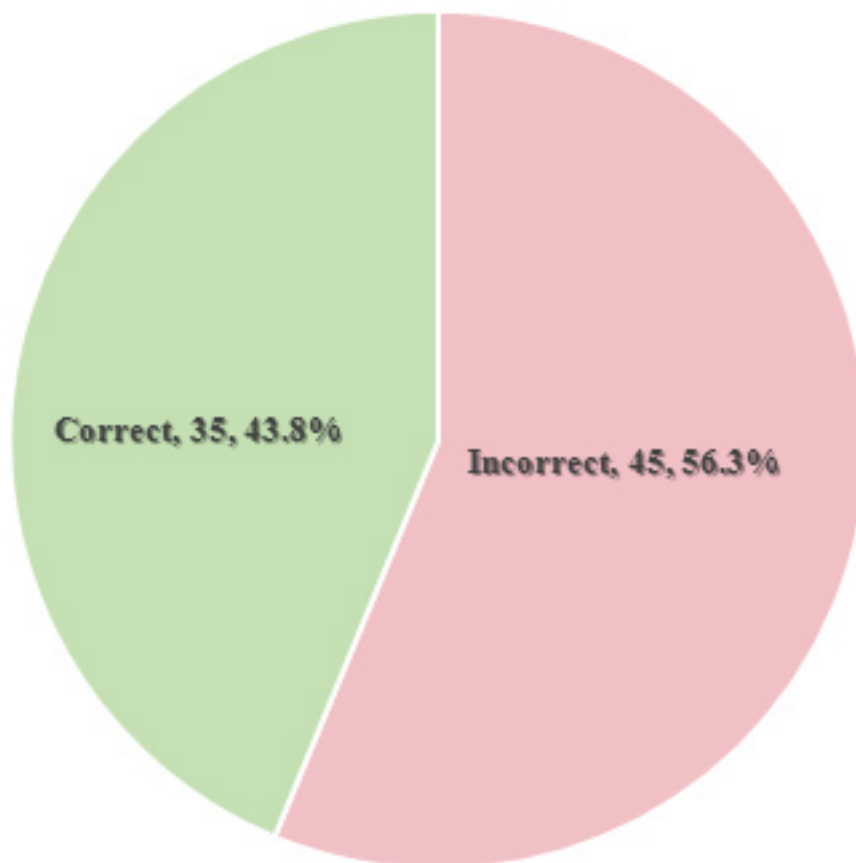**Figure 2: Parents' perception regarding their children's weight**

Figure 2 shows that 56.3% of parents incorrectly perceived their children's weight.

Table 11: Association between parents' health literacy and their perception regarding their children's weight

Parent's health Literacy	Responses	Incorrect Perception No. (%)	Mean Rank	P value
How do you judge your child's weight?	Measuring by his treating doctor	17/45(37.8)		
	BMI calculator	3/45(6.7)		
	External body shape	18/45(40)	42.47	0.776
	Opinion of those around him	7/45(15.5)		
How do you weigh your child?	Balance weight measurement	25/45(55.6)		
	Weighing with a scale without shoes	10/45(22.2)		
	BMI calculator	1/45(2.2)	43.39	0.501
	Plot BMI on a growth chart	9/45(20)		
What is the main source for their information about health?	Books and magazines	0/45(0.0)		
	Internet	7/45(15.6)		
	Social media	6/45(13.3)		
	Doctors	24/45(54.3)	38.08	0.863
	Other	8/45(17.8)		

Table 11 shows that parents' incorrect perception regarding their children's weight did not differ significantly according to the way they judged their children's weight, how they weigh their children, or their sources of health literacy.

Table 12: Association between parent's sociodemographic and incorrect recognition of their children's weight

Parents' sociodemographic variables	Responses	Incorrect Perception No. (%)	Mean Rank	P-value
Parent's age	29-37	24/44 (54.6)	43.12	0.473
	38-46	14/44 (31.8)		
	47-56	6/44 (13.6)		
Marital status	Married	41/44 (93.2)	40.08	0.605
	Divorced	2/44 (4.5)		
	Widow	1/44 (2.3)		
Education level	Illiterate	1/44 (2.3)	41.66	0.787
	Primary	6/44 (13.6)		
	Intermediate	1/44 (2.3)		
	Secondary	8/44 (18.2)		
	Diploma	6/44 (13.6)		
	University	22/44 (50)		
Occupation	Governmental	24/44 (54.5)	40.32	0.998
	Private sector	5/44 (11.4)		
	Retired	1/44 (2.3)		
	Housewife	14/44 (31.8)		
Monthly income (SR)	<5000	12/44 (27.3)	42.71	0.112
	5,000-10,000	23/44 (52.3)		
	>10,000	9/44 (20.4)		

Table 12 shows that parents' incorrect perception regarding their children's weight did not differ significantly according to parents' sociodemographic variables.

Discussion

Studies have shown that most overweight and obese children grow to become obese adults (19). Due to its great public health importance, up-to-date information on prevalence and trends in childhood obesity is necessary for developing and evaluating success of interventions for prevention of obesity in any country (20).

Our study demonstrated that prevalence of overweight/obesity was as high as 18.8% among children aged 6-12 years in Yanbu city, Saudi Arabia, with 5% being overweight (i.e., BMI is 25.0-29.9 kg/m2), while 13.8% being obese (i.e., BMI ≥30.0 kg/m2).

Previous studies in Saudi Arabia reported variable prevalence of obesity in children and adolescents based on the age and geographic region selected as well as the measurement reference (5; 21). Al-Shaikh et al. (21) reported that the overall prevalence of overweight/obesity among children aged 6-19 years in the western, central, and eastern regions is 21.5%. In 2010, Riyadh City, Saudi Arabia, the overall prevalence rate for overweight/obesity among children aged 6-16 years was as high as 26.1%, being 20.4% and 5.7% for overweight and obesity, respectively (22), while in 2019, prevalence of childhood overweight/obesity among the same age group became 31.6%, being 13.4% for overweight and 18.2%, for obesity (20).

In the Eastern Province, Saudi Arabia, Al-Dossary et al. (23) reported that about 50% of Saudi children had a BMI above the 85% percentile. They noted that by the age of 9 years, 21% of children were overweight and 21% obese—and their weight continued to increase into the adolescent years. In Taif, Saudi Arabia, Al Ghamdi (24) reported that prevalence of overweight and obesity among school children were 10.7% and 7.6%, respectively.

High prevalence of overweight/obesity were also reported in other Gulf countries. Malik and Bakir (25) reported that more than 30% of children aged 5-17 years in the United Arab Emirates were either overweight (21.5%) or obese (13.7%).

Moreover, high prevalence rates of overweight/obesity were reported by studies both in developed and developing countries. In the USA, prevalence rates of overweight and obesity in children 2-19 years of age were 31.9% and 11.3%, respectively (26). In Italy, Paduano et al. (27) reported that prevalence of overweight/obesity among primary school children was 25.2%.

In India, Gautam and Jeong (28) reported that prevalence of overweight and obesity among children aged 12-16 years were 10.8% and 6.2%, respectively. In Nepal, Karki et al. (29) reported that 25.7% of children aged 6-13 years were overweight or obese. In Ghana, Adom et al. (30)

reported a prevalence of 9.2% for overweight and 7.2% were obese for children aged 8-11 years. In South Africa, Negash et al. (31) reported a prevalence of overweight/ obesity of 22.9% among children aged 7-18 years.

It is to be noted that early adolescence has been described as the critical period for the development for adult obesity (32). Therefore, early intervention before this age is critical for both their future health and their ability to sustain long-term weight control (33).

Our study revealed that unhealthy dietary habits were frequently adopted by participant children. Fast foods, soft drinks and fatty foods were frequently consumed by some children. In addition, there was limited parental monitoring of the quantities of sweets and other unhealthy dietary habits consumed by their children. Most parents let their children eat anything they want, or give them food when they feel upset or bored even if they were not hungry.

Our study also revealed that physical activities of most children were limited. Most children go to school by car. Even when they walk, their usual walking pace is either slow or medium. Children also spend much time in sedentary entertainment activities, such as viewing TV, computers and video games.

A study found that Saudi children consumed fast foods and were not engaged in sporting activities as much as their American counterparts (34). Hence, these commonly adopted unhealthy lifestyle could be attributed to the fact that children start going to school at the age of 6 years, and hence, there is a less control on their eating habits and nutrition. Therefore, these unhealthy dietary habits can be considered as a contributing factor to the resulting high prevalence of childhood overweight/obesity in the present study.

The daily per capita fat consumption in Saudi Arabia has risen to 143% and a similar trend in the reduction of energy expenditure has been recorded. Food has become more affordable to most people because they are able to earn significantly higher wages. Moreover, there has been remarkable changes in dietary and lifestyle habits. There has been increased consumption of fast foods, soda beverages, and unhealthy snacks and carbonated drinks along with physical inactivity among children and adolescents in Saudi Arabia (35-36).

Swinburn et al. (37) emphasized that the modifiable lifestyle factors such as physical inactivity, dining out, and excessive intake of high-fat, dense-caloric foods, and refined carbohydrates are largely responsible for the global increased prevalence of obesity and related health risks. Excessive media exposure has been repeatedly linked to unhealthy life choices.

In Riyadh, Saudi Arabia, Aljassim and Jradi (38) noted that prolonged daily use of screens for more than two hours increased the risk of being overweight/obese among children. Barker et al. (35) reported that, on average, children in Saudi Arabia spend about 6 hours per day in front of screens. Moreover, children who spend long hours using screens tend to snack while doing so, and eventually, gain weight because they increase their energy intake while seated for a long period of time. Therefore, parents should abide by the recommendations for screen time use among children and employ strict parenting control when it comes to the excessive use of screens (39).

Malik and Bakir (25) argued that, it seems that the lack of parental control over their children's food consumption patterns and physical activity is due to a widespread perception among parents that overweight is a sign of better health, high social status, beauty, and prosperity, in addition to an overwhelming aspiration to own TV, satellite dishes and cars; which are considered to be markers of financial progress. Al-Rukban (40) added that the lack of physical activity in Saudi Arabia can be attributed to the ability of adolescents to drive cars, which helps minimize physical activity and provides easy access to buy unhealthy diets and to spend less time eating at home, where meals would be more nutritional.

Al-Nozha et al. (41) stressed that it is difficult to reduce excessive weight once it becomes established. It is becoming a priority to establish preschool, school and adolescent health programs, with the emphasis on increasing physical education hours and consumption of healthy food, by incorporating health messages into the school curricula.

It is worth noting that significant time spent watching television or playing video games was associated with physical inactivity, which in turn is a major risk factor for being overweight or obese in all age group (42-43).

Controlling screen time use among children and encouraging active play is challenging in Riyadh, Saudi Arabia, due to limited access to neighborhood parks that are safe for children, and unfavorable weather conditions with excessive heat throughout most of the year. Children in Riyadh seek entertainment with electronic devices because they spend long hours indoors with their caregivers, and in private cars commuting to schools in a country with a male dependent driver system that lacks public transportation (44).

Recently, women were permitted to drive in Saudi Arabia. However, the practice of driving remains limited to very few women with jobs and from families that perceive it as culturally acceptable. Public health efforts should focus on planning for accessible indoor exercise facilities and on finding strategies that parents can apply in order to replace the frequent use of screen time. Parental perception about child weight status was significantly associated with child weight. These results are in accordance with findings from other studies (45).

The present study revealed that children's BMI grades did not differ significantly according to their sociodemographic factors or dietary habits, but differed significantly according to their duration of riding their bikes. However, most children go to school by car. Moreover, children's BMI

grades differed significantly according to their parents' educational level, with highest prevalence of obesity among less educated parents.

Pan et al. (46) noted that there is an association between childhood obesity and the environmental factors that may support cycling. A bikeable environment will encourage children and adolescents to conduct more physical activities, such as cycling (47), which would be an important contributor to reducing rates of childhood overweight and obesity, within a broader socio-ecological context (48).

Pont et al. (49) studied the associations between environmental factors and active transportation, finding that bike lane access may be associated with higher rates of active transportation among young people aged 5–18 years. In previous studies, bike lane was only discussed as a subgroup variable, but no studies specifically examined cycling behaviors directly in relation to cycling infrastructure (50).

European Studies showed that the risk of childhood obesity was significantly higher in children with lesser parental educational level (51). In Modena, Italy, Paduano et al. (27) reported that prevalence of overweight/obesity among primary school children was significantly lower in children born to parents with a high education. Moreover, Muthuri et al. (52) found a more positive influence of paternal rather than maternal higher education on lowered child overweight in higher economic status countries (i.e., Australia, Croatia, Germany, Italy, Mexico, and the USA).

Wolfson et al. (53) explained the favorable association between higher parental educational levels and the lower prevalence of their children's obesity by that parent education levels affect parents' ability to process health information, which leads to improved health-related decisions in parenting practice and which also affects their motivation to adopt a healthy lifestyle as role models for their children. Kant and Graubard (54) added that children of more educated parents are usually more likely to eat breakfast and consume fewer calories from snacks and sweetened beverages.

Our study revealed a high incorrect parental perception (56.3%) regarding their children's overweight or obesity. This finding was not surprising, since most of their judgments were based upon their children's body shape, and doctors were their main source of health information for only about two-fifths of parents. Nevertheless, parents' perception regarding their children's weight did not differ significantly according to parents' sociodemographic variables, health literacy, how they assess their children's weight, or their source of health information.

Similarly, in Riyadh, Aljassim and Jradi (38) found that 40.24% of parents had incorrect perception regarding their actual children's weight. Also in Abha City, Saudi Arabia, Al-Qahtani et al. (55) found that most parents did not know the ideal weight for their children, and 57.6% of the parents of overweight or obese children were unaware that their children were overweight, and parents depended

mainly on body shape for their perception of their child's weight. In Al-Qassim, Saudi Arabia, Al-Mohaimeed (56) reported that parents with overweight/obese children aged 6-10 years had significantly more misclassification regarding their children's weight than those with normal weight children, where 90% of parents of overweight children misclassified and reported that their children had normal weight, while 65% of parents of the obese children, misclassified the child's weight status.

Also in developed countries, parents incorrectly perceived their children's excess weight. Baughcum et al. (39) reported that only 20% of mothers in northern Kentucky, USA, correctly identified their overweight preschool children as overweight, while in UK, Carnell et al. (57) found that only 6% of parents correctly described their overweight children as "overweight." In Modena, Italy, Paduano et al. (27) reported that most parents (84.7%) of overweight/obese children underestimated their child's weight status. Childhood overweight/obesity was significantly associated with unhealthy lifestyles.

Several meta-analyses concluded that about 50% of parents underestimate their children's overweight/obese status (4; 58). Therefore, parental perception of a child's overweight status is essential for adhering to dietary and physical activity recommendations early in life.

Some explanations for such high rates of parental underestimates of overweight/obese children's weight have been posited. Campbell et al. (59) stated that popular media reports regarding childhood obesity often stereotype overweight children by showing images of severely obese children, a practice that may distort parents' understanding of what actually qualifies as overweight. Latner et al. (60) argued that most parents are usually resistant to labeling or stigmatizing their children. They may frequently think that their children's weights are ideal if their children's peers have body weights comparable to those of their children. Moreover, they may deny that their children are overweight because doing so would require that they recognize that they, too, may need to implement healthy lifestyle changes.

However, Jain et al. (61) considered that parents' underestimates may not be so intentional, as parents do not judge their child to be overweight if he/she engages in physical activity, is not teased about his/her size, and has no obviously threatening health problems. Moreover, most parents believe that their children will eventually "grow out" of the excess weight and that steady increases in height and weight indicate good parenting and healthy nutrition. Hence, it is important to emphasize that early intervention efforts to manage childhood obesity are unlikely to be successful if parents are unaware or unconcerned about their children's real weight status.

The present study showed that parents' sources of information about their children's ideal weight differed significantly with their educational levels, with books and magazines being the main sources for knowledge among highly educated parents. Therefore, it is a pressing

necessity to develop new culturally sensitive models for referring to the child's weight status in our community. Moreover, we need to start campaigns to raise the awareness of parents about ideal weight and the risks of obesity and its prevention among their children.

Strengths and Limitations
This study addressed several aspects of an important health topic in the Saudi community, i.e., childhood obesity. However, there are some limitations that should be admitted. This study followed a cross-sectional design, which is good for hypothesis generation, rather than hypothesis testing, thus making it difficult to prove causation. Moreover, the generalization of results should be taken cautiously, since it targeted parents attending urban PHCCs in Yanbu Albahr City.

Conclusion

Based on findings of this study, it can be concluded that prevalence of obesity among primary school children in Yanbu Albahr City, Saudi Arabia is quite high. Unhealthy dietary habits (e.g., fast foods, sweets, fatty foods and soft drinks), and physical inactivity (prolonged screen times, slow-to-moderate walking pace and going to school by car) are common among Saudi primary school children. Parents' health literacy regarding childhood obesity is generally lacking, and most parents misperceive their children's actual body weight. Children's BMI grades did not differ significantly according to their sociodemographic factors or dietary habits, but differed significantly according to their duration of riding their bikes. Moreover, children's BMI grades differed significantly according to their parents' educational level, with highest prevalence of obesity among less educated parents.

Recommendations

It is necessary to develop new culturally sensitive models for referring to the child's weight status, and to raise parents' awareness regarding the ideal weight and the risks of obesity and its prevention among their children.

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Ocular Complications in diabetic children in Aseer region

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Abstract

Background: Diabetes mellitus (DM), a multi-systemic disease marked by hyperglycaemia, is becoming more common around the world. Diabetes mellitus (DM) is a well-known cause of many ophthalmic problems, including diabetic retinopathy (DR), macular oedema, cataract, refractive change, and micro-vascular paralytic strabismus. A significant public health effort has been made to create ocular screening regimens for diabetic patients, beginning at a young age.

Aim: to assess the knowledge of diabetic children regarding the risk of ocular complications and prevalence of ocular complications among diabetic children.

Methodology: A descriptive cross-sectional study was used targeting all accessible diabetic children aged less than 18 years or their care givers in Aseer region. Data were collected from participants using an online pre-structured questionnaire. The questionnaire covered the following data: participants' socio-demographic data, diabetes related clinical data. The third part covered participants' knowledge using multiple responses and mutually exclusive questions. The questionnaire was uploaded online using social media platforms by the researchers during the period from 17 November 2021 to 2 June 2022. All accessible and eligible population in the study setting were invited to fill in the attached tool.

Results: A total of 499 children fulfilling the inclusion criteria completed the study questionnaire. Exactly 275 (55.1%) were males and 224 (44.9%) were females. None of the sampled children had other co-morbidities. Exactly 188 (37.7%) children had been diagnosed with DM for 6-10 years, 179 (35.9%) diagnosed for 11-15 years while 43 (8.65%) were diagnosed for less than 5 years. About 88% of the study participants agreed that diabetes may cause eye-related complications, and 87.6% agreed that early detection of eye diseases associated with diabetes may reduce their complications. A total of 85.2% think that the annual visit to the ophthalmologist for diabetics is important. Good control of HbA1c as the best method to prevent diabetic eye complications was known by 67.3% of the study participants.

Conclusions: In conclusion, the study revealed that diabetic eye complications among children were not frequent with poor diabetic control. Participants' knowledge regarding diabetes eye related complications was on average especially for the significance of ophthalmologist visits and early detection of the disorders.

Keywords: Diabetes, eye complications, children, care givers, knowledge, awareness, Saudi Arabia

Introduction

The chronic metabolic disorder diabetes mellitus is a fast-growing global problem with huge social, health, and economic consequences [1-2]. In 2000, 171 million people were diagnosed with diabetes, and it is predicted that this number may reach 366 million within the next three decades, with a higher burden in the developing countries [3]. Nowadays, Type 1 diabetes mellitus (T1DM) has been detected among nearly half a million children globally, with annual incidence of 80,000 cases [4]. Recently, T1DM and its complications were one of the most challenging public health problems, besides being a primary source of morbidity and high mortality [5].

Patients with T1DM experience many complications including ocular problems such as retinopathy, retinal oedema, papillopathy, cataract, glaucoma, strabismus, and refractive alterations which are well documented [6-7]. Annually, diabetic retinopathy and macular oedema end with blindness in 12,000 to 24,000 new patients in the United States [8].

In a recent study, a decreased retinal thickness was detected among patients with Type 1 DM with associated diabetic retinopathy compared with nondiabetic controls [9]. Thus, diabetes-associated neuronic lesions may have a significant role in the development of DR, dry eye syndrome (DES), and glaucoma that may cause clinical or subclinical microvascular changes [10].

Early detection and treatment of diabetic macular oedema and proliferative diabetic retinopathy (PDR) in individuals with DM will lower the risk of moderate and severe vision loss [11]. As a result, a significant public health effort has been made to create ocular screening regimens for diabetic patients, beginning at a young age. The purpose of this study was to assess diabetes-related ocular complications and knowledge level among diabetic children and their caregivers.

Methodology

A descriptive cross-sectional study was used targeting all accessible diabetic children aged less than 18 years, or their care givers in Aseer region, Southern Saudi Arabia. A total of 620 individuals received the study survey. Exactly 499 respondents were eligible and completed the study questionnaire with a participation rate of 80.4%. After obtaining permission from the Institutional ethics committee, data collection started. Data were collected from participants using an online pre-structured questionnaire. The researchers constructed the survey tool after comprehensive literature review and expert's consultation in the field of the study. The study questionnaire was reviewed, using a panel of 3 experts, for validity and clarity. Tool reliability was assessed using a pilot study of 35 participants with reliability coefficient (α-Cronbach's) of 0.73 for knowledge items. The questionnaire covered the following data: participants' socio-demographic data such as gender, medical history, family history of DM, history of eye diseases. The second section covered diabetes related clinical data including duration of DM, treatment received, HbA1c, and complications with medical consultation. The third part covered participants' knowledge using multiple responses and mutually exclusive questions. The questionnaire was uploaded online using social media platforms by the researchers during the period from 17 November 2021 to 2 June 2022. All accessible and eligible population in the study setting were invited to fill in the attached tool.

Data analysis

After data were extracted, it was revised, coded, and fed into Statistical Software IBM SPSS version 22(SPSS, Inc. Chicago, IL). All statistical analysis was done using two tailed tests. P value less than 0.05 was statistically significant. For knowledge and awareness items, each correct answer was scored one point and total summation of the discrete scores of the different items covering general knowledge regarding diabetes related ocular complications. Participants with a score less than 60% of the total score were considered to have poor knowledge level while good knowledge was considered if they had a score of 60% of the total or more. Descriptive analysis based on frequency and percent distribution was done for all variables including participants' socio-demographic data, medical history, family history of DM, and diabetes related data including duration, treatment received and complications. Also, participants' knowledge regarding diabetes related ocular complications are shown in frequency tables. Cross tabulation was used to assess distribution of participants' knowledge level regarding diabetes related ocular complications according to their personal data, and disease history. Relations were tested using Pearson chi-square test and exact probability test for small frequency distributions.

Results

A total of 499 children fulfilling the inclusion criteria completed the study questionnaire. Exactly 275 (55.1%) were males and 224 (44.9%) were females. None of the sampled children had other co-morbidities. A total of 288 (57.7%) children had a family history of DM which was type 1 DM among 182 (63.2%), and type 2 DM among 106 (36.8%). Medical history of eye diseases was reported among 133 (26.7%) children (Table 1).

Table 2. Diabetes related data and its complications among study children, Aseer region, Saudi Arabia. Exactly 188 (37.7%) children had been diagnosed with DM for 6-10 years, 179 (35.9%) diagnosed for 11-15 years while 43 (8.65) were diagnosed for less than 5 years. As for diabetes control, 203 (40.7%) children reported that their last HbA1c was 6.5-7.5% while 132 (26.5%) had HbA1c of 7.5-8.5% while 58 (11.6%) had HbA1c of 8.5% or more. A total of 228 (45.7%) children were on oral hypoglycaemics, 181 (36.3%) were on insulin and 90 (18%) were on both. Regarding diabetes complications, the most reported were retinopathy (12.2%), followed by DKA (7%), thrombosis (5.6%), and renal problems (4.6%). A total of 339 (67.9%) had no complications. A total of 275 (55.1%) children visited an ophthalmologist due to eye complications and myopia was diagnosed among 165 (33.1%) while 35 (7%) had hyperopia.

Table 3. Knowledge regarding diabetic eye complications among study patients, Aseer region, Saudi Arabia. Exactly 88% of the study participants agreed that diabetes may cause eye-related complications, and 87.6% agreed that early detection of eye diseases associated with diabetes may reduce its complications. A total of 67.1% reported that an ophthalmologist should be visited immediately after DM diagnosis. Exactly 85.2% think that the annual visit to the ophthalmologist for diabetics is important. Good control of HbA1c as the best method to prevent diabetic eye complications was known by 67.3% of the study participants and 57.5% think that eye complications for diabetics are very serious while 37.9% think it is only serious.

Figure 1. Overall knowledge regarding diabetic eye complications among study participants, Aseer region, Saudi Arabia. Exactly 218 (43.7%) participants had good knowledge level regarding diabetes related ocular complications while 281 (56.3%) had poor knowledge level.

Table 4. Distribution of participants knowledge level regarding diabetes ocular complications by their bio-demographic data. Exactly 51.3% of male participants had a good knowledge level compared to 34.4% of females with recorded statistical significance (P=.001). Also, 73% of children with diabetes for 16-17 years had good knowledge level regarding ocular complications versus 41.9% of those with diabetes for less than 5 years (P=.001). Exactly 47.6% of participants had family history of DM versus 38.4% of others without (P=.041). Also, good knowledge level was detected among 67.7% of participants with medical history of eye diseases versus 35% of others without (P=.001). Additionally, 56% of participants who visited ophthalmologists due to eye complications had good knowledge regarding ocular complications compared to 28.6% of others who did not (P=.001). A total of 68.5% of participants with myopia had good knowledge level versus 17.1% of those with hyperopia (P=.001).

Table 1. Socio-demographic data of sampled children with diabetes mellitus, Aseer region, Saudi Arabia

Socio-demographic data	No	%
Gender		
Male	275	55.1%
Female	224	44.9%
Have other diseases		
No	499	100.0%
Family history of DM		
Yes	288	57.7%
No	211	42.3%
If yes, type of DM?		
Type 1	182	63.2%
Type 2	106	36.8%
Have medical history of eye diseases		
Yes	133	26.7%
No	366	73.3%

Table 2. Diabetes related data and its complications among study children, Aseer region, Saudi Arabia

Diabetes related data / complications	No	%
Child age at diagnosis with DM		
< 5 years	43	8.6%
6-10	188	37.7%
11-15	179	35.9%
16-17	89	17.8%
Last value of HbA1c		
6-6.5%	39	7.8%
6.51-7.5%	203	40.7%
7.51-8.5%	132	26.5%
8.51-9.5%	58	11.6%
Don't know	67	13.4%
Treatment received		
Oral hypoglycaemics	228	45.7%
Insulin	181	36.3%
Both of them	90	18.0%
Have diabetes related complications?		
Retinopathy	61	12.2%
DKA	35	7.0%
Thrombosis	28	5.6%
Renal problems	23	4.6%
Peripheral neuropathy	11	2.2%
Vascular complications	2	.4%
None	339	67.9%
Have visited ophthalmologists due to eye complications?		
Yes	275	55.1%
No	224	44.9%
Do you have visual problems?		
Myopia	165	33.1%
Hyperopia	35	7.0%
None	299	59.9%

Table 3. Knowledge regarding diabetic eye complications among study patients, Aseer region, Saudi Arabia

Knowledge items	No	%
Diabetes may cause eye-related complications?		
Strongly agree	265	53.1%
Agree	174	34.9%
Disagree	23	4.6%
Strongly disagree	1	.2%
Don't know	36	7.2%
Early detection of eye diseases associated with diabetes may reduce its complications?		
Strongly agree	284	56.9%
Agree	153	30.7%
Disagree	21	4.2%
Don't know	41	8.2%
When you should visit ophthalmologist?		
Immediately after DM diagnosis	335	67.1%
When have visual problems	154	30.9%
No need at all	10	2.0%
The annual visit to the ophthalmologist for diabetics is important?		
Strongly agree	257	51.5%
Agree	168	33.7%
Disagree	23	4.6%
Strongly disagree	1	.2%
Don't know	50	10.0%
What is the best way to prevent diabetic eye complications?		
Good control of HbA1c	336	67.3%
Frequent visits of ophthalmologist	139	27.9%
Eye complications cannot be prevented	24	4.8%
How serious are eye complications for diabetics?		
Very serious	287	57.5%
Serious	189	37.9%
Not serious at all	23	4.6%

Figure 1. Overall knowledge regarding diabetic eye complications among study participants, Aseer region, Saudi Arabia
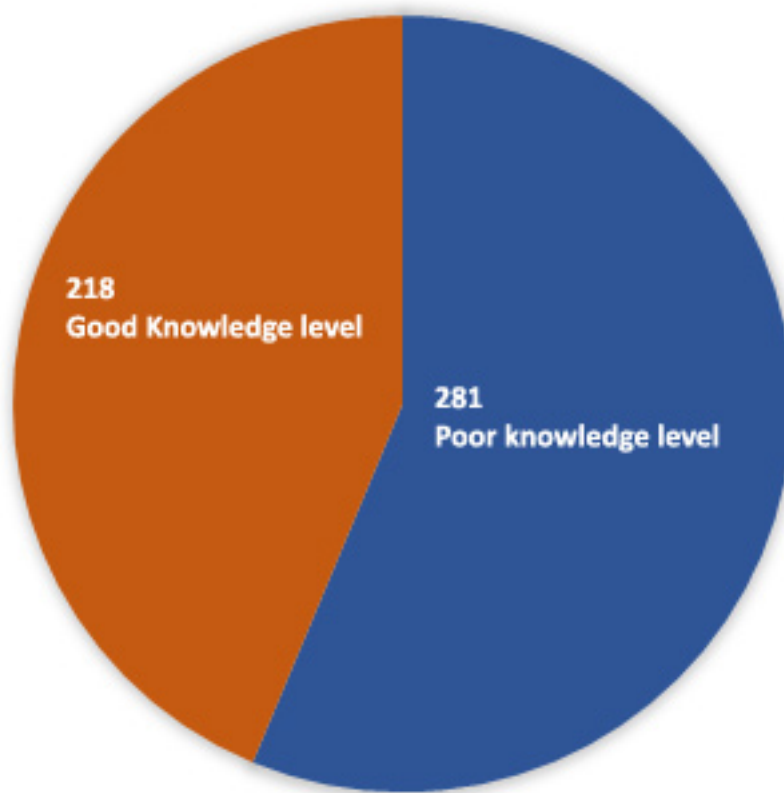

218
Good Knowledge level

281
Poor knowledge level

Table 4. Distribution of participants knowledge level regarding diabetes ocular complications by their bio-demographic data

Factors	Poor		Good		p-value
	No	%	No	%	
Gender					
Male	134	48.7%	141	51.3%	.001*
Female	147	65.6%	77	34.4%	
Child age at diagnosis with DM					
< 5 years	25	58.1%	18	41.9%	
6-10	135	71.8%	53	28.2%	.001*
11-15	97	54.2%	82	45.8%	
16-17	24	27.0%	65	73.0%	
Family history of DM					
Yes	151	52.4%	137	47.6%	.041*
No	130	61.6%	81	38.4%	
Have medical history of eye diseases					
Yes	43	32.3%	90	67.7%	.001*
No	238	65.0%	128	35.0%	
Have visited ophthalmologists due to eye complications?					
Yes	121	44.0%	154	56.0%	.001*
No	160	71.4%	64	28.6%	
Do you have visual problems?					
Myopia	52	31.5%	113	68.5%	.001*$
Hyperopia	29	82.9%	6	17.1%	
None	200	66.9%	99	33.1%	

P: Pearson X2 test $: Exact probability test   * P < 0.05 (significant)

Discussion

The retina is the interior coating at the back of each eye. The retina senses light and turns it into signals that the brain decodes, so people can see [12]. Diabetes associated damage of blood vessels is a hazard to the retina, causing a disease called diabetic retinopathy [13]. In early stage of diabetic retinopathy, blood vessels are weakened, swell, or leak into the retina. This stage is called non-proliferative diabetic retinopathy [14]. With more advanced stages, some blood vessels close off with growing of new blood vessels, or they proliferate, on the surface of the retina. This stage is called proliferative diabetic retinopathy. These abnormal new blood vessels can lead to serious vision problems [14-15]. Eye complications with diabetes are quickly evolving as a global health challenge that may threaten patients' visual acuity and visual function. Proper management of diabetic retinopathy can decrease the hazard of visual loss by 60% [16]. Diabetic retinopathy still remains the leading cause of blindness among working-age adults. The current study aimed to assess diabetes-related ocular complications and knowledge level among diabetic children and their caregivers.

The study results showed that more than half of the children were males and two thirds of them had type 1 DM. About one quarter of the children had a medical history of eye diseases. As for diabetes clinical data, it was recent (less than 5 years) among a very low percentage of the children while more than half of them had been diagnosed with DM for more than 10 years. About half of the children were on oral hypoglycaemics and others on insulin. More than half of the children reported that their HbA1c exceeded 7.5% which means poor diabetic control. The global average HbA1c in DM children was $9.09 \pm 2.12\%$. On average, there were 23.6% (95% CI 23.1–24.1%) children who had good glycemic control with HbA1c <7.5%, and 46.9% (95%CI 46.0–47.7%), [17] children with DM had HbA1c ≥9.0% which is in concordance with the current study findings. The American Diabetes Association (ADA) recommended HbA1c <7.5% in 2015 [18], the National Institute for Health and Care Excellence (NICE) suggested HbA1c <6.5% in 2016 [19], and the International Society for Paediatric and Adolescent Diabetes (ISPAD) recommended HbA1c <7.0% for children with DM in 2018 [20].

Regarding diabetes related complications, retinopathy was the most reported among the current study participants (nearly 1 out of each 10 children), followed by DKA, and thrombosis. More than half of the children visited ophthalmologists due to eye complications and myopia was the most diagnosed visual problem (nearly one third of the patients). This is against literature findings and recommendations where a study of DM among children reported that having DM type 1 at a very young age may protect against the development of DR [21]. Even less is known about DR risk and incidence in children with type 2 DM, which is a progressively significant population to study given the rising magnitude of children with this disorder. The current study included one third of the children with type 2 DM for long duration (more than 10 years) which may explain DR cases.

Regarding children and caregivers' knowledge of diabetes related eye complications, the study results showed that less than half were knowledgeable regarding these complications. In more details, the vast majority of the study participants agreed that diabetes may cause eye-related complications, and also agreed that early detection of eye diseases associated with diabetes may reduce their complications. About two thirds of the participants said that an ophthalmologist should be visited immediately after DM diagnosis. More than three quarters of the respondents think that the annual visit to the ophthalmologist for diabetics is important. Good control of HbA1c as the best method to prevent diabetic eye complications was known by two thirds of the study participants and more than half of them think that eye complications for diabetics are very serious while one third think it's only serious. Knowledge was significantly higher among male participants, with long duration diabetes, positive family history, and those with eye diseases who visited an ophthalmologist. Ramke J et al. [22] reported that correct nomination of at least one symptom, risk factor, prevention or treatment of diabetes was made by 6.1% of adolescents. Also, 6.8% supposed that diabetes caused problems with the body and 3.6% reported diabetes caused eye problems. AlHargan MH in Riyadh found that there was good awareness about DR, diabetes was well controlled among 61% of the patients, but less than half (45%) had their eyes checked within 1 year. Good awareness regarding diabetes associated eye complications was shown in other studies in Hail and Al Jouf (76%) and Jeddah (83%) [23-25]. Also, studies from Oman (93%), [26] Jordan (88%), [27] and Turkey (88%), [28] showed a similarly high level of awareness regarding DM affecting the eyes.

Conclusions and Recommendations

In conclusion, the study revealed that diabetic eye complications among children were not frequent with poor diabetic control. Participants' knowledge regarding diabetes eye related complications was on average, especially for the significance of ophthalmologist visits and early detection of the disorders. Long duration of diabetes, family history of DM, with ophthalmologists' visits were the most significant determinants of knowledge level. More effort should be paid to increase the incentive of

the patients for regular eye examination. The physicians can be the superlative source for providing this motivation since a high proportion of patients report that they received their information from their doctors.

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Anxiety and coping strategies among COVID-19 patients in Medina, Saudi Arabia

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Abstract

Background: Infectious disease outbreaks cause significant psychosocial problems. Studies have found that any coronavirus-infected individuals, such those with Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS) and coronavirus disease 2019 (COVID-19), may exhibit depression, anxiety, post-traumatic stress, and other neuropsychiatric syndromes. Therefore, this study aimed to measure the anxiety levels and different coping strategies of COVID-19 patients in Saudi Arabia.

Methods: This observational, analytical, cross-sectional study included 297 COVID-19 patients evaluated between April and May 2020 in Al-Madinah, Saudi Arabia. The data were collected from patients directly via telephone calls using a questionnaire. Anxiety and coping strategies were measured using a translated and validated version of the Generalized Anxiety Disorder Scale and Brief Coping Orientation to Problems Experienced scale.

Results: Most of the participants were male (64.6%), and more than half (59.6%) were Saudi. The mean age was 35 ± 10.6 years (range, 17–63 years). The frequency of patients with moderate to severe anxiety (score > 10) was 55.9%, and the most frequently used coping strategy was religion (7.20 ± 1.35). Anxiety was significantly associated with self-blame, venting, denial, and active coping in the final multivariable analysis.

Conclusion: Moderate to severe anxiety was experienced by 55.9% of COVID-19 patients, and anxiety was associated with self-blame, venting, denial, and active coping. Therefore, increasing awareness of the effects of COVID-19 on mental health, and patient education on healthy coping mechanisms for anxiety management are recommended for the Saudi Arabian population.

Key words: anxiety, coping, COVID-19, infectious diseases, patients, Saudi Arabia

Abbreviations
COVID-19, coronavirus disease 2019; GAD-7, Generalized Anxiety Disorder Scale; COPE, Coping Orientation to Problems Experienced; BMI, body mass index

Introduction

Coronavirus disease 2019 (COVID-19) was declared a global pandemic by the World Health Organization on March 11, 2020. By April 17, 2020, approximately 2,214,861 confirmed COVID-19 cases had been reported worldwide. Overall, 7,142 cases have been reported in Saudi Arabia with 1,226 cases in Al-Madinah alone [1]. COVID-19 is caused by severe acute respiratory syndrome coronavirus 2, a member of the coronavirus family [2]. As previously reported, infectious disease outbreaks significantly cause psychosocial problems [3]. Individuals infected with coronaviruses, such as those causing Severe Acute Respiratory Syndrome, Middle East Respiratory Syndrome, and COVID-19 may experience depression, anxiety, posttraumatic stress, and other neuropsychiatric syndromes [4]. In Saudi Arabia, numerous restrictions have been implemented due to the COVID-19 outbreak, and these limitations, especially curfews, can impact the mental health of the population. In addition, many people are isolated since they cannot attend schools, mosques, or shops. Worldwide, as the crisis has progressed, there has been an increase in reported psychological impacts from the public, medical staff, and patients in many countries.
A systematic review regarding the impact of a COVID-19 pandemic on mental health among the general population in China, Spain, Italy, Iran, USA, Turkey, Nepal, and Denmark reported anxiety scores of 6.33%–50.9% [5].
Only a few studies have been published concentrating on the psychological effects of the disease, especially in Saudi Arabia and the Middle East. In a recent study, Alkhamees et al. investigated the psychological impact of the COVID-19 pandemic on the general population in Saudi Arabia. Of the participants, 23.6% reported having moderate to severe anxiety [6].

To our knowledge, no previous studies have been conducted to measure anxiety among COVID-19 patients in the Saudi population; therefore, this study aimed to measure the anxiety level and different coping responses of COVID-19 patients in Medina, Saudi Arabia in 2020.

Materials and Methods

Study design, settings, and participants
This observational, analytical, cross-sectional study was conducted from April 2020 to May 2020 by the Al-Madinah public health administration. Patients who tested positive for COVID-19, registered, and were followed-up by public health administration in Al-Madinah were included. Initially, the total number of patients was obtained from the official Ministry of Health website. Once the total number of patients was confirmed, a random sample was obtained, and the sample size was calculated accordingly. Non-Arabic speakers and severely ill patients (intensive care unit patients) were excluded from the study. A total of 589 patients were asked to participate in the study and 297 responded, resulting in a response rate of 50%. Non-responders were defined as people who refused to participate and did not answer calls after 2 days.

Study instruments and data collection procedure
The data were collected from patients directly via telephone call from qualified healthcare workers at the public health administration call center. The workers were trained by the researcher on how to complete the questionnaire to ensure complete confidentiality and validity.

The questionnaire was in Google format and consisted of two parts. The first section contained sociodemographic data (age, sex, education, residence, monthly income, nationality, marital status) and a brief medical history (smoking history, chronic disease, and signs and symptoms of COVID-19). The second section contained a translated and validated version of the Generalized Anxiety Disorder Scale (GAD-7). The GAD-7 is a seven-item scale frequently used as a diagnostic self-reporting scale for screening, diagnosis, and severity assessment of anxiety disorders. Individuals answered the questions according to the previous 2 weeks, and the responses ranged from 0 (not at all sure) to 3 (nearly every day). The scores ranged from 0–21 for each item. Scores of 5–9, 10–14, and ≥ 15 were taken as the cutoff points for mild, moderate, and severe anxiety, respectively. Cronbach's alpha for the Arabic version was 0.95[7]. The second section also contained a Brief Coping Orientation to Problems Experienced (COPE) scale, an abbreviated version of the COPE Inventory Scale. This scale is most frequently used in healthcare settings to determine how patients react emotionally to a difficult situation. It comprises 14 coping strategies: self-distraction, active coping, denial, substance use, the use of emotional support, the use of instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame. Responses ranged from 1 (I have not been doing this at all) to 4 (I have been doing this a lot). Total scores ranged from 2–8 for each coping style, with higher scores indicating a higher tendency to implement the corresponding coping style. In the Arabic version of the Brief COPE scale, Cronbach's alpha ranged from 0.23–0.7 [8].

Ethics approval of research
Ethical approval was obtained from the Ethics Committee of the Directorate of Health in Al-Madinah. The objectives and benefits of the study were explained to the participants, and oral consent was obtained via telephone from all participants before beginning data collection. First, the data collector read the consent form to the participant, answered any questions that the participant might have, and then registered the consent by participant number, time, and date. The privacy and confidentiality of all participants was ensured.

Data analysis
Responses from the Google form were transferred to Microsoft Excel. After coding and data cleaning, the data were imported into SPSS software (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.) for the analysis. Qualitative variables are presented as frequencies and percentages, whereas quantitative variables are expressed as mean and standard deviation.

An independent t-test was used to estimate the difference between the two groups, and the analysis of variance was applied for three or more groups. The correlation between coping strategies and the GAD-7 score was measured. A multiple linear regression analysis was used to determine the predictors of anxiety among COVID-19 patients. Statistical significance was set at $p < 0.01$.

Results

A total of 297 COVID-19 patients were included in this study. Through the analysis, we found that 59.6% of the participants were Saudi. The majority of the patients were male (64.6%) and the mean age was 35 ± 10.6 years (range 17–63). Regarding clinical characteristics, only 19% of patients had a chronic disease. Based on the body mass index (BMI),24.6 % overweight, 39.1 were normal, 78% had COVID-19 symptoms, and 38.7% had fever (as shown in Table 1).

Anxiety among COVID-19 patients and associated factors
The mean anxiety score was 11.6 ± 5.0 and the frequency of patients with moderate to severe anxiety (score > 10) was 55.9%. Upon analysis, we found that there was a significant difference in anxiety scores between Saudi (11.1 ± 4.6) and non-Saudi patients (12.4 ± 5.5) ($p < 0.001$), married (12.2 ± 5.4) and single patients (10.8 ± 4.3) ($p < 0.001$), and patients presenting with different classifications of BMI, including underweight (11.8 ± 5.2), normal weight (10.8 ± 3.9), and overweight (12.8 ± 6.1) ($p < 0.001$). In addition, we also found that there was a significant difference between patients who felt ashamed of the disease (15.4 ± 6.7) ($p < 0.001$), patients who were afraid of how they were viewed by society (15.1 ± 6.8) ($p < 0.001$), and those who were afraid of disease complications (15.2 ± 5.8) ($p < 0.001$) (as shown in Table 2).

Coping strategies and relationship to anxiety
The most frequently used coping strategy was religion (7.2 ± 1.4), followed by approach coping acceptance (6.5 ± 1.7). The least frequently used coping strategies were avoidant approach and substance use (2.0 ± 0.2). There was a significant positive correlation between anxiety and avoidant coping strategies, self-distraction, denial, venting, and self-blame ($p < 0.001$). There were also significant positive correlations between anxiety and the following coping strategies: active coping, the use of informational support, positive reframing, emotional support, planning, and religion ($p < 0.001$). The strongest correlation was observed in patients who used self-blame ($r = 0.445$), and the weakest correlation was in patients who used religion as a coping strategy ($r = 0.121$) (as shown in Table 3).

Factors associated with anxiety in the multivariate analysis
All independent variables that were significantly associated with anxiety as per the univariate analysis were included in the multiple linear regression analysis. The final multivariable linear regression model found that anxiety was significantly associated with self-blame ($p < 0.001$), venting ($p < 0.001$), denial ($p < 0.001$), and active coping ($p < 0.001$). Also, it was significantly associated with feeling ashamed of the disease ($p < 0.001$) and fear of complications ($p < 0.001$) and was responsible for 37% of the variability in anxiety levels (as shown in Table 4).

Characteristic	Frequency	Percent (%)
Sex		
Male	192	64.6
Female	105	35.4
Age		
≤ 35	160	53.9
>35	137	46.1
Nationality		
Saudi	177	59.6
Non-Saudi	120	40.4
Marital status		
Married	166	55.9
Single	131	44.1
Occupation		
Not employed	113	38.0
Government	69	23.2
Private	115	38.7
Education		
School	139	46.8
University	158	53.2
Residence type		
Apartment/villa	264	88.9
Dorms/workers residence	33	11.1
Monthly income		
< 5000	183	61.6
≥ 5000	114	38.4
Cigarette smoking		
Yes	52	17.5
No	245	82.5
Shisha smoking		
Yes	38	12.8
No	259	87.2
Chronic diseases		
Yes	57	19.2
No	240	80.8
BMI		
Underweight	105	35.4
Normal	116	39.1
Overweight	73	24.6
COVID-19 symptom		
Cough	43	14.5
Fever	115	38.7
SOB	22	7.4
URTI	51	17.2
Muscle pain	44	14.8
General fatigue	53	17.8
Change in smell or taste	56	18.9
Headache	63	21.2
No symptoms	63	21.2
Feeling ashamed of the disease		
Yes	30	10.1
No	267	89.9
Fear of how society views me		
Yes	31	10.4
No	266	89.6
Fear of disease complications		
Yes	69	23.2
No	228	76.8

**Table 1.
Socio-demographic
characteristics of
participants**

BMI, body mass index;
COVID-19, coronavirus
disease 2019; SOB,
shortness of breath; URTI,
upper respiratory tract
infection

Table 2. Independent t-test and analysis of variance between all independent variables and anxiety

Variable	Mean (SD)	p value
Sex		
Male	11.7 (5.2)	0.673
Female	11.4 (4.7)	
Age		
≤ 35	11.6 (4.8)	0.855
> 35	11.5 (5.3)	
Nationality		
Saudi	11.1 (4.6)	< 0.001
Non-Saudi	12.4 (5.5)	
Marital status		
Married	12.2 (5.4)	< 0.001
Single	10.8 (4.3)	
Occupation		
Not employed	11.0 (4.4)	0.226
Government job	11.6 (4.9)	
Private job	12.1 (5.7)	
Education		
School	11.6 (5.1)	0.955
University	11.6 (4.9)	
Residence type		
Apartment/villa	11.7 (5.1)	0.334
Dorms/workers residence	10.8 (4.2)	
Monthly income		
< 5000	11.5 (5.0)	0.654
≥ 5000	11.8 (5.0)	
Cigarette smoking		
Yes	11.2 (4.1)	0.535
No	11.7 (5.2)	
Shisha smoking		
Yes	12.2 (6.1)	0.452
No	11.5 (4.9)	
Chronic diseases		
Yes	12.7 (5.8)	0.078
No	11.3 (4.8)	
BMI		
Underweight	11.8 (5.2)	< 0.001
Normal	10.8 (3.9)	
Overweight	12.8 (6.1)	
COVID-19 symptoms		
Yes	11.7 (5.2)	0.285
No	10.9 (4.1)	
I feel ashamed of the disease		
Yes	15.4 (6.7)	< 0.001
No	11.2 (4.6)	
I am afraid of how society views me		
Yes	15.1 (6.8)	< 0.001
No	11.2 (4.6)	
I am afraid of disease complications		
Yes	15.2 (5.8)	< 0.001
No	10.5 (4.2)	

BMI, body mass index; COVID-19, coronavirus disease 2019

Table 3. Correlation between coping strategies and anxiety

GAD coping strategy	r coefficient	p value
Self-distraction	0.200	< 0.001
Active coping	- 0.232	< 0.001
Denial	0.359	< 0.001
Substance use	0.080	0.167
Emotional support	0.242	< 0.001
Use of informational support	0.157	< 0.001
Behavioral disengagement	0.144	< 0.001
Venting	0.322	< 0.001
Positive reframing	0.205	< 0.001
Planning	0.259	< 0.001
Humor	0.103	0.075
Acceptance	0.111	< 0.001
Religion	0.121	< 0.001
Self-blame	0.445	< 0.001

GAD, Generalized Anxiety Disorder Scale

Table 4.Multiple linear regression analysis of predictors of anxiety among COVID-19 patients

Independent variables	b	p value	95% Confidence interval	
			Lower	Upper
Self-blame	0.761	< 0.001	0.4	1.1
Venting	0.396	< 0.001	0.1	0.7
Denial	0.576	< 0.001	0.2	0.9
Active coping	-0.362	< 0.001	-0.1	-0.6
Feeling afraid of the complication of the disease	2.422	< 0.001	3.6	1.2
Feeling ashamed of the disease	2.077	< 0.001	3.8	0.4

COVID-19, coronavirus disease 2019

Discussion

This study aimed to measure anxiety levels and coping mechanisms in COVID-19-experiencing individuals in Medina, Saudi Arabia in 2020. Our study results indicated that 55.9% of the infected individuals experienced moderate to severe anxiety. According to a cohort study conducted by Mazza et al. among survivors of COVID-19 after a 1-month follow-up from their hospitalization, 42% experienced anxiety[9]. In addition, two cross-sectional studies in China reported that the prevalence of anxiety among individuals who experienced COVID-19 was 15%,[10] and 20.9%,[11] respectively.

Few studies have been published on the prevalence of anxiety among COVID-19-experiencing individuals. Conversely, many published studies have been conducted on anxiety levels among the general population and healthcare workers. Systematic reviews and meta-analyses have reported an average 15.5% prevalence of anxiety among populations affected by the COVID-19 pandemic [12]. According to a study by Khademian et al., COVID-19 affects mental health leading to stress, anxiety, and depression [13]. In a study conducted by Zandifar et al., employing an online survey methodology, a significant number of respondents reported moderate to high levels of anxiety and depression following COVID-19 infection [14]. Another systematic review including studies from China, Spain, Italy, Iran, USA, Turkey, Nepal, and Denmark also reported a high rate of anxiety (6.33%–50.9%) among the general population [5]. In Saudi Arabia, two cross-sectional studies reported anxiety prevalence rates of 16.4% [15] and 23.6% [6] during the COVID-19 pandemic.

Notably, the current study found a significant difference in anxiety scores between married and single individuals, consistent with a previous study [14]. However, we did not find significant differences in anxiety levels between men and women. In contrast, previously published studies among COVID-19 patients found that anxiety levels were higher among women than men [9, 11].

Approach coping is associated with more supportive responses, better physical health outcomes, and more stable emotional responses than avoidant coping, which is mildly effective in managing anxiety. The current study found that religion was the most frequently used coping mechanism. People usually tend to practice more of their religious rituals in difficult life situations, especially if they are uncertain. This finding is consistent with those of a cross-sectional study conducted among university students in Pakistan during the COVID-19 pandemic [16].

The current study found that anxiety was associated with adopting self-blame, venting, and denial coping response, which is considered a part of the avoidant coping response. This response is associated with poor physical health among those with medical conditions and is also mildly effective in managing anxiety [17]. In addition, we found that anxiety levels were significantly associated with individuals who were feeling ashamed of the disease and afraid of its complications. Such a result was expected, as the present study was conducted at the beginning of the pandemic when there was a lack of information about the COVID-19-causing virus virulence.

Limitations of the study
The current study was conducted in one city in Saudi Arabia, limiting its generalizability to the entire population of the country. Another limitation was the method used for gathering the data. Owing to the COVID-19 pandemic, physical interviews with respondents were difficult, and interviews were instead conducted using phone calls. This data collection procedure was associated with difficulty in clarifying respondents' statements and sentiments. In addition, despite the large sample size, there was a low response rate, leading to a response bias. For example, respondents who perceived themselves as anxious were reluctant to participate in the study.

Conclusion

This cross-sectional study found that 55.9% of COVID-19 patients had moderate to severe anxiety. Furthermore, most of the participants used religion as a coping response to their illness, and anxiety was associated with self-blame, venting, denial, and active coping. Therefore, the current study recommends increasing awareness in the Saudi Arabian population about the effects of COVID-19 on mental health and suggests education on healthy coping mechanisms for anxiety management. For example, awareness can be enhanced by sending teaching materials on public phones. Additionally, future studies should include similar research performed in different geographical settings and among diverse populations in Saudi Arabia.

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Unusual presentation of tinea corporis skin lesion - A Case Report

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Abstract

Here we report a case about Tinea Corporis that had unusual presentation in an 18-year-old female without any underlying chronic skin disorders. The patient was treated with antifungal medication, oral and topical, and was followed up for 6 months.

Background: Tinea corporis is a common fungal infection that mimics many other annular lesions, and it is commonly misdiagnosed. Primary care Physicians must familiarize themselves with this condition and its treatment.

Keywords: Dermatophyte, Epidermophyton, onychomycosis, Micros Porum, Trichophyton, antifungal drugs.

Introduction

Tinea corporis, also known as 'ringworm' is a superficial dermatophyte infection of the skin, other than on the hands (tinea manuum), feet (tinea pedis), scalp (tinea capitis), bearded areas (tinea barbae), face (tinea faciei), groin (tinea cruris), and nails (onychomycosis or tinea unguium) (1). Tinea corporis is most commonly caused by dermatophytes belonging to one of the three genera, namely, Trichophyton (which causes infections on skin, hair, and nails), Microsporum (which causes infections on skin and hair), and Epidermophyton (which causes infections on skin and nails) (1,3).

Tinea corporis is the most common dermatophytosis (4). While tinea corporis occurs worldwide, it is most commonly observed in tropical regions (5). The lifetime risk of acquiring tinea corporis is estimated to be 10–20% (6). Tinea corporis occurs most frequently in post-pubertal children and young adults (5,7).

Humans may become infected through close contact with an infected individual, an infected animal (in particular, domestic dog or cat), contaminated fomites, or contaminated soil (8,10). Infection may be acquired as a result of spread from another site of dermatophyte infection (e.g. tinea capitis, tinea pedis, onychomycosis) (11,12). Transmission among household family members is by far the most common route; children often become infected by spores shed by an infected household family member (10). Autoinfection by dermatophytes elsewhere in the body may also occur (13). Transmission of the fungus is facilitated by a moist, warm environment, sharing of towels and clothing, and wearing of occlusive clothing (1,13).

The diagnosis can be made on clinical appearance and can be confirmed by microscopy or culture. A wide range of topical antifungal drugs are used to treat these superficial dermatomycoses.

Case Presentation

An 18-year-old female without any history of skin lesion. She has no other significant medical history. She was seen in the Family Medicine Clinic for a non-related medical condition.

Noticed with atypical presentation of tinea corporis on her face and the neck region for 6 months and has been under follow-up with dermatology clinic prior her visit to the primary health care physician.

She had mentioned that she applied some shared cosmetics which was used occasionally, then the skin lesion started to appear and to increase in size. A well-demarcated, sharply circumscribed, erythematous, annular, scaly plaque with a raised leading edge and scaling with central clearing lesion on the face and spreading over the upper trunk region.

Despite her multiple follow-ups regarding this lesion in the dermatology clinic the lesion continued to spread in a way of desquamation and peeling of skin in the lower part of her face and spreading to the entire neck region.

At her first visit with the dermatologist, she complained that the lesion was only a small spot on her chin and neck and it was diagnosed as contact dermatitis. It was treated with topical emollients such as hydrocortisone topical cream application for 7 days and mometasone topical application for 14 days.

Her status was worsening as the lesion started spreading to cover the half of her lower face and lips; it was in the form of severe desquamation with extensive redness and peeling.

One day she was seen in the family medicine clinic for a non-related skin condition. Upon her examination I had noticed her extensive skin lesion which was disfiguring her face.

The lesion was extensive superficial skin desquamation covering her lower face and neck region with redness and peeling. The patient was feeling embarrassed from her look and depressed.

We started her on a trial of the following medications:
1- Topical clotrimazole cream BID * 14 days
2- Fusidic acid topical cream TID * 7 days (short course of antibiotics just to treat the recent infection).
3- Miconazole topical cream TID * 14 days.

The patient was given a follow up after 15 days and it showed remarkable improvement.

(continued next page)

The next follow up was given after a month and it had improved results. The patient was given instructions not to use any shared cosmetics or towels of the family members.

We saw the patient after 3 months; the lesion was way improved with 30 % of the scales reduced, but we decided to start oral fluconazole 150 mg oral once weekly.

After 3 months follow up, the skin was much improved and most of the flakes and the desquamation gone except slight flakes of skin around the mouth.

Discussion

Tinea corporis is a common fungal infection and the differential diagnosis is broad and at times, difficult. A well-demarcated, sharply circumscribed, mildly erythematous, annular, scaly plaque with a raised leading edge, and scaling and central clearing on the body is characteristic of tinea corporis. At times, the diagnosis can be difficult due to the prior use of medications, such as calcineurin inhibitors or corticosteroids.

Antifungals play a key role in combating infection caused by dermatophytes. A combination of oral and topical antifungal appears to be the effective choice of treatment. Other body parts especially scalp must be examined, and adequate treatment should be initiated to eradicate the infection and prevent re-infection.

However, prognosis, for localized tinea corporis is excellent with appropriate treatment and patient compliance. Recurrence may occur if therapy is discontinued without complete eradication of the fungi.

Conclusion

In conclusion, Tinea corporis is a common fungal infection that mimics many other annular lesions, and it is commonly misdiagnosed. At times, the diagnosis can be difficult due to the prior use of medications, such as calcineurin inhibitors or corticosteroids. It is important to treat Tinea corporis with combined oral and topical antifungals.

This case emphasizes that Primary Care physicians must be familiar with this condition so that an accurate diagnosis can be made, and appropriate treatment initiated at the primary care level. It is extremely important as this condition could be treated in primary care and reduce referral to secondary care.

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Contact Lens Use Patterns and Safety Determinants among Adolescents in Western Saudi Arabia

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Abstract

Background: Besides medical use, cosmetic contact lens (CL) use, associated with several ophthalmological risks, is gaining substantial popularity, especially among the young.

Objective: This study aimed to estimate eye risk extent related to CL use among adolescents and understand the association between risk level and CL use patterns and adherence to hygiene and maintenance instructions.

Method: A population-based, cross-sectional study was conducted among adolescents aged 14–19 years residing in the Western region of Saudi Arabia. A structured online questionnaire was used to explore the demographic data, CL use patterns, levels of adherence to safety behaviors in CL use, and experienced eye complaints.

Result: Of 350 participants, 248 (70.9%) used CLs. There was an overwhelming female predominance (93.1%) among users, with occasional, cosmetic, and combined cosmetic-medical uses without prescription or follow-up being the most frequent pattern. Practices in CL hygiene and care were unsatisfactory, with poorer adherence to maintenance instructions. Clinically significant complications (CSC), defined as the presence of at least one of the clinically significant symptoms or any two other symptoms, were reported in 38.7% of CL users (95% CI = 32.6%–45.1%). CSC risk independently increased after 5 years of use (OR = 3.59, 95% CI = 1.51–8.52) and in double-purpose use (OR = 3.34, 95% CI = 1.52–7.37) by reference to cosmetic use only, while adherence levels to CL removal during sleep (OR = 0.21, 95% CI = 0.05–0.92) and not using CLs after the expiration date (OR = 0.28, 95% CI = 0.11–0.73) were protective factors against CSC.

Conclusion: Young Saudi adolescents are highly exposed to unregulated CL use with significant ophthalmological risks. This has several clinical, public health, and policy-making implications.

Keywords: Contact lenses, habits, teenagers, Jeddah, cosmetic, refractive

Introduction

Contact lens (CL) use is becoming highly popular, accounting for a huge market of more than $US12 million, with a nearly 7% of growth rate globally(1,2). In the past 15 years, there was a significant increase in CL use to control myopia and other eye conditions among children and adolescents, achieving notable clinical success(3–5). Other health advantages of CLs are represented by improved psychological and social well-being due to improvements in self-esteem and quality of life(6,7).

However, besides medical use, cosmetic tinted CLs use is gaining substantial popularity among the young, especially in Saudi Arabia(8,9). A local study in 2014 involving female students from three universities in Riyadh showed a high CL use prevalence of 70%, with cosmetic use representing 63.3% of the cases, while exclusive medical use was reported in only 19.1%, and the remaining 17.7% comprised combined medical and cosmetic uses(10). The same study reported that approximately 40% purchased and used CLs without prescription or prior ophthalmological examination. A more recent study involving school children and adolescents aged 11–20 years in Riyadh, Saudi Arabia, showed that 15% of the participants had CLs, and less than 10% of them had been prescribed by an eye care professional for a medical indication. The authors also reported low knowledge levels and poor practice regarding hygiene and safety instructions(11).

Despite the advances in design and manufacturing and the ongoing research and innovation, (12,13) CL safety in children is still concerning(14). Several ophthalmological risk factors that can have an impact on children and adolescents have been identified, particularly in the case of cosmetic and/or unregulated use(15,16). These include factors related to the lens material nature and physical properties, protein deposits and bacterial contamination, and user's behavior, including use patterns, adherence to hygiene instructions and maintenance practices, and other behaviors, such as smoking and psychotropic drug use(16,17).

This study aimed to estimate eye risk extent related to CL use in adolescents and understand the association between risk level and CL use patterns and adherence to hygiene and maintenance instructions.

Methods

Design and setting
A population-based cross-sectional study was conducted among the residents of the Western region of Saudi Arabia between September 2020 and January 2021. The study was approved by the Biomedical Ethics Research Committee at King Abdulaziz University, Jeddah, Saudi Arabia (Reference No. 743-19).

Participants and sampling
The study targeted male and female adolescents aged 14–19 years. Participants with sensorial impairment, psychiatric comorbidity, or end-stage disease were not included.

The sample size was calculated to detect an expected CL use prevalence of 70%,(10) with a 95% confidence interval, 5% type 1 error, and 80% statistical power. The calculated sample size (N = 318) was increased to 350. The study sample was selected conveniently according to participants' accessibility and willingness to participate. Consent was obtained from all participants after informing them about the study purpose. There were no personal questions or identifier collection in the questionnaire.

Tool
A structured questionnaire was designed by the author to explore the following dimensions:
1) Demographic data, including age, gender, and nationality.
2) CL use, using a single question "do you use contact lenses?"
3) CL use patterns for its users, including the age when they started using CLs, duration in years, whether the user received education regarding CL care, main knowledge source about CL, the purpose of use (medical, cosmetic, or both), type of CL used, frequency of use, daily wearing regimen, whether the use is prescribed by an ophthalmologist or optician, and follow-up by a professional.
4) Safety measures in CL use exploring adherence level with 12 safety-related behaviors, including seven unsafe behaviors, such as wearing CLs during sleep or shower, and five safe behaviors, such as handwashing before and after wearing, solution and container change, etc. For both unsafe and safe behaviors, answers used a frequency scale, such as "never, rarely, sometimes, and always", or a dichotomous "yes/no" answer. In three items, the option "does not apply" was added.
5) Ophthalmological complications exploring a set of six symptoms, including itchy watery eye, swollen red eyes, eye pain or discomfort, photosensitivity, trouble seeing, and corneal abrasion.

Scoring
The questionnaire subset related to safety was used to calculate a safety adherence score (SAS). The scoring method followed the assumption that adherence ranged from no adherence (rated as 0) to complete adherence (rated as 1), while incomplete adherence was scored 0.25 or 0.5 depending on the level (e.g., rarely vs. sometimes). For the variables related to container wash, solution change, and container change frequency, values referring to the option "do not apply" were deleted and replaced using the mean imputation. The SAS was computed as the sum of the adherence scores of the 12 measures, yielding a score range of 0–12.

Variables

Complications incidence was analyzed as the dependent variable in the present study. A clinically significant complication (CSC) was defined as the occurrence of at least one of the symptoms considered clinically significant, including swollen red eye, trouble seeing or corneal abrasion, or two or more of any of the other symptoms.

Procedure

The questionnaire was translated into the Arabic language. An electronic version was edited using Google Forms. The link was disseminated via social media, including Twitter and WhatsApp. The link for the questionnaire was maintained active for five months.

Statistical methods

Statistical analysis was performed with Statistical Package for Social Sciences version 21.0 for Windows (SPSS Inc., Chicago, IL, USA). Categorical variables are presented as frequency and percentage, while numerical variables are presented as mean ± standard deviation (SD) or median and interquartile range (IQR), as applicable. The normality distribution of SAS was tested using Kolmogorov-Smirnov and Shapiro-Wilk tests. Since the score was not normally distributed, the first quartile (Q1) value was used as a cutoff to define poor adherence to safety measures (SAS < Q1). Each complication and CSC prevalence was calculated with an estimation of 95% CI. Chi-square and Fisher's exact tests were used, as applicable, to analyze the association of CSC with categorical variables factors. Independent t-test was used to compare the mean and variance of age and age of when the participant started using CLs across the outcome groups (CSC vs. no CSC). A multivariate binary logistic model was carried out to analyze the independent factors associated with CSC. A p value of <0.05 was considered to reject the null hypothesis.

Results

Participants' characteristics

The study sample consisted of 350 adolescents, of whom 248 (70.9%) declared using CLs while the remaining 102 (29.1%) denied wearing them. Most CL users were females, accounting for 96.4% of the group, compared with 78.4% in the nonuser group (p < 0.001) (Table 1).

Patterns of CL use

Users started wearing CLs at a mean age of 14.25 (SD = 1.91) years, and 23.0% have been using them for five years or more. Cosmetic CL use was the most frequent purpose for wearing CL, either separately (45.2%) or combined with the medical purpose (30.2%). However, two-thirds (69.8%) declared wearing their CLs less than two days per month or lesser, on average. Most users (84.7%) declared being educated for CL care; however, the most frequent knowledge source was a family member (40.7%), followed by Internet and social media (33.9%). Only 8.9% declared seeking knowledge about CL care from their ophthalmologist or optometrist. A small number of participants use CLs with a prescription (27.8%) and are followed up by a professional 21.4% (Table 2).

Safety parameters in CL use

Adherence to 12 safety measures showed the three highest rates for rigorous compliance in the following dimensions: abstinence from wearing CL while swimming (81.5%), avoidance of using CL during sleep (79.0%), and avoiding sharing CLs with others (79.0%). The lowest rates for rigorous compliance concerned container maintenance frequency, including change (12.9%) and wash (30.6%), followed by CL solution change frequency (41.5%). These observations were confirmed by the mean adherence scores measured (Table 3). The overall SAS showed a mean (SD) of 8.31 (1.59) out of 12, a range of 3.25–12.0, and a median (IQR) of 8.50 (2.25). Normality testing showed non-normal distribution with Kolmogorov-Smirnov (0.092, p < 0.001) and Shapiro–Wilk tests (0.982, p = 0.003) (Figure 1).

Ophthalmological complications in CL users

Eye pain or discomfort (51.2%), itchy watery eye (34.7%), and swollen red eye (16.9%) were the most commonly reported symptoms by CL users, and 29.0% reported having two or more symptoms. CSCs, defined as the presence of at least one of the clinically significant symptoms or any two other symptoms, was reported in 38.7% (95%CI = 32.6%–45.1%) (Table 4).

Association of safety instructions with eye complaints

Bivariate correlations between adherence scores to 12 safety measures and different eye complaints demonstrated several significant results (Supplemental Table). Swollen red eye was negatively associated with adherence to instructions on CL use during shower (R = −0.153, p = 0.016) and after the expiration date (R = 0.268, p < 0.001). Eye pain or discomfort was inversely associated with adherence to instructions on CL use during sleep (R = −0.136, p = 0.032) and after the expiration date (R = −0.138, p = 0.029). Photosensitivity was negatively correlated with adherence to instructions related to sleep (R = −0.165, p = 0.009), shower (R = −0.233, p < 0.001), swimming (R = 0.246, p < 0.001), expiration date (R = −0.148, p = 0.020), and sandstorm (R = −0.178, p = 0.005). Difficult vision was negatively correlated with adherence to instructions related to sleep (R = −0.154, p = 0.015) while it paradoxically showed a positive correlation with compliance to handwashing (R = 0.179, p = 0.005) and container wash frequency (R = 0.303, p < 0.001).

Factors associated with CSCs

Of the explored safety measures, only frequency of CL use during sleep (p = 0.010, Mann-Whitney U test) and CL use after the expiration date (p = 0.012, Mann-Whitney U test) were significantly associated with CSC risk in unadjusted analysis (results not presented). Furthermore, CSC risk was increased in cases of using CL for ≥5 years (61.4% vs. 25.8–35.2%, p < 0.001), double-purpose (53.3%) or medical (52.6%) use vs. 26.8% for cosmetic use (p = 0.001), and among participants with inadequate adherence to safety measures (SAS < 7.25, 50.8% vs. 34.8%, p = 0.025) (Table 5).

Predictors of CSCs

Two logistic regression models were carried out. The first model included CL use duration, CL use purpose, and the safety adherence level using SAS Q1 as the cutoff. In this model, CSC risk independently increased after 5 years of CL use (OR = 3.22, 95% CI = 1.43–7.28) and in double-purpose CL use (OR = 2.50, 95% CI = 1.29–4.85) by reference to cosmetic CL use only. The model explained 11.5% of the outcome variance. The level of adherence with safe CL use measures did not show significance in this model.

The second model included use duration, use purpose, and 12 adherence measures scores. The model showed that CSC risk independently increased after 5 years of CL use (OR = 3.59, 95% CI = 1.51–8.52) and in double-purpose CL use (OR = 3.34, 95% CI = 1.52–7.37) by reference to cosmetic CL use only, while adherence levels to CL removal during sleep (OR = 0.21, 95% CI = 0.05–0.92) and not using CLs after the expiration date (OR = 0.28, 95% CI = 0.11–0.73) were protective factors against CSC (Table 6).

Table 1. Demographic characteristics of contact lens users versus nonusers (N=350)

		Nonusers (N=102)		Users (N=248)		
Parameter	Level	Mean	SD	Mean	SD	p-value
Age	(years)	17.44	1.63	17.50	1.59	.719
Parameter	Level	N	%	N	%	p-value
Gender	Male	22	21.6	9	3.6	
	Female	80	78.4	239	96.4	<.001*
Residence	Baha	0	0.0	2	0.8	
	Jeddah	84	82.4	199	80.2	
	Madinah	1	1.0	1	0.4	
	Mecca	13	12.7	43	17.6	
	Riyadh	4	3.9	2	0.8	
	Yanbu	0	0.0	1	0.4	.241
Nationality	Saudi	94	92.2	231	93.1	
	Non-Saudi	8	7.8	17	6.9	.744

Table 2. Patterns of contact lens use (N=248)

Parameter	Level	Mean	SD
Starting age	(years), range =11-18	14.25	1.91

Parameter	Level	N	%
Duration of use	Less than a year	66	26.6
	1-4 years	125	50.4
	5 years or more	57	23.0
Education for contact lens care	No	38	15.3
	Yes	210	84.7
Main source of knowledge on how to use the contact lens	Ophthalmologist or optometrist	22	8.9
	Family member	101	40.7
	Friend	21	8.5
	Internet or social media	84	33.9
	Other	2	0.8
	NA / no answer	18	7.3
Purpose of use	Medical	61	24.6
	Cosmetic	112	45.2
	Both medical and cosmetic	75	30.2
Type of contact lens used*	Daily disposable soft CL	61	24.6
	Weekly disposable soft CL	12	4.8
	Monthly disposable soft CL	123	49.6
	Extended wear soft CL	97	39.1
Number of types used	Not answered	2	0.8
	1	207	83.5
	2	32	12.9
	3	6	2.4
	4	1	0.4
Frequency of use	Daily	29	11.7
	4-6 days a week	20	8.1
	1-3 days a week	26	10.5
	1-2 days a month	51	20.6
	Only a few days per year	122	49.2
Wearing regimen	<6 hours	87	35.1
	6-11 hours	139	56.0
	12-24 hours	17	6.9
	>24 hours	5	2.0
Prescription by ophthalmologist or optician	No	179	72.2
	Yes	69	27.8
Follow up by professional	None	195	78.6
	Once a year	37	14.9
	Every 6 months	16	6.5

* A participant may use more than one type

Table 3. Safety parameters in contact lenses use

Parameter	Level (safety score out of 1)	N	%	Mean safety score
Wearing CL while sleeping	Never (1)	196	79.0	
	Rarely (0.5)	38	15.3	
	Sometimes (0.25)	9	3.6	
	Always (0)	5	2.0	0.88 (0.25)
Wearing CL while showering	Never (1)	192	77.4	
	Rarely (0.5)	26	10.5	
	Sometimes (0.25)	19	7.7	
	Always (0)	11	4.4	0.85 (0.30)
Wearing CL while swimming	Never (1)	202	81.5	
	Rarely (0.5)	11	4.4	
	Sometimes (0.25)	19	7.7	
	Always (0)	16	6.5	0.86 (0.31)
Sharing own CL with others	Never (1)	196	79.0	
	Rarely (0.5)	19	7.7	
	Sometimes (0.25)	29	11.7	
	Always (0)	4	1.6	0.83 (0.35)
Storing or washing CL in other solutions	Never (1)	185	74.6	
	Rarely (0.5)	39	15.7	
	Sometimes (0.25)	21	8.5	
	Always (0)	3	1.2	0.85 (0.27)
Using CL after their expiration date	Never (1)	136	54.8	
	Rarely (0.5)	51	20.6	
	Sometimes (0.25)	49	19.8	
	Always (0)	12	4.8	0.70 (0.35)
Wearing the CL longer than their designed duration of use	Never (1)	151	60.9	
	Rarely (0.5)	28	11.3	
	Sometimes (0.25)	48	19.4	
	Always (0)	21	8.5	0.71 (0.37)
Hand washing pre and post wearing CL	Never (0)	1	0.4	
	Rarely (0.25)	12	4.8	
	Sometimes (0.5)	81	32.7	
	Always (1)	154	62.1	0.81 (0.24)
Frequency of container wash	Never (0)	16	6.5	
	Rarely (0.25)	26	10.5	
	Sometimes (0.5)	97	39.1	
	Always (1)	76	30.6	
	Does not apply (imputed = 0.61)	33	13.3	0.61 (0.30)
Frequency of solution change	Never (0)	34	13.7	
	Rarely (0.25)	35	14.1	
	Sometimes (0.5)	28	11.3	
	Always (1)	103	41.5	
	Does not apply (imputed = 0.28)	48	19.4	0.28 (0.33)
Frequency of container change	Never (0)	151	60.9	
	Every 6 months (0.5)	29	11.7	
	Every 3 months (1)	32	12.9	
	Does not apply (imputed = 0.22)	36	14.5	0.22 (0.34)
Abstinence from wearing CL during sandstorm	No (0)	68	27.4	
	Yes (1)	180	72.6	0.73 (0.45)

Figure 1. Distribution of safety adherence score
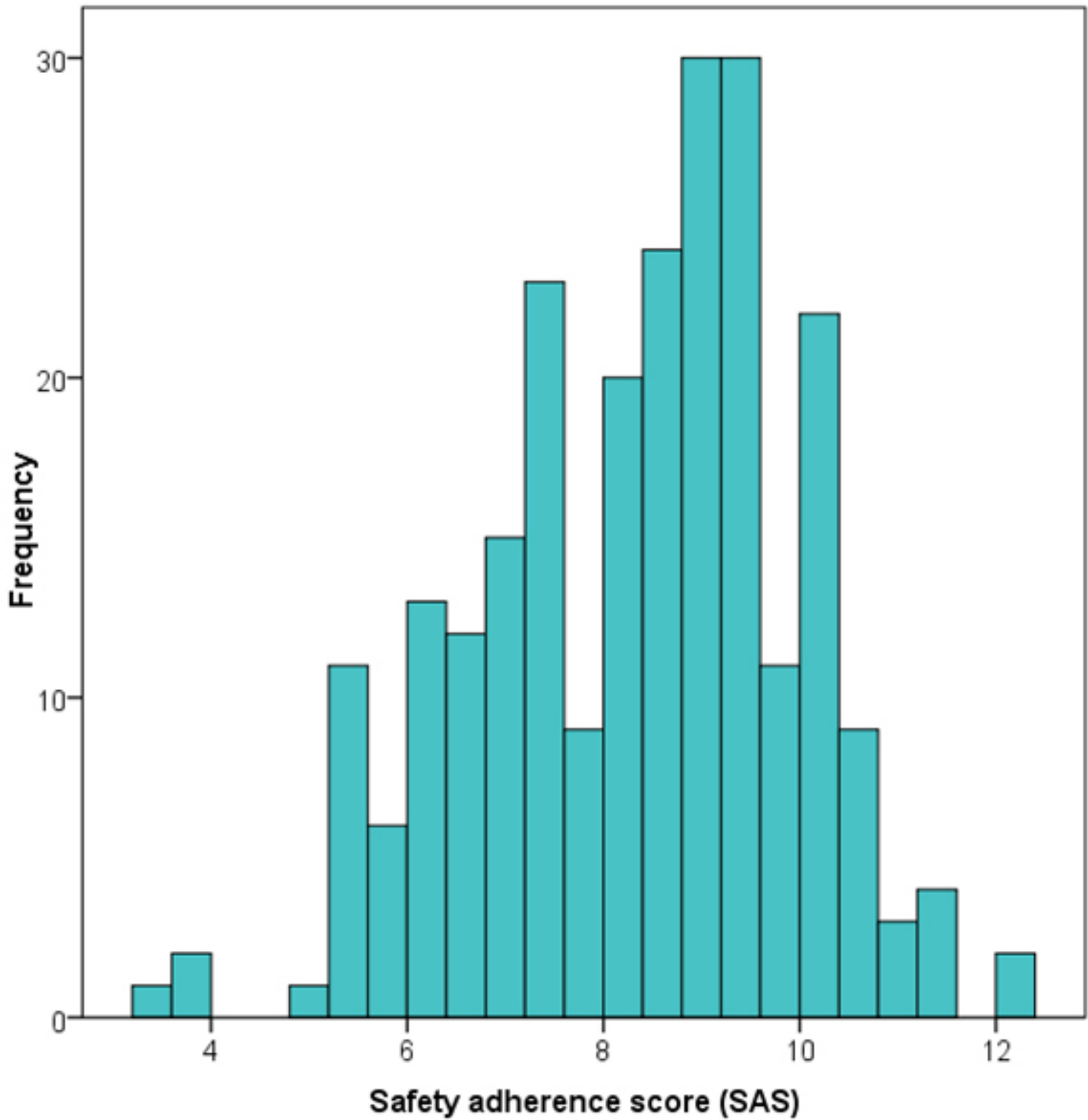
Table 4. Ophthalmological complications in contact lens users (N=248)

Complication	Frequency	Prevalence (%)	95%CI
Itchy watery eyes	86	34.7	28.8 – 41.0
Swollen red eyes*	42	16.9	12.5 – 22.2
Eye pain or discomfort	127	51.2	44.8 – 57.6
Photosensitivity	31	12.5	8.65 – 17.3
Trouble seeing*	25	10.1	6.63 – 14.5
Corneal abrasion*	7	2.8	1.14 – 5.73
No. cumulative complications			
0	85	34.3	
1	74	29.8	
2	42	16.9	
3	30	12.1	
4+	17	6.8	
Clinically significant complication			
Yes	96	38.7	32.6 – 45.1%
No	152	61.3	

* Symptoms considered as clinically significant
Clinically significant complication is defined as the presence of at least one of the clinically significant symptoms or any 2 other symptoms or more.

Supplemental Table 1. Correlations between adherence to different safety measures and eye complaints

Instruction dimension	Itchy watery eye	Red swollen eye	Pain or discomfort	Photo-sensitivity	Trouble seeing	Corneal abrasion
Sleep	-0.062 (.333)	-0.076 (.230)	-0.136 (.032*)	-0.165 (.009*)	-0.154 (.015*)	-0.061 (.338)
Shower	-.049 (.442)	-.153 (.016*)	-.105 (.098)	-.233 (<.001*)	-.051 (.423)	-.075 (.241)
Swimming	-.084 (.187)	-.101 (.112)	-.102 (.110)	-.264 (<.001*)	-.060 (.349)	-.077 (.226)
Sharing	-.006 (.921)	-.101 (.112)	-.028 (.656)	.063 (.323)	.087 (.171)	-.056 (.383)
Storage in other container or solution	-.030 (.633)	-.118 (.063)	.017 (.787)	.068 (.286)	.017 (.785)	.051 (.420)
Expiry date	-.103 (.104)	-.268 (<.001*)	-.138 (.029*)	-.148 (.020*)	.047 (.457)	-.063 (.321)
Overuse	-.014 (.823)	-.114 (.072)	.029 (.646)	-.029 (.655)	-.012 (.847)	.000 (.997)
Handwashing	-.094 (.138)	-.090 (.156)	-.014 (.822)	.019 (.768)	.179 (.005*)	-.068 (.289)
Container wash	-.011 (.859)	.028 (.657)	-.046 (.473)	.015 (.808)	.006 (.930)	.110 (.085)
Solution change	.036 (.568)	-.042 (.515)	.088 (.169)	.089 (.163)	.303 (<.001*)	-.047 (.459)
Container change	-.078 (.224)	-.007 (.907)	-.060 (.350)	-.002 (.981)	-.013 (.842)	-.094 (.142)
Sandstorm	.030 (.638)	-.036 (.575)	-.039 (.537)	-.178 (.005*)	-.064 (.312)	-.004 (.945)

Results are Pearson's correlation coefficient R (p-value)
* Statistically significant correlation (p<0.05)

Table 5. Factors associated with clinically significant complications

Factor	Level	No CSC		CSC		p-value
		Mean	SD	Mean	SD	
Age	(years)	17.36	1.67	17.73	1.43	.076
Age of CL start	(years)	14.41	1.82	13.98	2.01	.080
Factor	Level	N	%	N	%	p-value
Gender	Male	5	55.6	4	44.4	
	Female	147	61.5	92	38.5	.738F
Duration of use	Less than a year	49	74.2	17	25.8	
	1-4 years	81	64.8	44	35.2	
	5 years or more	22	38.6	35	61.4	<.001*
Education	No	22	57.9	16	42.1	
	Yes	130	61.9	80	38.1	.640
Main source of knowledge	Ophthalmologist or optometrist	16	72.7	6	27.3	
	Relative or friend	75	61.5	47	38.5	
	Internet or none	61	58.7	41.3	41.3	.468
Purpose of use	Medical	35	57.4	26	52.6	
	Cosmetic	82	73.2	30	26.8	
	Both	35	46.7	40	53.3	.001*
Frequency of use	Daily	13	44.8	16	55.2	
	4-6 days a week	13	65.0	7	35.0	
	1-3 days a week	15	57.7	11	42.3	
	1-2 days a month	37	72.5	14	27.5	
	A few days/year	74	60.7	48	39.3	.177
Wearing regimen	<6 hours	56	64.4	31	35.6	
	6-11 hours	85	61.2	54	38.8	
	12-24 hours	10	58.8	7	41.2	
	>24 hours	1	20.0	4	80.0	.263
On prescription	No	111	62.0	68	38.0	
	Yes	41	59.4	28	40.6	.707
Follow up by professional	None	120	61.5	75	38.5	
	Once a year	20	54.1	17	45.9	
	Every 6 months	12	75.0	4	25.0	.352
Safety adherence (SAS)	Inadequate (SAS<7.25)	30	49.2	31	50.8	
	Adequate (SAS≥7.25)	122	65.2	65	34.8	.025*

* Statistically significant result (p<0.05).

Table 6. Predictors of clinically significant complications

Model / Predictor	Level	OR	95%CI		p-value
Model 1					
Duration of use	Less than a year	Ref	-	-	.004*
	1-4 years	1.26	0.63	2.53	.519
	5 years or more	3.37	1.51	7.55	.003*
Purpose of use	Cosmetic	Ref	-	-	.006*
	Medical	1.88	0.94	3.75	.074
	Both	2.81	1.48	5.34	.002*
Safety adherence level	Inadequate	1.68	0.89	3.17	.112
	Adequate	Ref	-	-	-
Model 2					
Duration of use	Less than a year	Ref	-	-	.003*
	1-4 years	1.10	0.52	2.35	.804
	5 years or more	3.59	1.51	8.52	.004*
Purpose of use	Cosmetic	Ref	-	-	.011*
	Medical	2.45	0.99	6.08	.054
	Both	3.34	1.52	7.37	.003*
No wearing during sleep	(Score 0-1)	0.21	0.05	0.92	.039*
No wearing during shower	(Score 0-1)	1.21	.27	5.49	.805
No wearing while swimming	(Score 0-1)	0.71	0.19	2.63	.607
No sharing of CL	(Score 0-1)	0.56	0.21	1.50	.252
No storing in inappropriate solution or container	(Score 0-1)	0.79	0.25	2.51	.689
No use after expiry date	(Score 0-1)	0.28	0.11	0.73	.009*
No prolonged wearing	(Score 0-1)	2.02	0.78	5.22	.145
Handwashing	(Score 0-1)	0.96	0.26	3.51	.953
Container washing frequency	(Score 0-1)	1.85	0.64	5.34	.255
Solution change frequency	(Score 0-1)	1.03	0.36	2.96	.960
Container change frequency	(Score 0-1)	0.39	0.14	1.07	.068
No wearing during sandstorm	(Score 0-1)	2.06	0.99	4.32	.055

Discussion

This study explored CL use patterns and related safety behaviors among adolescents in Western Saudi Arabia. It also estimated clinically significant ophthalmological complication prevalence and their associations with CL use patterns and level of adherence to safety behaviors. Females are the predominant gender among CL users, and occasional cosmetic CL use without medical prescription or follow-up was the most common pattern. The overall compliance to safety measures was suboptimal-to-acceptable; however, a remarkably poor practice was observed regarding the solution and container maintenance. Ophthalmological complaints were frequent, reported by up to 51.2% of users, depending on the symptom, and showed many significant negative correlations with different safety behaviors. CSC prevalence was estimated to be 38.7% (95% CI = 32.6–45.1%). Longer CL use duration (≥5 years) and combined medical-cosmetic CL use were significant predictors for CSC, associated with approximately 3.6 and 3.3 odd ratios, respectively. On the other hand, adherence to safety and hygiene instructions were protective factors, especially not wearing CLs during sleep and after the expiration date, associated with approximately 70%–80% reduction in CSC risk. Findings from the present study are consistent with those from the literature and have significant public health, clinical, and policy implications that will be discussed in this section.

Although this study was not designed to estimate CL use prevalence among the young population, some demographic and epidemiological figures have been noted. The most important features are female predominance and frequent cosmetic CL use. Our findings compare well with the local studies that showed a high prevalence of CL use among children and adolescents with increasingly frequent cosmetic CL use, especially among females(10,11). These observations, combined with poor practice regarding hygiene and maintenance instructions and CL market issues, are the source of several ophthalmological risks among this population.

CL complications are higher in the young population compared to adults. For example, a literature review including nine prospective studies involving children and adolescents using CLs identified that corneal infiltrative events incidence was estimated to be up to 3.4%, while such complication can be asymptomatic in several cases(14). This indicates that, in the absence of adequate follow-up and screening strategy, the clinical incidence of CL-induced eye complications is likely to be underestimated.

In the present study, CL users reported different eye complaints at variable frequency. The most common complaint was eye discomfort. Eye discomfort is very common, particularly among new users, with a prevalence that may reach 94%(18,19). Eye discomfort is defined as occasional or persistent adverse sensation associated with CL wear, which results from a conflict of CL shape and material with the eye environment and anatomy.

Although it is considered benign, improving with time and eye lubricants use, eye discomfort may impact CL use, which constitutes an issue in the case of medical CL use(19,20).

By focusing on symptoms that were clinically significant, the swollen red eye was reported by 16.9% of the participants. Such a complaint could indicate vasodilatation due to physical and chemical stress exerted on the eye, which results in a local inflammatory response(17). On the other hand, such a symptom may be consistent with genuine conjunctivitis that may go undiagnosed and/or untreated without follow-up by an eye care professional(21). One of the clinical forms of CL-induced conjunctivitis is papillary conjunctivitis, which involves focal or generalized inflammation of the upper palpebral conjunctiva. It is to note that patients with papillary conjunctivitis may remain asymptomatic or complain of eye discomfort, itchiness, or blurred vision. These symptoms resolve rapidly after eye cleaning and CL discontinuation, and proper management may require changing CL type or material(21). This stresses the importance of adequate patient education and follow-up with an eye care professional to enhance the prevention and diagnosis of such complications and prevent future related complications. By consequence, such preventive measures are less likely to have place in case of unprescribed and unregulated CL use.

However, in an interesting approach, Efron N. supported that "contact lens wear is intrinsically inflammatory in nature", meaning that evidence of clinical or subclinical inflammation is found in all CL users, regardless of CL type. This is due to the exogenous material introduction in the intimate eye environment. The other authors' thesis supported that, although such an inflammatory state is fundamentally disruptive for the eye homeostasis, its presence may have an indirect protective influence against corneal infiltration by inducing both preventive behaviors among users and adaptive changes in the eye(22). However, such observations and hypotheses should be contextualized with regards to the level of CL use necessity, which should weigh the indication or purpose of CL use with such risks. In other terms, such risks may be acceptable in the case of medical CL use but highly controverted in purely cosmetic CL use.

The other risk of CL-induced conjunctivitis is the progression to bacterial infection, especially in case of poor-quality, unsafe material, or poor adherence to disinfection instructions. A study by Chan et al. (2014) tested bacterial adherence to commercial tinted CL considering pigment detachment. The experiment showed that pigments were detachable in 13 out of 15 of the tested brands, which was associated with increased Pseudomonas aeruginosa proliferation(23). In line with this, a meta-analysis including 871 CL users confirmed that corneal staining was one of the complications observed during the ophthalmological examination(9). This demonstrates the disparity in safety across the CL brands, owing to their quality, which further emphasizes professional counseling and follow-up importance. Additionally, such observations highlight

the importance of adherence to disinfection guidelines among the users. In adolescents examined in this study, CL disinfection and storage yielded the lowest adherence levels. On the other hand, CSC risk was independently associated with adherence level to handwashing before and after CL wear.

The other clinically significant complaint was corneal abrasion, reported by 2.8% of the participants. Reporting such a symptom is conceivably indicative of a medical diagnosis of corneal epithelial erosion, which would have been motivated by a warning symptom. By extrapolation, asymptomatic forms may remain undiagnosed, notably in our population characterized by the predominance of over-the-counter CL use without proper follow-up by an eye specialist. Corneal erosions are a mechanical complication of CL wearing, most frequently observed in poor-quality CL(21). They are characterized by corneal epithelium discontinuity in variable area, depth, and location, which can be detected by a fluorescein test. Corneal erosions may present with symptoms that range from foreign body sensation to severe pain. However, in many cases, they remain asymptomatic(17). This emphasizes eye care specialists' role in the prevention, education, and screening for such complications.

Another serious risk that was not reported by the participants in the present study is microbial keratitis. This is potentially the most dreaded CL use complication, with an incidence of 2 per 10,000 CL users(24). It is a multifactorial condition due to microtrauma and a hypoxic environment favoring microbial growth, especially in case of contamination due to poor practice of CL care or unregulated product use(9,15,25). The most frequently responsible microorganisms are gram-negative bacteria(26). A Saudi study explored 46 patients with CL-induced keratitis and found bacterial growth in 19.5% of the patients, with P. aeruginosa representing the most frequently isolated microorganism, followed by Staphylococcus aureus. These cases resulted in an average 3-month medical follow-up with persistent visual acuity impairment requiring correction spectacles prescription(8). Another review article involving 70 cases of complications related to CL use from unregulated suppliers showed that microbial keratitis represented 61% of the complications, resulting in chronic eye damage in the majority of the affected patients. The same study reported that CLs were purchased over-the-counter or via the Internet in most cases, associated with a significant delay in consultation after the onset of symptoms among the concerned patients(15). These observations emphasize the relevance of reinforcing control by suppliers' authorities and their products compliance with the safety standards. On the other hand, it is critical to raise awareness among the population, and more specifically, the potential users, about the risks related to poor-quality CLs use and enhance timely care seeking behavior at onset of symptoms.

Limitations

The present study is mainly limited by the sampling method that might have introduced selection bias, in addition to reliance on self-reported symptoms and subjective scales use to assess adherence to safety measures. These limitations may impact both the internal and external validity of the findings.

Conclusion and Implications

In conclusion, CL use among adolescents accumulates several ophthalmological risk factors, including rising popularity and accessibility of CLs and their cosmetic use, high propensity to use pigmented CL, even for medical indications, frequent unprescribed CL use, unregulated supply with poor-quality CL material and design, low knowledge levels on safe CL use instructions, untrusted information sources use, poor practices in CL use and maintenance, and inadequate follow-up.

The implications of these risks can be categorized into three different perspectives, including clinical, public health, and policy and decision-making. From a clinical standpoint, eye professionals, including ophthalmologists, optometrists, and opticians, should be aware of CL use extent among the young population and the risk of complications resulting from poor CL maintenance and usage practice. This should translate into enhanced screening and prevention strategies against eye problems among CL users, CL use systematic consideration in the differential diagnosis of eye complaints, and patient education about the health risks, optimal CL use, and specialized follow-up importance.

From the public health perspective, the increasing figures of non-medical and unhealthy CL use patterns among the young population should be further evaluated, considering the potentially substantial morbidity and economic burden. The populations' awareness should be raised about the risks related to over-the-counter and Internet-purchased CL, especially from unregulated suppliers. The specialist prescription and/or follow-up are critically important to reduce the risk of severe complications, as well as the knowledge about and adherence with safety guidelines. CL-related ophthalmologic concerns should be integrated into the health education and awareness programs that target the young populations, especially via social media and school health pathways.

From the decision makers' perspective, policies should be implemented to regulate and control CL commercialization by implementing a certification process based on rigorous safety assessments, enhancing access to relevant information among end-users, and improving the compliance of commercial practices with safety measures. Specific regulation measures should be implemented to protect adolescents and children, considering their high vulnerability to commercial campaigns, especially via the Internet.

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