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

ISSN 1839-0188

May 2021 - Volume 19, Issue 5

Does workplace Physical and Psychological violence exist against physicians and nurses in Primary Health Care Centers in Kuwait? A cross-sectional study

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Review

Editorial

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In this issue we have papers from the region and Malaysia covering various topics and a good review dealing with Vitamin D deficiency and project management in health. Naz et al., looked at pneumococcal and influenza vaccination amongst diabetics in the GCC: Exploring barriers and strategies for improvement. They stressed the alarming rise in the prevalence of diabetes mellitus (DM) within the Gulf Cooperation Council (GCC) has become a major public health concern. Respiratory infections in diabetics can result in a high morbidity and mortality rate, hence all the Arab states recommend pneumococcal and influenza vaccination for patients with diabetes. The few studies that have measured the rate of vaccination of within the GCC have consistently reported it to be poor. This is a cause for concern given the exponential rate at which diabetes is increasing within the region. The aim of this article is to highlight the importance of vaccination in diabetic patients, elaborate on the barriers faced in their promotion and propose strategies to improve vaccination rates.

Al-Ghareeb et al., did a retrospective cross-sectional study was conducted in Kuwait in one year (Jan 2020 to Jan 2021) in 50 PHC centers in five health regions in Kuwait and surveyed 446 participants (220 physicians, 226 nurses) who are working in PHC centers for at least a year and have regular contact with patients or clients by using a designed WHO self-administered questionnaire. the frequency and consequences of physical. The response rate for all staff was 89%. The highest respondent rate was from nurses (90%) and the lowest respondent rate was from physicians(88%). The authors concluded that the results showed that the violence towards health care professionals (physicians and nurses) occur frequently and exists against physicians and nurses in Primary Health Care Centers in Kuwait . Health care workers should feel secure and confident in their working environment by reducing violence prevalence and increase job satisfaction by understanding the causes and factors that influence the increasing levels of violence. More research's is needed on occupational support provisions that reduce the risk of staff experiencing physical and psychological violence and the stress that is associated with it.

Mabrouk, et al., did a cross-sectional study, conducted in Hail, KSA from May 1 5, 2020, till October 2020 was carried out using the SPSS program. 411 adult persons lived in Ha'il region, aged 18 years and more, were the material of the present study. Most of the participants were Saudi (97%), female (69.4%), and most of them were highly educated, 76.7% knew the definition of squint, 56% knew at least one cause of strabismus, 43% knew the symptoms and the main source of information was family /friends in 27.5%.

Salti et al., did a qualitative descriptive case study describes the implementation of training workshops for enhancing nurses' skills in accurate blood pressure (BP) measurement and screening for diabetic peripheral neuropathy (DPN). Ninety nurses attended three full-day workshops conducted in Jeddah and Riyadh, Saudi Arabia and Dubai, United Arab Emirates. The workshops included learning modules on BP, DPN and diabetic foot care, a practical session on correct utilization of BP and DPN assessment tools and case study discussions. The nurses reported that the workshop was relevant to clinical practice and expanded their skills and knowledge. They believed it provided value as they received hands-on training in DPN diagnostic tools and proper BP measurement technique. The participating hospitals reported greater nurse involvement in diabetes management. The authors concluded that the continuous education of nurses on the latest recommendations and tools must be encouraged to ensure better patient outcomes. Screening tools for DPN should be incorporated in the nurse triage for diabetic patients to enable early detection of diabetic foot complications. Similar workshops can be conducted and utilized as training modules to enhance the skills of caregivers and other healthcare professionals.

Samer et al., looked at whether Gastroesophageal reflux disease and poorly controlled asthma in pediatric population: are they linked? Effect of anti-reflex treatment. Using internet search, a comprehensive literature review was done and words such as Bronchial asthma, gastro esophageal reflux disease, Asthma; Proton pump inhibitors; were searched. The references of the relevant articles on this subject were also searched for further information. Results: Analyses of results of various studies from various parts of the world were considered and their prevalence was noted to access the correlation between asthma and GERD. Conclusion: The results of review researches indicate a relationship between gastroesophageal reflux and asthma, patients with persistent asthma should be screened for reflux and receive treatment for better control of their asthma.

Al-Shehri et al., attempted to assess the knowledge, behavior, and practice of parents regarding the tonsillectomy process for children in Aseer. Data were collected from participants using an electronic prestructured questionnaire. The researchers developed the questionnaire by the help of field experts and after intensive literature review. Tool was reviewed using a panel of 3 experts for validation and applicability. Out of total 239 respondents the mean (SD) age of the respondents were 32.71(10.71). 65% were fathers and 35% were mothers. From the data we have observed that 15.5% of the children's of the respondents had pass through the tonsillectomy process. The authors concluded that the educational level and socioeconomic status of the parents were the key factors associated with these positive behaviors. These results indicate that conducting educational programs on tonsillectomy can be beneficial.

Al Turki, et al., presented a review on the important topic of burn wound infections. Burn wounds induce metabolic alterations that predispose the patient to various complications. Infection is the most common cause of morbidity and mortality in this population. Bacterial profile of burn wound patients is diverse, depending on timing and location of injury. Early after burning, the predominant microorganisms is gram-positive bacteria such as Staphylococcus aureus. Subsequently, the burn wound colonizes with variety of microorganisms comprising both susceptible and multi-drug resistant gram-negative bacteria such as Pseudomonas aeruginosa and Acinetobacter species. This review will help in understanding the epidemiology of burn wound infection and the prevalence of highly resistant bacteria in burn wound patients. In addition, it illustrates the role

of strict infection control practices in preventing the nosocomial transmission of microorganisms among burn patients, and it provide guidance for empiric antibiotic therapy to avoid unnecessary broad antibiotic usage, which will reduce mortality and morbidity related to infections and decrease incidence of multi-drug resistant organisms in burn unit.

Farooq, et al., explored the incidence of iatrogenesis due to errors by physicians, adverse drug reactions (ADRs) and unhygienic conditions in hospital environment. The main hypothesis for the present study was "higher the errors in diagnosis, prescription, and adverse reactions of drugs, higher will be the risk of Iatrogenesis". Survey research is conducted by developing questionnaire. The data is collected from 300 hospitalized and outdoor patients from hospitals of District and Tehsil Head Quarters Hospitals of BhakkarThe value of Cronbach's Alpha for 17 items of "Iatrogenesis" is .879 that ensures the strong reliability of the tool and consistency of responses; having N =300, with a mean = 55.34 and std. deviation = 12.354. The results show that respondents are well aware that their health is more at risk because of errors in Physician's diagnosis and prescription and iatrogenesis incidence is prevailing due to high dosage of drug taken; adverse reaction of drugs and unhygienic conditions of hospital environment. The authors concluded that health professionals are creating unrealistic demands for consumption of more and more medicine and medical treatment.

Alghamdi, et al., tried to assess Glycaemic Control and Dyslipidemia in type 1 diabetic patients in diabetic center Al-Baha region, Saudi Arabia.A record based descriptive cross sectional was conducted at diabetes center in Al-Baha region, located in the southern area of Saudi Arabia. The study included 225 children with type 1 DM. Children ages ranged from 1 to 21 years with mean age of 10.4 ± 3.5 years old. Exact of 120 (53.3%) diabetic children were males. Majority of the diabetic children had the diseases for 1-4 years (63.6%; 143). The authors concluded that the current study revealed that dyslipidemia is a common finding among diabetic cases including type 1 diabetes mellites. Also, there is a significant association between glycaemic control and having abnormal lipid profile especially for cholesterol and HDL.

Alshaiki, et al., Follow a cross-sectional design, this study was conducted at primary health care (PHC) centers to assess primary care physicians' knowledge and practices regarding screening for colorectal cancer (CC) in Abha City. It included 104 PHC physicians. The data collection sheet included sociodemographic data of participants and a modified form of the National Survey of Primary Care Physicians' Cancer Screening Recommendations and Practices, Colorectal and Lung Cancer Screening Questionnaire. Fecal occult blood test (FOBT) was the CC screening test most commonly recommended (76%). The authors concluded that about two-thirds of them have poor knowledge grade regarding colorectal screening. FOBT is the CC screening test most commonly discussed and recommended by PHC physicians. Cost of screening test is the most influential regarding PHC physicians' recommendations for colorectal cancer screening. Practice grades are significantly better among those with more experience in PHC and among those who attended CME on cancer screening.

Alshammari, et al., did a cross-sectional study that was conducted via a pre-validated questionnaire and was distributed among different social media with a sample size of 394 diabetic patients. The purpose of the study is to determine the prevalence of gastroesophageal reflux disease in diabetes mellitus patients. The prevalence of diabetes mellitus was 24.6%. most participants (98.9%) had a 50% or greater chance of developing GERD. Only type of management of diabetes were found to be a significant factor in developing GERD (P value = 0.001). The authors concluded that the prevalence of GERD symptoms in diabetic patients is not uncommon, 98.9% of the participants had a 50% likelihood developing GERD. The higher the duration of DM, the lower the risk of exhibiting symptoms of GERD.

Abu Hwij & Ali looked at the role of vitamin D in the human body. They stressed that Vit D is essential for calcium and bone homeostasis, especially in children because childhood and adolescence are the most critical periods for bone development. The role of Vit D is not limited to bone health as it also has important roles in many extra-skeletal targets throughout the body, such as the muscles, immune system, and the cardiovascular system. Severe vitamin D deficiency (VDD) is a well-established cause of disease, including hypocalcemia and skeletal abnormalities (e.g., rickets). Although severe deficiency causing classic bone manifestations is now rare, many adults and children endure a subclinical VDD state that may predispose them to neurologic, cardiovascular, respiratory, and immune pathology.

Razan reviewed the issue of the use of project management technique in healthcare and public health. She stressed that the research into the factors that influence project management performance and success has been ongoing for several years, and as a result, the literature on this subject is fairly extensive. While success is a central concept in project management (PM), the literature on topics related to PM success is relatively extensive and generalist. Numerous metrics and factors affecting the success of a project are common across industries, although some are unique. The focus of public health action projects and programs is on the protection of the health of specific target groups or populations, and many of them address issues of survival. Public health projects, on the other hand, have a different focus; they are concerned with creating the conditions necessary for people to be healthy, and they are critical for population welfare. Their unique characteristics justify the need for research to develop a unique model of success factors to assist top management and project managers with planning and operational management. A model of success factors would assist in identifying, controlling, and mitigating issues that increase the likelihood of going in the wrong direction, while strengthening those that add value or increase the likelihood of succeeding. It would also be beneficial as a predictive and diagnostic tool for objectively and gradually reducing the probability of project failure, thereby assisting in project performance improvement. The success of public health projects requires a systematic approach and the application of a comprehensive set of success criteria. This article provides a concise overview of the literature on the use of project management in public health.

Prevalence of Gastroesophageal Reflux Disease Among Diabetes Mellitus Patients in Ha'il City, Saudi Arabia

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Khalid Farhan Alshammari et al. Prevalence of Gastroesophageal Reflux Disease Among Diabetes Mellitus Patients in Ha'il City, Saudi Arabia. World Family Medicine. 2021; 19(5): 6-12 DOI: 10.5742/MEWFM.2021.94042

Abstract

Objective: Gastroesophageal reflux disease is a chronic and relapsing condition which is a prolonged reflux of hydrochloric acid, pepsin, and bile salt into the esophagus. The purpose of the study is to determine the prevalence of gastroesophageal reflux disease in diabetes mellitus patients among Ha'il population and elicit a relation.

Methods: This is a cross-sectional study that was conducted via a pre-validated questionnaire and was distributed among different social media with a sample size of 394 diabetic patients.

Results: The prevalence of diabetes mellitus was 24.6%. Most participants (98.9%) had a 50% or greater chance of developing GERD. Only type of management of diabetes was found to be a significant factor in developing GERD (P value = 0.001).

Conclusion: The prevalence of GERD symptoms in diabetic patients is not uncommon, 98.9% of the participants had a 50% likelihood of developing GERD. The higher the duration of DM, the lower the risk of exhibiting symptoms of GERD.

Key words: Prevalence, GERD, DM, relations, risk factors.

Introduction

Gastroesophageal reflux disease (GERD) is characterized by the esophageal mucosal damage or symptoms of reflux which is caused by excessive gastric reflux into the esophagus (1). These symptoms include: non-cardiac chest pain, regurgitation of acids, and heartburn. GERD has a serious esophageal complication such as: adenocarcinoma of the esophagus, esophageal strictures, erosive esophagitis, and Barrett's esophagus. Various conditions such as: increased gastric acid secretion, elevated intragastric pressure, access to esophageal acid, and disturbance of the lower esophageal sphincter are thought to play an important role in the development of GERD (2-4).

There is insufficient understanding of the causes of this disorder. In Western societies, GERD has been found to be highly prevalent. However, it is a common disorder in both Western and Asian populations and has become more prevalent in recent decades, especially among Asian populations. In a study conducted in Saudi Arabia, they found that the prevalence of GERD was 28.7% (5). The disease is important not just for its effect on patients' quality of life, also in their productivity, and its complications and for a large proportion of the overall cost to the health care system that it produces. Diabetes mellitus (DM) is one of the metabolic disorders that is characterized by hyperglycemia, which is caused by defects of insulin secretion, insulin activity, or both (6). DM patients suffer from numerous complications and experience gastrointestinal symptoms considerably more frequently. The pathogenesis of gastrointestinal manifestations in DM, which is usually due to neurological dysfunction of particularly autonomic neuropathy, was not specifically elucidated. Long esophageal dysfunction is reported to occur frequently in patients with diabetic autonomic neuropathy and 35% of patients with DM have esophageal transit delay (7, 8).

There have been contradictory results produced by studies assessing the relationship between DM and GERD. Some researchers suggested a correlation with either DM or metabolic syndrome and GERD (9-11) although other research did not find any correlation to connect these disorders to each other (12, 13).

Methods

A cross-sectional study with a pre-validated questionnaire regarding both DM and GERD, which was used in another study was used in this research (14). A study sample size was estimated to be at least 383 participants, using the Raosoft sample size calculator with 5% marginal error and 95% confidence interval (15). The inclusion criteria were Ha'il citizens and diabetic patients. The questionnaire included three sections: demographics, DM, and GERD related questions, with 17-items in total. A link to an online questionnaire was distributed among Ha'il society through different social media platforms. Before filling out the questionnaire, participants had an in-screen message to confirm that they are Ha'il citizens and ensuring that all collected data are secured and confidential; two options were available, whether to proceed or abstain. The online form was available during the period from November to December 2020. GerdQ was used in the study to estimate the likelihood developing GERD (16).

Statistical analysis. Data collection and organization were performed using Excel program (Version 16.0.8730.2046). Statistical analysis was performed using IBM SPSS (Version 23.0. Armonk, NY: IBM crop). Descriptive statistics (frequencies, percentages, mean, and standard deviation) were used to describe the quantitative variables. A chi-square test was used to measure the significance between the categorical variables. A P-value of <0.05 was considered statistically significant.

Results

A total of 1,613 engaged with the survey; 13 participants abstained from continuing, 1,206 were ruled out of the study as they were non-diabetic participants, and the remaining 394 participants were included as they met the inclusion criteria. The total prevalence of DM in Ha'il general population was found to be 24.6%. The majority of participants (56.3%) were female, and age ranged from 18 to 72 years (45.07±13.12). The mean BMI was calculated to be 29.91±6.93, with a vast majority (83.8%) of non-smokers. Table 1 shows the demographic data of the participants.

Most participants (75.9%) were diagnosed with type 2 diabetes mellitus (T2DM), over the last five years, 33.5% of the participants were diagnosed with DM, 25.6% of participants use insulin replacement therapy. For complications, about half of the participants (47.7%) reported no complications, followed by 20.3% who reported hypertension, 4.3% reported retinopathy, and 2.3% reported proteinuria as their only complication. However, 20.6% reported multiple complications. A decent proportion (63.1%) confirmed sensation of numbness. In correlation between management of DM and numbness sensation, 61% of those on oral hypoglycemic agents felt a sort of numbness, 80.1% of those on insulin replacement therapy felt the sensation of numbness, whereas 56.4% on multiple therapeutic plans reported numbness sensation. Table 2 shows the diabetic characteristics of the participants. For those with type 1 diabetes mellitus (T1DM), 30.5% were diagnosed for more than twenty years, and 65.2% were using insulin replacement therapy as their only therapeutic plan. Regarding complications, half of the participants (50.52%) reported no complications, followed by 16.8% who reported hypertension, and 6.3% reported retinopathy as their only complication. The vast majority (75.78%) confirmed the sensation of numbness. For those with T2DM, 36.1% of the participants were diagnosed within the last five years, 33.4% were using oral hypoglycemic agents as their only therapeutic plan. For complications, more than two-fifths of the participants (46.82%) reported no complications, followed by 21.4% who reported hypertension and 3.67% reported retinopathy

as their only complication, while 20.6% reported multiple complications.

For the gastroesophageal reflux symptoms during the previous week; 46.2% reported no heartburn, 56.9% reported no nausea, 56.1% did not use antacids. Table 3 demonstrates the gastroesophageal reflux symptoms data. During the previous week, 57.5% of those diagnosed with DM within the last five years, reported the sensation of heartburn at least once, while 60.3% of those diagnosed for more than 20 years reported no heartburn sensation. Most of the participants (98.9%) had a likelihood of 50% or higher of developing GERD. In correlation between T2DM, numbness, and GerdQ score, 33 (18.6%) of the participants who have been diagnosed with T2DM within five years had a likelihood of 50% developing GERD. Table 4 shows the likelihood of developing GERD among T2DM participants according to their duration. Meanwhile, gender (p=0.103), smoking status (p=0.211), type of diabetes (p=0.847) and duration of diabetes DM (p=0.055) were all non-significant factors affecting GERD scoring. On the other hand, the only significant factor found was type of management of Diabetics with a P value of 0.001 (Table 5).

Table 1: Demographic data of participants

Factor		Number / Mean	Percentage / Standard deviation
Gender	Male	172	43.7 %
	Female	222	56.3 %
Age		45.07	13.12
BMI		29.91	6.93
Smoking	Yes	64	16.2 %
	No	330	83.8 %

Table 2: Diabetic characteristic of participants

Factor	Number	Percentage
Type of diabetes		
Insulin dependent	95	24.1
Non-insulin dependent	299	75.9
Duration		
Less than 5 years	132	33.5
5-9 years	95	24.1
10-14 years	63	16
15-20 years	51	12.9
More than 20 years	53	13.5
Management		
Exercise	5	1.3
Diet therapy	18	4.6
Oral hypoglycemic agents	100	25.4
Insulin replacement therapy	101	25.6
Multiple therapeutic plans	170	43.1
Complications		
Hypertension	80	20.3
Organ failure	3	0.8
Proteinuria	9	2.3
Limb or digit amputation	1	0.3
Atherosclerosis	6	1.5
Stroke or Heart attack	2	0.5
Neuropathy	7	1.8
Retinopathy	17	4.3
No complications	188	47.7
Multiple complications	81	20.6
Numbness sensation		
Yes	249	63.1
No	145	36.9

Table 3: Gastroesophageal reflux symptoms characteristic of participants

Factor	Number	Percentage
Heart burn		
Never	182	46.2
Once	116	29.4
Twice to three times	71	18
Four to seven times	25	6.4
Regurgitation		
Never	159	40.3
Once	129	32.7
Twice to three times	79	20.1
Four to seven times	27	6.9
Epigastric pain		
Never	149	37.8
Once	144	36.5
Twice to three times	74	18.8
Four to seven times	27	6.9
Nausea		
Never	224	56.9
Once	103	26.1
Twice to three times	51	12.9
Four to seven times	16	4.1
Sleep difficulties		
Never	215	54.6
Once	110	27.9
Twice to three times	52	13.2
Four to seven times	17	4.3
Antacids drugs		
Never	221	56.1
Once	86	21.8
Twice to three times	49	12.4
Four to seven times	38	9.7
Gastroesophageal reflux disease score		
0%	4	1
50%	215	54.6
79%	131	33.2
89%	44	11.2

Table 4: Likelihood of developing Gastroesophageal reflux disease in non-insulin dependent diabetes mellitus according to duration

Duration/Likelihood	0%	50%	79%	89%
Less than 5 years	1	60	37	10
5-9 years	0	61	21	8
10-14 years	0	19	19	4
15-20 years	0	14	13	8
More than 20 years	2	11	10	1

Discussion

GERD prevalence was investigated in patients with DM in relation to their age, gender, BMI, smoking, duration of diabetes, various therapeutic plans, peripheral numbness, and the presence of certain complications. The total prevalence of DM in the Ha'il general population was found to be 24.6%. Compared to a study in Turaif city, they found that the prevalence of DM was 5.8% (17). The enormous diversity between the two communities, is mostly related to the increased prevalence of obesity in the Ha'il community (33.9%), and the significant relation between DM and obesity (18, 19). T2DM prevalence (75.9%) in the study was more than that of T1DM. According to the WHO, the prevalence of T2DM in countries of all income levels has grown rapidly over the last three decades (20). Much research in several communities regarding the prevalence of GERD has been published to be more prevalent in DM patients than in the general population (21, 22). A 9 studies meta-analysis from different Asian regions showed a significant association between DM and GERD (23). An overall prevalence of 68% of DM patients with GERD was observed in Turkey (24). In China, a 3-fold higher prevalence of GERD among DM patients was found compared to the general population (22). The bulk of the participants in this study (98.9%) had a likelihood of 50% or higher developing GERD. As shown in Table 4, the longer the duration diagnosed with DM, the lesser likelihood developing GERD symptoms. The decrease in gastrointestinal symptoms is most likely due to simultaneous afferent and efferent nerve damage. This nerve damage is mostly a result of diabetic neuropathy, which occurs when blood glucose levels are increased, but this is mostly seen 5-10 years after the onset of DM (25, 26). On the other hand, a case-control study concludes that diabetic patients with neuropathy have a higher prevalence of esophageal dysmotility (27). Female gender, non-smoking status, T2DM, five years or less diagnosed with DM, on either oral hypoglycemic agents or insulin replacement therapy, and sensation of numbness all are found to be risks for developing GERD. The only risk factors found to be significant were oral hypoglycemic agents, insulin replacement therapy, and sensation of numbness.

Study limitations: Patients self-reported information about their DM and GERD manifestations. Subjects were from a single city, so the findings cannot be generalized. Objective measures of these complications are expected in future studies, with no causal relationships established.

Conclusions and Recommendations

The prevalence of GERD symptoms in diabetic patients is not uncommon, 98.9% of the participants had a 50% likelihood of developing GERD. The majority of participants (75.9%) were diagnosed with T2DM. The higher the duration of DM, the lower the risk of exhibiting symptoms of GERD. One-fifth (20.3%) complained of hypertension. Oral hypoglycemic agents, insulin replacement therapy, and sensation of numbness are considered significant risk factors.

Acknowledgment. The authors would like to thank all participants for their time and respectable cooperation.

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Table 5: Correlation using Chi-Square test between GERD score and different variables

		GERD Score					P value
		0(n)	*50(n)*	*79(n)*	*89(n)*	*Total(n)*	
Gender	Male	0	103	53	16	172	0.103
	Female	4	112	78	28	222	
	Total	4	215	131	44	394	
Smoking	No	0	29	28	7	64	0.211
	Yes	4	186	103	37	330	
	Total	4	215	131	44	394	
Numbness	No	3	90	42	10	145	0.020*
	Yes	1	125	89	34	249	
	Total	4	215	131	44	394	
Type of Diabetes	T1DM	1	50	31	13	95	0.847
	T2DM	3	165	100	31	299	
	Total	4	215	131	44	394	
Diabetes Duration	< 5 years	1	71	46	14	132	0.055
	5-9 years	0	64	22	9	95	
	10-14 years	1	30	26	6	63	
	15-19 years	0	23	17	11	51	
	> 20 years	2	27	20	4	53	
	Total	4	215	131	44	394	
Management	Sport	0	4	1	0	5	0.001*
	Diet	0	9	7	2	18	
	Drugs	0	57	36	7	100	
	Insulin	1	54	31	15	101	
	Sport, Diet, Drugs	0	19	9	3	31	
	Sport, Drugs, Insulin	0	6	6	2	14	
	Diet, Drugs	0	25	11	3	39	
	Sport, Diet	1	15	1	0	17	
	Sport, Diet, Insulin	0	5	4	0	9	
	Diet, Insulin	2	4	2	1	9	
	Drugs, Insulin	0	7	7	5	19	
	Sport, Drugs	0	5	6	3	14	
	Sport, Insulin	0	1	1	1	3	
	Sport, Diet, Drugs, Insulin (All)	0	1	2	0	3	
	Diet, Drugs, Insulin	0	1	1	1	3	
	Sport, Insulin	0	2	6	1	9	
	Total	4	215	131	44	394	

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Does workplace Physical and Psychological violence exist against physicians and nurses in Primary Health Care Centers in Kuwait? A cross-sectional study

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Huda Al-Ghareeb, Rehab Al-Wotayan. Does workplace Physical and Psychological violence exist against physicians and nurses in Primary Health Care Centers in Kuwait? A cross-sectional study. World Family Medicine. 2021; 19(5): 13-27 DOI: 10.5742/MEWFM.2021.94043

Abstract

Background: Workplace violence by definition is a violent act (including physical assault and threats of assault) directed toward persons at work . Workplace violence in the health care sector may lead to poor quality of care, turnover and absenteeism of healthcare professionals, reducing health services available to the general public, unhealthy work environment, improper societal behaviors, increasing health costs, and deterioration of staff's health.

Material and Methods: A retrospective cross-sectional study was conducted in Kuwait in one year (January 2020 to January 2021) in 50 PHC centers in five health regions in Kuwait and surveyed 446 participants (220 physicians, 226 nurses) who have been working in PHC centers for at least a year and have regular contact with patients or clients by using a designed WHO self-administered questionnaire. The frequency and consequences of physical and psychological violence among physicians and nurses in PHC centers were investigated.

Results: The response rate for all staff was 89%. The highest respondent rate was from nurses (90%) and the lowest respondent rate was from physicians (88%). A total of 6.4% of the respondents had experienced physical violence and 77.3% had experienced psychological violence divided into 48.8% verbal Abuse, 10.1% bullying/Mobbing, 1.9% sexual harassment and 20.3% racial harassment.

Conclusions: The presented results showed that violence towards health care professionals (physicians and nurses) occurs frequently and exists against physicians and nurses in Primary Health Care Centers in Kuwait. Health care workers should feel secure and confident in their working environment by reducing the prevalence of violence and increasing job satisfaction by understanding the causes and factors that influence the increasing levels of violence. More research is needed on occupational support provisions that reduce the risk of staff experiencing physical and psychological violence and the stress that is associated with it.

Key words: violence, primary health care centers, physical, psychological.

Background

Workplace violence is a concept with ambiguous boundaries: "Violent acts (including physical assaults and threats of assault) directed toward persons at work or on duty". In another definition, workplace violence includes physical and psychological violence, abuse, mobbing or bullying, racial harassment and sexual harassment and can include interactions between co-workers, supervisors, patients, families, visitors, and others [1].

The World Health Organization (WHO) defined violence as: "The intentional use of power, threatened or actual, against another person or against oneself or a group of people that results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development or deprivation [2,3,5,9,11].

Recognizing and addressing the interconnections among the different forms of violence will help us better prevent all forms of violence [4].

Health care violence is a significant worldwide problem with negative consequences on both the safety and well-being of health care workers as well as workplace activities. Patients and their relatives may behave aggressively or violently either due to their medical conditions, side effects of their medications, or dissatisfaction with the services provided by the health care facilities. There are many factors that increase the risk of workplace violence against health care workers. Those factors are either related to offenders, coworkers, or the workplace environment [5].

The CDC defines workplace violence as violent acts (including physical assault and threats of assault) directed toward persons at work or on duty [6].

Health care workplace violence is an underreported, ubiquitous, and persistent problem that has been tolerated and largely ignored [7]. Violence is not only an occupational health issue but also may have significant implications for the quality of care provided [8].

Violence is an emerging problem in the PHC setting, and there is informal commitment to reveal its magnitude and circumstance [9]. Health workers have a 3 to 4-fold increased risk of experiencing violence at work [10].

The prevalence of workplace violence in healthcare settings remains unacceptably high. Workers in health care settings are at higher risk of verbal and physical abuse than any other occupational group. Workplace violence in the health care sector may lead to poor quality of care, turnover and absenteeism of healthcare professionals, reducing health services available to the general public, unhealthy work environment, improper societal behaviors, increasing health costs and deterioration of staff health [11].

High costs are involved in violence in healthcare settings. Individually, violence leads to decreasing well-being and job satisfaction among healthcare workers [12].

Method

Study design, setting, and duration:
This descriptive cross-sectional study was conducted over a period of one year (January 2020 to January 2021) in 50 PHC Centers in five health regions in Kuwait for physicians and nurses who had worked in PHC centers for at least a year, by using a designed WHO self-administered questionnaire. The researcher was responsible for the distribution and explanation of the objectives of the study to the PHC workers.

The infrastructure data regarding number of staff, number of health centers and number of working hours were taken from the health statistic section in primary care central department of the Ministry of Health (MOH).

Sample:
Questionnaires were distributed to 50 PHC centers in the five Governmental health regions to all full time PHC centers' physicians and nurses. The respondents were those who completed more than 50% of the items of the questionnaire and the selected 50 PHC centers were representative of 106 PHC centers in Kuwait.

Inclusion and exclusion criteria:
The inclusion criteria were all physicians and nurses at the PHCs who were available at the time of the study and willing to participate for 1 year. The exclusion criteria included those who were working in PHC for less than 1 year and those who decided not to participate in the research.

Data collection Tool:
Following permission from the MOH in Kuwait to conduct the study with ethical approval the questionnaire was sent to the PHC centers through the principal investigator.

Data collection was conducted using a validated version of the WHO English Questionnaire that consisted of two parts:
Part one included the personal and workplace data of the participants regarding age, gender, marital status, nationality, education, occupation, profession, years of work experience, time of work, work shift, interaction with patients/clients during work, the patients/clients they most frequently work with and their sex, the number of staff present in the same work setting, worry about violence in the current workplace, procedures for reporting of violence in the workplace and if there is any encouragement to report workplace violence and name of health districts.
Part two included the Physical workplace violence questionnaire which included three questions (exposure to violence whatever its type, incident witness and incident reporting) during the past year.

Participants were requested to complete the questionnaire during their free time and to return it to the head of clinic within 2 weeks of receiving it. Each participant was given a code number instead of their names and the privacy of their information given was secured.

Data analysis:
The collected data was reviewed, coded, verified and statistically analyzed by using statistical package for social sciences (SPSS) version 20. Descriptive statistics for all studied variables and chi-square test were used and P-value level of <0.05 was considered significant throughout the study.

Results

Respondents' characteristics:
Only 446 of the 500 physicians and nurses answered the questionnaire and returned it completed after distribution to 50 PHC centers in five health regions in Kuwait.

The highest percentage of staff response rate per health region was from Farwaniya (94%) and the lowest from Capital area (84%) as shown in Table 1.

Table 1: Staff response rate /health region

Health Area	No of participating centers /health region	No of respondents staff /health region
Capital	10	84
Farwaniya	10	94
Hawali	10	93
Ahmadi	10	85
Jahra	10	90

A total of 90% of nurses responded and 88% of physicians responded, as shown in Table 2.

Table 2: Staff position respondent rate:

Work type	Number of respondents	Total number	Response rate (%)
Physician	220	250	88%
Nurse	226	250	90%
Total	446	500	89%

Participants ranged in age from 25 to above 60 with a mean age of 4.81(SD=1.74%); (24.7%) were females and (75.3%) were males with a mean 1.25 (SD=0.43). (81.8%) were non-Kuwaiti and (17.9%) were Kuwaiti with a mean 1.82 (SD=0.38%). The majority of them were married (89.9%) and the rest were single, separated or widowed (9.6%). Regarding the work experience in Kuwait for the participants (0.7%) had worked under 1 year, (9.4%) worked for 1-5 years, (22.9%) worked for 6-10 years, (33.6%) worked for 11-15 years, (13.9%) worked for 16-20 years and (19.1%) worked for over 20 years. 92.2% of participants worked full time 4.3% worked part time and 0.2% were temporary. A total of 90.4% of the participants worked in shifts in which 76% of them worked between 6 pm and 7am. They interacted with 97.5% of patients in which 25.1% were newborn, 41.3% infant, 36.5% children, 62.1% adolescents, 92.8% adults and 69.7% elderly. The most frequent patients that the participants worked with were females and males in (66.6%), females in (21.5%) and males in (32%). The number of staff who were present in the same working setting with the participants in more than 50% of the work time were none in (6.7%), 1-5 staff in (47.3%), 6-10 staff in (17.9%), 11-15 staff in (11.2%), and over 15 staff in (9.2%). The participants were not worried at all about violence in the current workplace in (15.5%), not worried in (30.3%), neutral in (29.6%), worried in (12.8%) and very worried in (8.7%). The presence of procedure of reporting of violence in the workplace reached (63.5%) in which (49.8%) of participants knew how to use them. 55.8% of participants encouraged reporting workplace violence by manager/employer in (50%), colleagues in (5.6%), own family/friend in (0.4%) and others in (1.3%) as shown in Table 3.

Table 3: personal and workplace characteristics data of the studied participants

Socio-demographic characteristics	Frequency (%)	Mean	SD	P-value
Age in years:				
25-29	19 (4.3%)	4.81%	1.74%	0.00
30-34	67 (15%)			
35-39	159 (35.7%)			
40-44	84(18.8%)			
45-49	44 (9.9%)			
50-54	25(5.6%)			
55-59	20(4.5%)			
60+	28(6.3%)			
Total	446(100%)			
Gender:				
Female	110 (24.7%)	1.25%	0.43%	0.00
Male	336(75.3%)			
Total	446(100%)			
Marital status:				
Single	24(5.4%)	2%	0.37%	0.63
Married	401(89.9%)			
Separated/divorced	13(2.9%)			
Widow/widower	6(1.3%)			
Total	444(99.6%)			
Nationality:				
Kuwaiti	80(17.9%)	1.82%	0.38%	0.94
Non-Kuwaiti	365(81.8%)			
Total	446(100%)			
Professional group:				
Physician	220 (49.3%)	1.51%	0.50%	0.18
Nurse	226(50.7%)			
Total	446(100%)			
Work experience:				
Under1 year	3(0.7%)	4.08%	1.25%	0.00
1-5 y	42(9.4%)			
6-10 y	102(22.9%)			
11-15 Y	150(33.6%)			
16-20Y	62(13.9%)			
Over20 Y	85(19.1%)			
Total	444(99.6%)			
Working time:				
Full time	411(95.4%)	1.05%	0.22%	0.98
Part time	19(4.4%)			
Temporary/casual	1(0.2%)			
Total	431(100%)			

Table 3: personal and workplace characteristics data of the studied participants (continued)

Working shift:				
Yes	403(92.4%)	0.92%	0.26%	0.43
No	33(7.6%)			
Total	436 (100%)			
Working time between 6 pm and 7 am:				
Yes	346(77.6%)	0.79%	0.40%	0.61
No	90(20.2%)			
Total	436(100%)			
Patient/Client interaction:				
Yes	425 (97.5%)	0.97%	0.15%	0.28
No	11(2.5%)			
Total	436(100%)			
Most frequent patients/client:				
Newborn	112(25.6%)	0.26%	0.43%	0.50
Infants	183(41.8%)	0.42%	0.49%	0.49
Children	275(62.8%)	0.62%	0.48%	0.53
Adolescents	272(62.1%)	0.62%	0.48%	0.40
Adults	414(94.5%)	0.94%	0.22%	0.77
Elderly	311(71.2%)	0.71%	0.45%	0.02
Total	446(100%)			
Patient sex:				
Female	94(21.5%)	2.4%	0.82%	0.90
Male	46(10.5%)			
Male and Female	297(68%)			
Total	437(100%)			
The number of staff in the same workplace:				
None	30(7.3%)	1.66%	1.10%	0.49
1-5	211(51.2%)			
6-10	80(19.4%)			
11-15	50(12.1%)			
Over15	41(10%)			
Total	412(100%)			
Current workplace violence worry:				
Not worried at all	69(16%)	2.68%	1.16%	0.65
Not worried	135(31.3%)			
Neutral	132(30.6%)			
Worry	57(13.2%)			
Very worried	39(9.0%)			
Total	432(100%)			
Workplace violence procedure reporting:				
Yes	283(66.6%)	0.66%	0.47%	0.99
No	142(33.4%)			
Total	425(100%)			
Reporting use:				
Yes	222(84.1%)	0.84%	0.36%	0.57
No	42(15.9%)			
Total	264(100%)			

Table 3: personal and workplace characteristics data of the studied participants (continued)

Reporting use:				
Yes	222(84.1%)	0.84%	0.36%	0.57
No	42(15.9%)			
Total	264(100%)			
Reporting encouragement:				
Yes	249(67.7%)	0.68%	0.46%	0.74
No	119(32.3%)			
Total	368(100%)			
Whom report:				
Manager/employer	223 (50%)	1.25%	0.86%	0.84
Colleague	25 (5.6%)			
Union	-			
Association	-			
Own family/friend	2 (0.4%)			
Other	6 (1.3%)			
Total	256 (57.4%)			
Health district:				
Capital	84(18.8%)	3.01%	1.40%	0.00
Farwaniya	94(21.1%)			
Hawaly	93(20.9%)			
Ahmadi	85(19.1%)			
Jahra	90(20.2%)			
Total	446(100%)			

*Non- physical violence includes Verbal abuse, Bullying, Racial harassment, sexual harassment

The descriptive association between respondents' characteristics and exposure to physical and nonphysical violence in the past 12 months indicated that there was no significant differences in relation to reported physical and non-physical violence by age, gender, marital status, work experience, work time and work time between 6 am and 7 pm ($p > 0.05$). However, the respondents reported a significantly higher percentage of physical violence incident regarding nationality ($p = 0.04$). The respondents reported a significantly higher percentage of non- physical violence incidents regarding profession group ($p = 0.04$). The respondents reported a significantly higher percentage of non-physical violence incident regarding profession group ($p = 0.04$). The respondents reported a significantly higher percentage of physical violence incidents regarding work shift ($p = 0.03$) as shown in Table 4.

Table 4: Characteristics of exposure to physical and non-physical violence in the last 12 months

	Physical violence			Non- physical violence*		
	N	%	P-VALUE	N	%	P-VALUE
Age						
25-29	1	0.2%	0.50	16	3.6%	0.43
30-34	7	1.6%		48	11.1%	
35-39	8	0.8%		139	32.4%	
40-44	5	1.1%		56	13%	
45-49	3	0.6%		37	15.6%	
50-54	3	0.6%		17	3.9%	
55-59	1	0.2%		13	2.9%	
60*	0	0%		19	4.3%	
Gender						
Male	19	4.3%	0.80	263	28.9%	0.40
Female	9	2%		82	19.1%	
Marital status:						
Single	2	0.4%	0.89	6	4.3%	0.53
Married	25	5.7%		151	73.4%	
Separated/divorced	1	0.2%		3	1.3%	
Widow/widower	0	0%		4	1.8%	
Nationality:						
Kuwaiti	9	2%	0.04	80	27.5%	0.19
Non-Kuwaiti	19	4.3%		275	64.5%	
Professional group:						
Physician	18	4.1%	0.12	236	55.4%	0.04
Nurse	10	2.2%		109	25.4%	
Work experience:						
Under1 year	0	0%	0.93	3	0.7%	0.642
1-5 years	2	0.4%		28	6.4%	
6-10 years	5	1.1%		80	18.7%	
11-15 years	11	2.5%		122	28.6%	
16-20 years	5	1.1%		44	10.2%	
20+	5	1.1%		68	15.8%	
Work time:						
Full time	2	6.4%	0.48	152	76.6%	0.61
Part time	0	0%		6	4.2%	
Temporary/casual	0	0%		1	0.2%	
Work shift:						
Yes	5	1.1%	0.03	20	4.8%	0.29
No	27	6.3%		85	24.7%	
Work time between 6 pm and 7am:						
Yes	9	2.1%	0.08	44	10.3%	0.28
No	77	4.2%		273	70.9%	

*Non- physical violence includes Verbal abuse, Bullying, Racial harassment, sexual harassment

Prevalence of violence:
Most health care workers (physicians and nurses) were subjected to at least one incident of physical and psychological violence in the 12 months prior to the survey, with verbal abuse being the most prevalent type of workplace violence. All violence committed against PHC health care workers was nonfatal. The most frequent causes of violent acts by visitors were physical harm (6.3%), verbal abuse (48.8%), Bullying/Mobbing (10.1%) sexual harm (1.9%), and racial harm (20.3%) in the past 12 months as shown in Table 5.

Table 5 :Types of violence in reported events:

Types of violence	Number (%)
- Physical	28(6.3%)
- Psychological:	
Verbal Abuse	209(48.8%)
Bullying/Mobbing	42(10.1%)
Racial harassment	86(20.3%)
Sexual harassment	8(1.9%)

The health care workers who were exposed to violence varied in using coping mechanisms in response to violence between taking no action (21.3%), tried to pretend it never happened (14.1%), told the person to stop (29.2%), tried to defend him/herself physically (0.2%), told friends/families (24.2%), told a colleague (28.3%), sought counseling (3%), reported to a senior (28.8%),transferred to another position (4.5%), sought help from the union (1.3%), completed incident/accident (5%) pursued prosecution (0.6%), completed a compensation claim (0.2%) and others (1.1%) as shown in Table 6.

Table 6: Coping mechanisms of health care workers exposed to violence

Coping mechanisms	Numbers (%)				
	PV	VA	B/M	SH	RH
-took no action	2(0.4%)	45(10.1%)	7(1.6%)	4(0.9%)	37(8.3%)
-tried to pretend it never happened	2(0.4%)	32(7.2%)	18(4%)	-	11(2.5%)
- told the person to stop	19(4.3%)	73(16.4%)	16(3.6%)	2(0.4%)	20(4.5%)
-tried to defend myself physically	1(0.2%)	-	-	-	-
-told friends/family	2(0.4%)	60(13.5%)	17(3.8%)	1(0.2%)	28(6.3%)
-told a colleague	7(1.6%)	68(15.2%)	23(5.2%)	1(0.2%)	27(6.1%)
-sought counseling	2(0.4%)	5(1.1%)	6(1.3%)	-	1(0.2%)
-reported it to a senior staff member	11(2.5%)	85(19.1%)	11(2.5%)	1(0.2%)	20(4.5%)
-transferred to another position	3(0.7%)	10(2.2%)	3(0.7%)	-	4(0.9%)
-sought help from association	-	3(0.7%)	1(0.2%)	-	2(0.4%)
-sought help from the union	1(0.2%)	4(0.9%)	-	-	1(0.2%)
-completed incident/accident form	1(0.2%)	18(4%)	2(0.4%)	-	2(0.4%)
-pursued prosecution	2(0.4%)	1(0.2%)	-	-	-
-completed a compensation claim	-	1(0.2%)	-	-	-
-other	-	4(0.9%)	-	-	1(0.2%)

The actions taken to investigate the cause of incidents during the last year by the participants who experienced violence was (8.2%) by management/employer (7%) or union (1.3%) or community group (0.4%) or police in (1.6%) or others (0.4%) as shown in Table 7.

Table 7 : Action taken to investigate the cause of incident

	Numbers (%)				
	PV	VA	B/M	SH	RH
Action taken to investigate the causes of incident:					
-Yes	6(1.3%)	22(4.9%)	7(1.6%)	1(0.2%)	1(0.2%)
-No	10(2.2%	118(26.5%)	22(4.9%)	4(0.9%)	55(12.3%)
-Don't know	10(2.2%)	57(12.8%)	12(2.7%)	4(0.9%)	19(4.3%)
By whom:					
-manager/employer	6(1.3%)	16(3.6%)	6(1.3%)	2(0.4%)	2(0.4%)
-union	2(0.4%)	3(0.7%)	-	-	1(0.2%)
-association	-	-	-	-	-
-community group	-	1(0.2%)	1(0.2%)	-	-
-police	3(0.7%)	4(0.9%)	-	-	-
-others	-	-	-	1(0.2%)	1(0.2%)

Almost (5.8%)of the consequences for the attacker reported by the participants who exposed to different types of violence did nothing, on the other hand, 2% of the participants issued a verbal warning, 1.5% reported the violence they experienced to the police and only 0.4% of aggressors were prosecuted as shown in Table 8.

Table 8: The consequences for the attacker reported by the participants exposed to violence during the last year

Consequences	Numbers (%)				
	PV	VA	B/M	SH	RH
none	7(1.6%)	12(2.7%)	5(1.1%)	1(0.2%)	1(0.2%)
verbal warning issued	-	6(1.3%)	3(0.7%)	-	-
care discontinued	-	-	-	-	-
reported to police	1(0.2%)	5(1.1%)	-	1(0.2%)	-
aggressor prosecuted	-	2(0.4%)	-	-	-
other	-	1(0.2%)	-	-	-
don't know	-	2(0.4%)	-	-	1(0.2%)

The employer/supervisor provided different offers to the participants who were affected by violence such as counseling (24%), opportunity to speak/report (41%), and other support (26.8%) as shown in Table 9.

Table 9: Employer/supervisor offers

	Numbers (%)				
	PV	VA	B/M	SH	RH
Employer/ supervisor offers:					
Counseling	11(2.5%)	50(11.2%)	17(3.8%)	4(0.9%)	25(5.6%)
Opportunity to speak/report	16(3.6%)	99(22.2%)	28(6.3%)	6(1.3%)	34(7.6%)
Other support	9(2%)	70(15.7%)	18(4%)	2(0.4%)	21(4.7%)

The majority of the participants who experienced different types of violence were either unsatisfied regarding the handling of the incident in (17.6%) or very unsatisfied (21.7%), while the remaining were satisfied (4.1%) or very satisfied (3.9%) as shown in Table 10.

Table 10: Handling incident satisfaction

Handling incident satisfaction	Numbers (%)				
	PV	VA	B/M	SH	RH
-very dissatisfied	6(1.3%)	53(11.9%)	9(2%)	3(0.7%)	26(5.8%)
-dissatisfied	15(3.4%	63(4.1%)	16(3.6%)	1(0.2%)	28(6.3%)
-neutral	4(0.9%)	51(11.4%)	13(2.9%)	5(1.1%)	12(2.7%)
-satisfied	1(0.2%)	10(2.2%)	2(0.4%)	-	6(1.3%
-very satisfied	2(0.4%)	13(2.9%)	2(0.4%)	-	1(0.2%)

The reasons for not reporting by the participants included the belief that reporting was not important (14.1%), felt ashamed (8%), felt guilty (4.3%), afraid of negative consequences (17.4%), did not know whom to report to (6.4%) and useless (33%) as shown in Table 11.

Table 11: Reasons for not reporting incidents by the participants:

Reasons for not reporting the incidents	Numbers (%)				
	PV	VA	B/M	SH	RH
- it was not important	4(0.9%)	43(9.6%)	1(0.2%)	-	15(3.4%)
- felt ashamed	6(1.3%)	10(2.2%)	11(2.5%)	2(0.4%)	7(1.6%)
- felt guilty	-	4(0.9%)	8(1.8%)	-	7(1.6%)
- afraid of negative consequences	6(1.3%)	34(7.6%)	14(3.1%)	3(0.7%)	21(4.7%)
- did not know who to report to	7(1.6%)	15(3.4%)	3(0.7%)	-	3(0.7%)
- useless	6(1.3%)	71(15.9%)	27(6.1%)	3(0.7%)	40(9%)

The health care administration in PHC centers developed specific policies in health and safety (79.8%), physical workplace violence (49.1%), verbal abuse (41.9), sexual harassment (28%), racial harassment (25.8%), Bullying/ Mobbing (28.9%) and threat (36.5%) as shown in Table 12.

Table 12: Development of specific policies in the workplace by employer:

Development of specific policies in the workplace by employer:	Frequency (%)	Mean	SD	P value
Health and safety				
yes	356(79.8%)	1%	0.36%	0.19
no	25(5.6%)			
don't know	29(6.5%)			
Physical workplace violence				
yes	219(49.1%)	1%	0.67%	0.28
no	88(19.7%)			
don't know	90(20.2%)			
Verbal abuse				
yes	187(41.9%)	0.97%	0.72%	0.63
no	110(24.7%)			
don't know	99(22.2%)			
Sexual harassment				
yes	125(28%)	1.08%	0.82%	0.87
no	115(25.8%)			
don't know	149(33.4%)			
Racial harassment				
yes	115(25.8%)	1.10%	0.83%	0.83
no	117(26.2%)			
don't know	156(35%)			
Bullying/Mobbing				
yes	129(28.9%)	1.08%	0.81%	0.80
no	113(25.3%)			
don't know	144(32.3%)			
Threat				
yes	163(36.5%)	1.08%	0.75%	0.66
no	97(21.7%)			
don't know	129(28.9%)			

The prevention action against violence in the workplace includes different measures that exist like security measures (69.1%), improved surroundings (45.1%), restrict public access (30.3%), patient screening (32.7%), patient protocols (28.5%), restrict exchange (19.3%), increased staff numbers (27.1%), check in procedures for staff (18.8%), use special equipment or clothing (22.4%), changed shifts (30.3%), reduced periods of working alone (33.4%), training (33.9%), investment in human resource development (20%) and other measures (0.9%) as shown in Table 13.

Table 13: workplace violence measures to deal with it in the workplace:

Do measures to deal with workplace violence exist in your workplace?	Frequency (%)	Mean	SD	P value
Security measures				
yes	308(69.1%)	0.72%	0.44%	0.12
no	117(26.2%)			
Improve surroundings				
yes	201(45.1%)	0.47%	0.49%	0.59
no	223(50%)			
Restrict public access				
yes	135(30.3%)	0.31%	0.46%	0.00
no	289(64.8%)			
Patient screening				
yes	146(32.7%)	0.34%	0.47%	0.33
no	278(62.3%)			
Patient protocols				
yes	127(28.5%)	0.30%	0.45%	0.15
no	296(66.4%)			
Restrict exchange of money at the workplace				
yes	86(19.3%)	0.20%	0.40%	0.02
no	338(75.8%)			
Increased staff numbers				
yes	121(27.1%)	0.28%	0.45%	0.05
no	303(67.9%)			
Check-in procedures for staff				
yes	84(18.8%)	0.19%	0.39%	0.18
no	340(76.2%)			
Special equipment or clothing				
yes	100(22.4%)	0.23%	0.42%	0.18
no	324(72.6%)			
Changed shifts or rotas				
yes	135(30.3%)	0.31%	0.46%	0.71
no	288(64. 6%)			
Reduced periods of working alone				
yes	149(33.4%)	0.35%	0.47%	0.09
no	275(61.7%)			
Training				
yes	151(33.9%)	0.35%	0.47%	0.53
no	273(61.2%)			
Investment in human resource development				
yes				
no	89(20%)	0.20%	0.40%	0.40
	335(75.1%)			
None of these		0.07%	0.26%	0.24
yes	33(7.4%)			
no	390(87.4%)			
Other				
yes	4(0.9%))	0.00%	0.09%	0.34
no	418(93.7%)			

The participants' opinions on the impacts of the workplace changes on the daily work was nothing done (14.8%), staff worsening in work situation (13%), staff improvement in work situation (28.3%), worsened work situation for patients/clients (2.2%), improved work situation for patients/clients (8.1%), don't know (14.1%) and other opinions (0.7%) as shown in Table 14.

Table 14: Participant opinion regarding the impact of workplace and health care setting in the changes on daily work

HE5 changes opinion	Frequency (%)	Mean	SD	P value
None.	66(14.8%)	2.25%	1.71%	0.33
Work situation for staff worsened	58(13%)			
Work situation for staff improved	126(28.3%)			
Work situation for patient worsened	10(2.2%)			
Work situation for patient improved	36(8.1%)			
Don't know	63(14.1%)			
Other	3(0.7%)			
Total	362(81.2%)			

Discussion

The result of this study demonstrated the types of violence (physical, psychological, verbal, sexual, racial, Bullying/Mobbing) caused by attacker among physicians and nurses and the risk factors associated with workplace violence. This is in agreement with the study in Saudi Arabia [9].

Regarding the Characteristics of the study population (demographic and work characteristics):
The nurses were more exposed to violence than physicians which is similar to a study in Serbia [10,13]. The high percentage of violence against nurses is probably due to spending more time in contact with patients, language barriers, inadequate communication skills and a lack of security measures and control. A study in Greece showed equal exposure in physicians and nurses (19), while another study showed that physicians were slightly more exposed to violence than nurses [5,20].

The majority of the participants were married (89.9%) and the rest were single (5.4%), separated (2.9%) or widowed (1.3%). (19.1%) of the participants worked in Kuwait over 20 years, (13.9%) worked for 16-20 years, (33.6%) of the participants worked for 11-15 years, (22.9%) worked for 6-10 years, (9.4%) worked for 1-5 years and (0.7%) worked for less than 1 year. In a previous study in Kuwait a shorter professional experience in general is a significant risk for physical violence [2].

The participants (92.2%) worked full time, (4.3%) part time and (0.2%) were temporary as most of them worked in a shift in (90.4%) and (76%) of them worked between 6 pm. and 7 am.

The number of staff present in the same working setting (more than 50%) most of the time ranged from 1-5(47.3%), 6-10 (17.9%), 11-15(11.2%), 15+ (9.2%) and none (6.7%).

Working in shifts is very stressful for health workers. Night shift work is considered to be a high-risk factor for exposure to violence [10]. In other study, night shifts had significantly lower rates of verbal and physical violence when compared to the day and evening shifts. The evening shift had a significantly higher rate of physical aggression than the other shifts [13].

Higher rates of violence during this time can be also attributed to lower presence of administration and shortening of staff numbers during the evening and night shifts that would require personnel to work alone [20].

Regarding the prevalence of violence:
In this study, (6.2%) of participants were exposed to physical violence and (77.3%) were exposed to psychological violence during the last year.

Nonphysical violence is widespread, with verbal abuse being the most common form. Verbal abuse as a single non-physical act was experienced by (48.8%) of the participants in the current study. In comparison to the verbal abuse, from the countries included in WHO case studies (39.5 %) of the respondents had experienced verbal abuse in the last year in Brazil, (32.2%) in Bulgaria, (52 %) in South Africa with (60.1%) in the public sector, (47.7 %) in Thailand, (51%) in the health center complexes and (27.4 %) in a hospital in Portugal, (40.9 %) in Lebanon and up to (67 %) in Australia [2].

The second main type of violence is racial harm which was experienced by (20.3%) in our study, (25.6%) in Greece, (2.5%) in Al-Hessa.

In comparison to the physical violence investigated from the countries included in WHO case studies, (7.5%) of the respondents reported had been physically attacked in the previous year to the study, in Bulgaria, (6.4 %) in Brazil, (5.8 %) in Lebanon, (10.5 %) in Thailand, (9 %) in the private sector and up to (17 %) in the public sector in South Africa. Even in Portugal, where the percentage is limited to (3%), physical violence has been indicated as being very important for emergency care crews. The extremely high level of physical violence in the public health sector in South Africa comes as a shock even to the country's researchers. Even more shocking when one considers that up to (71.1%) of the respondents in the public sector, as against (51.6 %) in the private one, reported having experienced at least one incident of workplace violence, while (25.5 %) in the public sector and (10.1%) in the private sector had witnessed episodes of physical violence in the previous twelve months [2].

The important result of the study was the relatively low prevalence of sexual harassment. Although even these low rates of incidence could be alarming because of underreporting and some type of bias a slightly higher prevalence of sexual harassment was found in another similar study [10].

Regarding the descriptive association between respondents' characteristics and exposure to physical and nonphysical violence:

Certain characteristics have been found to increase the risk of workers being targets of workplace violence in the healthcare setting, including the workers' age, gender, marital status, work experience, work time and work time between 6 am. and 7 pm.

In this study there was no significant differences in relation to reported physical and non- physical violence by age, gender, marital status, work experience, work time and work time between 6 am. and 7 pm. ($p > 0.05$). However, the respondents reported a significantly higher percentage of physical violence incident regarding nationality ($p = 0.04$). The respondents reported a significantly higher percentage of non-physical violence incident regarding profession group ($p = 0.04$). The respondents reported a significantly higher percentage of physical violence incidents in relation to work shift ($p = 0.03$).

Regarding the reporting of workplace violence by the health care workers (physicians and nurses):

It is found that the procedures of reporting of violence in the workplace of PHC centers was around (49.8%) with those encouraged to be reported by manager in (50%), colleagues in (5.6%), own family/friend in (0.4%) and others in (1.3%). Many of those did not report a violent incident because they did not believe it would lead to any action[2].

Underreporting of workplace violence against participants in another study was very common ranging from (46 to 80%) [9].

In other studies, the HCW felt that the violence was part of their job, had negative experience when reporting, feared consequences for reporting, believed that reporting was an inefficient reaction and some feared losing their job [5]. It is also possible that health care professionals may not want to report an incident due to a desire not to further stigmatize individuals who may have mental illness or impairment of some kind [6]. The health-care workers were reluctant to report injuries and illnesses because they feel that it might compromise how they are perceived by management [13]. Respondents believed that reporting is useless because health center management will not take any action, and because of fear of negative consequences such as blame which was similar to a previous study[20].

Regarding the workplace violence measures to deal with it in the workplace:

The measures that exist in the workplace related to workplace violence includes security measures in (69.1%), improved surroundings in (45.1%), restriction on public access in (30.3%), patient screening in (32.7%), patient protocols in (28.5%), restrict exchange in (19.3%), increased staff numbers in (27.1%), check in procedures for staff in (18.8%), special equipment or clothing in (22.4%), changed shifts in (30.3%), reduced periods of working alone in (33.4%), training in (33.9%), investment in human resource development in (20%) and others in (0.9%). The importance of increasing preparedness through training in the management of violence is supported by previous studies [6].

It was suggested that maintaining staffing patterns, which would limit working being alone and limiting after-hour care, and producing firm penalties for offenders are needed to reduce the risk of workplace violence[5].

Availability of security measures, improved surroundings, restrict public access, patient screening, patient protocols, restrict exchange of money at the workplace, increased staff numbers, check-in procedures for staff, special equipment or clothing, changed shifts or rotas, reduced periods of working alone, training and investment in human resource development are the most frequent suggestions to prevent and control violence. This is in agreement with other studies [9,12,15,18,20].

The formal support systems should include the provision of legal and administrative advice, and implementation of organizational measures to prevent future incidents [6].

Regarding the workplace health care setting changes and the opinions of the health care workers:

The workplace/health care setting changes in the last 2 years differed from no changes in (25.1%), restructuring/ reorganization in (15.7%) staff cuts in (12.3%), increased staff member in (10.8%), restriction of resources in (1.6%), additional resources in (1.3%), others in (0.9%) and don't know in (14.1%).

There were no participants' opinions on the impacts of the workplace changes on the daily work in (14.8%), (13%) found the work situation for staff worsening, (28.3%) found that work situation for staff improved, (2.2%) found that the work situation for patients/clients worsened in work situation, (8.1%) found the work situation for patients/ clients improved and (14.1%) don't know.

Conclusion

Violence towards health care professionals (physicians and nurses) occurs frequently and affects physicians and nurses in Primary Health Care Centers in Kuwait.

Working in a safe environment should be a priority as employees are at serious risk of violent incidents. Health care workers should feel secure and confident in their working environment. Therefore, building a good medical environment and reducing violence prevalence is one of the effective measures in reducing job burnout, stabilizing the health care workers teams and increasing job satisfaction. It is also necessary to establish a unified and appropriate reporting system and provide training programs for health professionals.

Recommendation:
Based on the finding of this study and the opinions of the participants, different recommendations that are needed to be followed in the future:

1. Developing a human-centered safe workplace culture.
2. Reinforce relevant human resources policies.
3. Management commitment and worker participation.
4. Worksite analysis and hazard identification.
5. Organizational interventions.

The implementation of strategies and preventive measures seems imperative for health care staff to feel secure and confident in the health care environment like:

Staffing: Ensure adequate presence of staff, in terms of numbers and qualifications.

Information and communication among the staff and working areas: Circulation of information and open communication among the staff and working areas can greatly reduce the risk of workplace violence by defusing tension and frustration among workers.

Management style: Openness, communication and dialogue, in which caring attitudes and respect for the dignity of individuals are priorities.

Work practices: Changing and improving work practices is a most effective, inexpensive way of diffusing workplace violence.

Working time: working time management should avoid excessive work pressure.

6. Environmental Intervention:
Changing and improving work practices is a most effective, inexpensive way of diffusing workplace violence.

7. Individual-focused interventions should be developed and adapted having regard to the specific situations, and priorities among the various types of interventions available should be established in consultation with the local stakeholders.

8. Future research:
Future research on workplace violence in other sectors along with causes of violence in health care settings is needed to improve the reporting process.

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Awareness, perceptions and knowledge of strabismus among Ha'il population, KSA

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Amani Mohammed Khalifa Mabrouk et al. Awareness, perceptions and knowledge of strabismus among Ha'il population, KSA. World Family Medicine. 2021; 19(5): 28-37 DOI: 10.5742/MEWFM.2021.94044

Abstract

Introduction: Strabismus is an ocular condition affecting the alignment of the visual axis, whether caused by abnormalities in binocular vision or anomalies of neuromuscular control of ocular motility. Strabismus is a fairly widespread disorder worldwide, especially among new-borns, and can cause loss of vision if untreated. The current study aimed to assess the knowledge level of strabismus in many aspects among the community and spread awareness in the region in the future, as well as to encourage establishment of programs in the local hospital for a regular eye examination.

Material: 411 adult persons who lived in Ha'il region, aged 18 years and more, were the material of the present study. They were asked to answer a previously designed electronic self-administered questionnaire. Ethical informed consent was taken from each participant.

Methodology: A cross-sectional study, conducted in Hail, KSA from May 15, 2020, till October 2020 was carried out using the SPSS program.

Results: Most of the participants were Saudi (97%), female (69.4%), and most of them were highly educated; 76.7% knew the definition of squint, 56% knew at least one cause of strabismus, 43% knew the symptoms and the main source of information was family /friends in 27.5%.

Key words: Strabismus, squint, awareness, Hail, KSA.

Introduction

Strabismus is an ocular condition affecting the alignment of the visual axis, whether caused by abnormalities in binocular vision or anomalies of neuromuscular control of ocular motility [1]. Strabismus is a common childhood ocular disability with prevalence ranging between 0.13%–4.7% [2].

The evident misalignment of the eyes frequently results in defective binocular depth perception and amblyopia. The objective in the treatment of strabismus is to realign the visual axes to eradicate diplopia, restore binocular vision, enhance the visual field, and provide a normal appearance. Besides these functional effects, the psychosocial impact of strabismus on both the parents and children is variable but definite and depends on the socio-cultural-economic milieu [3].

Individuals with strabismus experience a negative influence on their lives and report a problem with self-image, personal relationships, and education performance. The parents of such children are faced with an enormous decision of planning the course of management based on differing views in the social environment [4].

Strabismus may harm family relationships [5]. Also, delayed development (e.g., reaching milestones such as first walking and using single words) and difficulty with tasks involving visual perception have been found in young children with strabismus [6]. Children with strabismus frequently acquire amblyopia and diminished stereopsis. Early recognition and management of strabismic children can inhibit amblyopia. The strabismus child with amblyopia has a significantly higher risk of becoming blind by losing vision in the non-amblyopic eye, due to trauma or disease [7].

''Crossed eye'' or strabismus is a fairly widespread disorder universally especially among new-borns. Horwood et al, 2004 [8] reported a prevalence of about 73% in one-month-old babies, reducing to 50% in two-month-old babies and virtually disappearing in normal four-month olds and the prevalence of squint in 5 year olds is said to be about 5%. A study was done among primary school children in Ilorin, Nigeria which recorded a prevalence of 0.14% [9]. Previous studies in Saudi Arabia found that the prevalence of amblyopia in Saudi Arabia varies by region: 2.6% in Riyadh, 3.9% in Qassim province [10].

Regarding the awareness about strabismus in Saudi Arabia; a previous study was done by Alzuhairy et al., 2019 [11] who found that parents of children with strabismus presenting to a tertiary care eye hospital had good knowledge about the signs, symptoms, and management of strabismus. Addressing barriers perceived by parents may improve early presentation rates of children with strabismus allowing timely management. On the other hand, another study was published at almost the same time by Alsaqr & Masmali, 2019 [10] which claimed that there was a lack of amblyopia awareness among the Saudi community. This shortage of knowledge can lead to visual harm of children. The current study aimed to know the knowledge level of strabismus in many aspects among the community and spread awareness in the region in the future, as well as , to encourage establishment of programs in the local hospital for a regular eye examination.

Material: 411 adult persons who lived in Ha'il region, aged 18 years and more, were the material of the present study. They were asked to answer a previously designed electronic self-administered questionnaire. Ethical informed consent was taken from each participant.

Methodology

A cross-sectional study, conducted in Hail, KSA from May 15, 2020, till October 2020 was carried out using the SPSS program[12].

Data analysis

Data analysis was performed using a computer software SPSS version 23. SPS was employed to make cross-tabulation amongst different variables, as well as to determine the statistical significance (if any), and Chi-square test (P value <0.5, was considered significant).

Ethical consent

Ethical approval for this study was obtained from the ethical committee of the University of Hail. All measures included in the current study comply with ethical standards of the 1964 Helsinki declaration, as well as, its related subsequent modifications. Ethical approval number: 20455\5\42 dated 16\4\1442 H.

Results

Figure 1: Distribution of participants according to age group

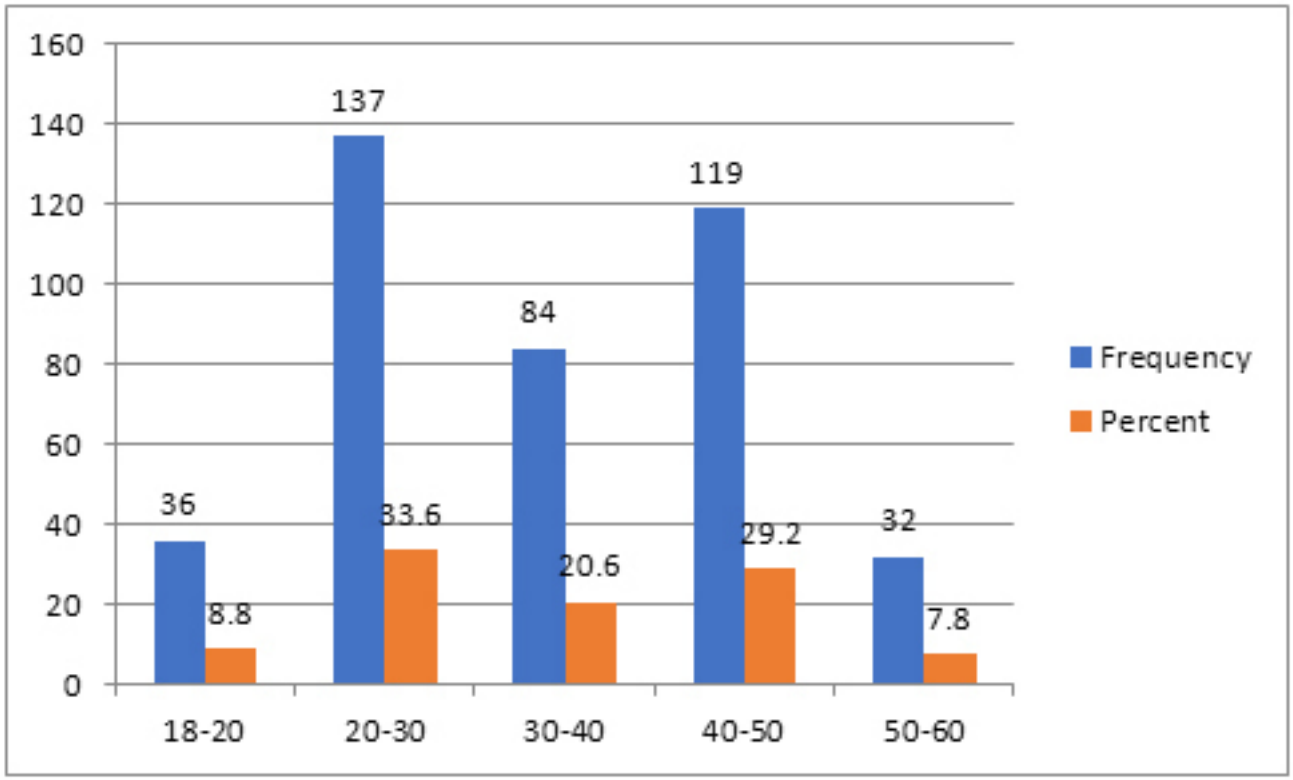


Figure 2: Distribution of participants according to nationality

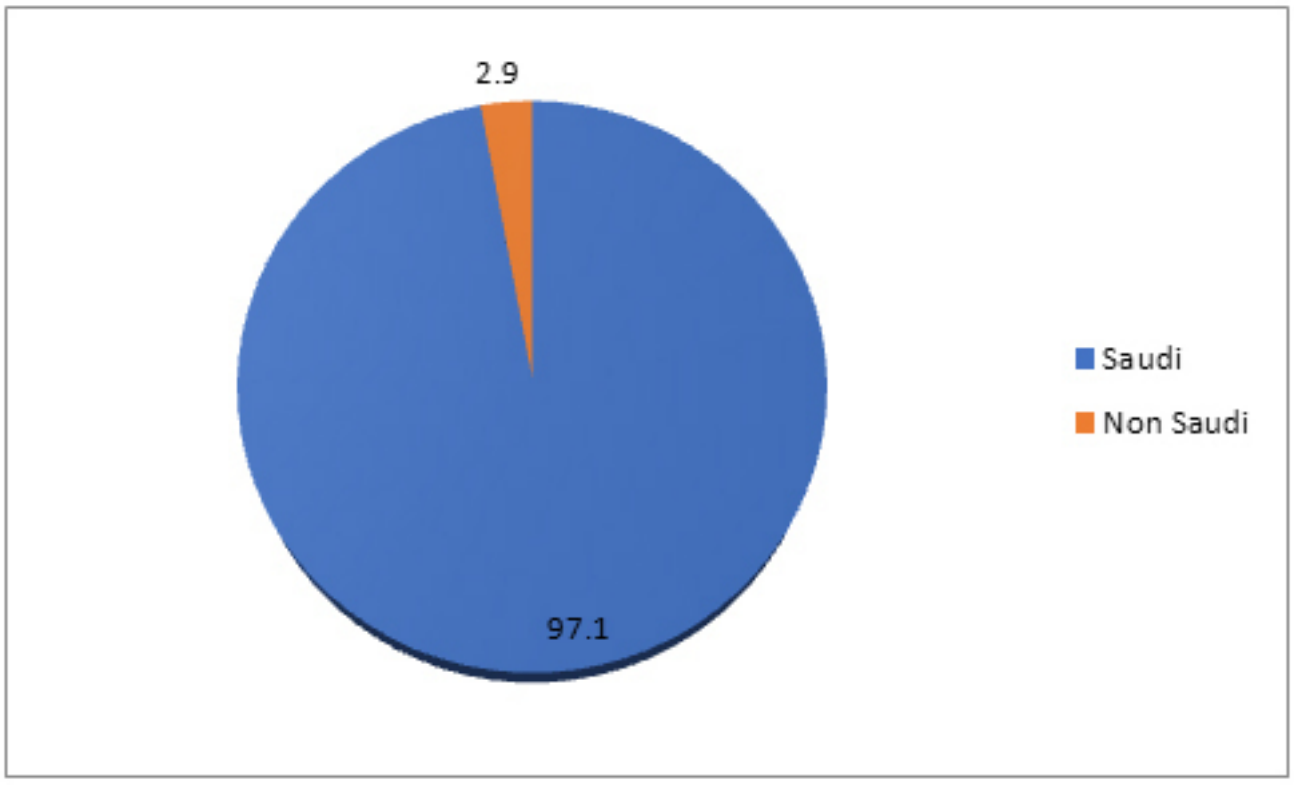


Figure 3: Distribution of participants according to gender

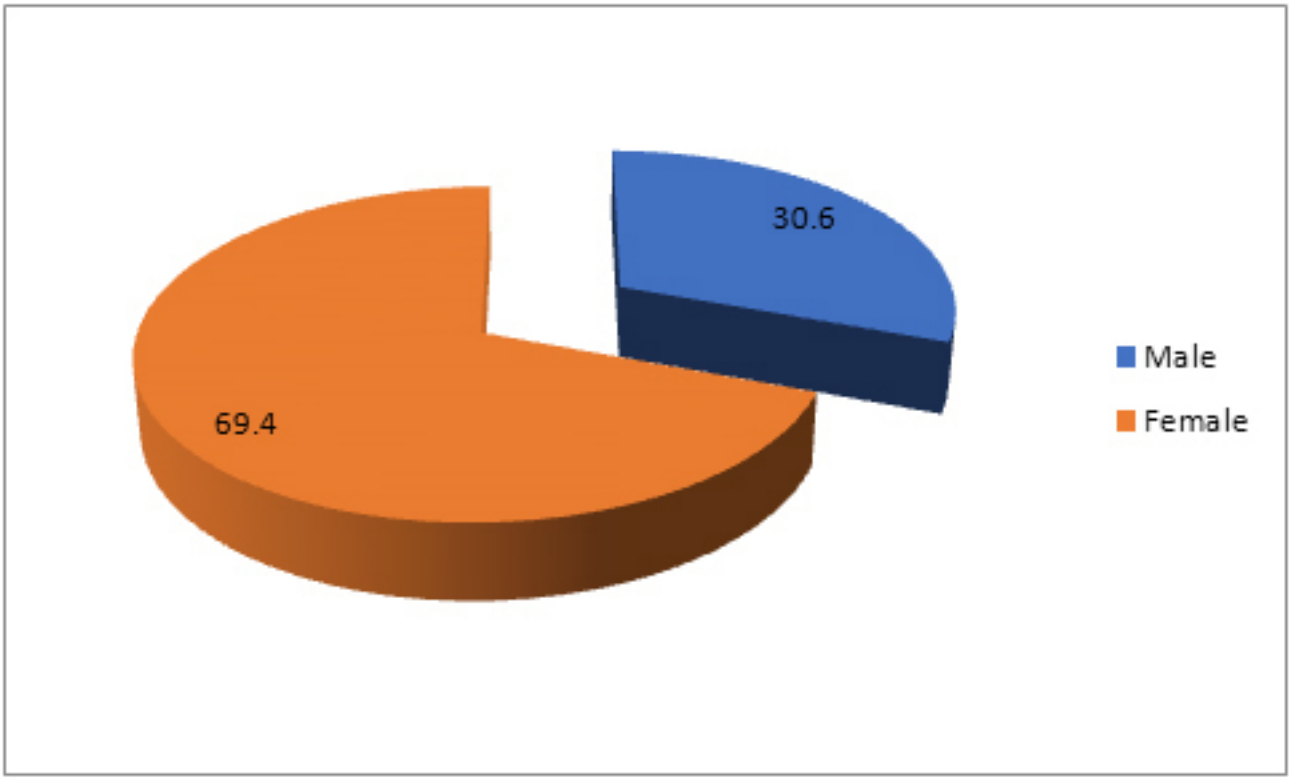
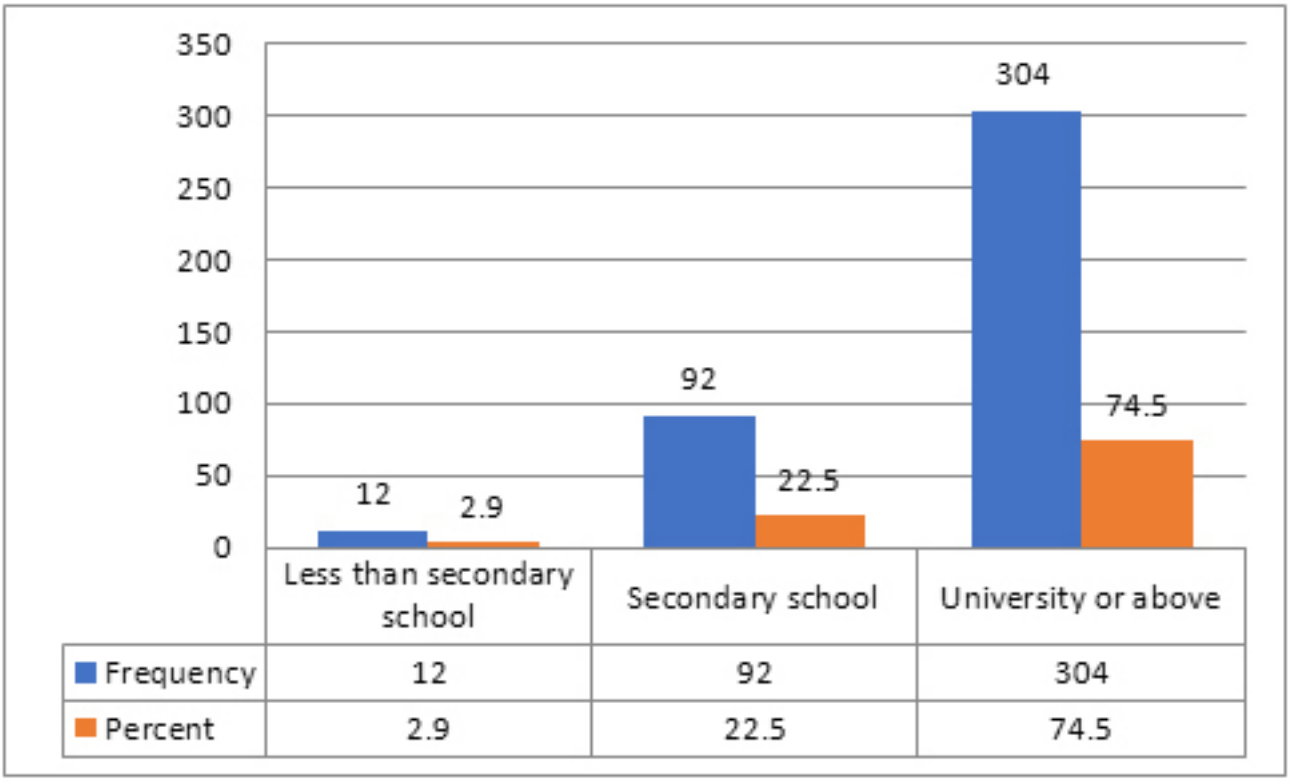


Figure 4: Distribution of participants according to educational level



	Less than secondary school	Secondary school	University or above
Frequency	12	92	304
Percent	2.9	22.5	74.5

Table 1: Demographic characteristics of participants

N = 408

Variable	Sub variable	Frequency	Percent
Age group	20-18	36	8.8
	30-20	137	33.6
	40-30	84	20.6
	50-40	119	29.2
	60-50	32	7.8
Nationality	Saudi	396	97.1
	Non Saudi	12	2.9
Gender	Male	125	30.6
	Female	283	69.4
Marital status	Single	164	40.2
	Married	224	54.9
	Divorced	6	1.5
	Widowed	14	3.4
Educational level	Less than secondary school	12	2.9
	Secondary school	92	22.5
	University or above	304	74.5

The majority of participants were within the age group 20 -30, 40 – 50 then 30 -40 respectively (33.6%, 29.2% and 20.6%). Most of them were Saudi (97%), female (96%), married (55%) and most of them had university degree or above (Table I, Figures 1-4).

Table 2: Participants' knowledge related to squint definition and age of appearance

N = 408

Variable	Sub variable	Frequency	Percent
Squint is	Optical defect that while one eye looks forwards to focus on an object, the other eye turns either inwards, outwards, upwards or downwards.	313	76.7
	Can be permanent or temporarily	22	5.4
	Affect one or both eyes	57	14.0
	I don't know	16	3.9
When does the squint appear?	Less than 6 months	313	76.7
	From 6 months to 7 years	22	5.4
	At any age	57	14.0
	I don't know	16	3.9

The majority of participants (76.7%) defined squint as an optical defect where one eye looked forward to focus on an object, the other eye turned either inwards, outwards, upwards or downwards. Also about 76.7% of participants

Table 3: Participants' knowledge related to the cause of squint

N = 408

Variable	Sub variable	Frequency	Percent
Causes of squint	Hereditary	49	12.0
	Prenatal exposure to toxic material during pregnancy (alcohol-smoker)	1	.2
	Birth problems (low birth weight ‹prematurity')	14	3.4
	Systemic disease (down syndrome, cerebral palsy, brain tumor)	7	1.7
	Refractive error (near-sightedness, farsightedness, and astigmatism, cataract)	38	9.3
	Head trauma	13	3.2
	Excessive use of smartphone	7	1.7
	Multiple causes	230	56.4
	I don't know	49	12.0

More than half of participants (56%) mentioned more than one cause of squint, the hereditary factor dominated the different causes (12%), followed by refractive error (near-sightedness, farsightedness, astigmatis , cataract) (9.3%) (Table 3).

Table 4: Participants' knowledge about the symptoms of squint

N = 408

Variable	Sub variable	Frequency	Percent
What are the symptoms of squint? (multiple choices)	Headache & eye ache	22	5.4
	Photophobia	4	1.0
	Inability to read comfortably	14	3.4
	Problems in judging distances and positions especially of moving objects	57	14.0
	No symptoms	55	13.5
	Multiple symptoms	176	43.1
	I don't know	80	19.6

Regarding the main symptoms of squint, as mentioned by participants, were problems in judging distances and positions especially of the moving objects (14%), headache & eye ache (5%), and inability to read comfortably (3%), while (43%) mentioned multiple symptoms. 13.5% of participants denied any symptoms and 19.6% didn't know the correct symptoms (Table 4).

Table 5: Participants' knowledge related to diagnosis, discovery, treatment and effect of delayed repair of squint

N = 408

Variable	Sub variable	Frequency	Percent
How will the squint be diagnosed?	Using specific test by doctors	202	49.5
	By naked eye	181	44.4
	I don't know	25	6.1
In your opinion who can discover the squint 1-family /friend, 2-doctor	Family/friend	14	3.4
	Doctor	39	9.6
	Family/friend and doctor	355	87.0
Optional treatment of squint	Glasses or contact lenses	58	14.2
	Eye patch	10	2.5
	Eye surgery	78	19.1
	Botox	3	.7
	Multi treatment options	196	48.0
	Not a curable disease	9	2.2
	I don't know	54	13.2
There is difficulty in repairing strabismus when treatment was delayed	Yes	328	80.4
	No	80	19.6

For diagnosis procedures of squint, 49.5% mentioned that it could be diagnosed by using a specific test by doctors, while 44.4% mentioned it could be diagnosed by the naked eye. The majority of participants (87%) mentioned that both family/friend and doctor could discover the squint. For optional treatment of squint, 19.1% mentioned eye surgery, while, 14.2% mentioned glasses or contact lenses. On the other hand, 48% stated multi treatment options. About 80% of participants mentioned that there were difficulties in repairing strabismus when treatment was delayed (Table 5).

Table 6: Participants' knowledge related to complications of an untreated squint

N = 408

Variable	Sub variable	Frequency	Percent
Complications of an untreated squint	Visual loss	7	1.7
	Cosmetic stigma	31	7.6
	Affect child performance at school	8	2.0
	Affect socially	3	.7
	Psychological problems	20	4.9
	Affects economically	3	.7
	There is no affect	9	2.2
	Multiple causes	327	80.2

The majority of participants mentioned that the complications of an untreated squint might lead to cosmetic stigma (7.6%), psychological problems (4.9%), visual loss (1.7%). Or more than one complications (80.2%) (Table 6).

Table 7: Participants' knowledge about the source of information of squint and importance of applying periodic complete ophthalmology examination in health centers

N = 408

Variable	Sub variable	Frequency	Percent
Source of your information about squint	Family/friends	112	27.5
	Awareness campaigns/school-college/courses	25	6.1
	Social media	59	14.5
	Your experience- know someone	99	24.3
	Ophthalmologist	21	5.1
	I don't know anything about squint	92	22.5
Do you think that regular periodic complete ophthalmology examination should be applied in health centres for paediatric age for early detection of squint?	Yes I agree	366	89.7
	Yes but no need for all age of paediatrics	33	8.1
	No, it's useless	9	2.2

As mentioned the main source of information about squint was family/friends (27.5%), experience or know someone (24.3%) or social media (14.5%). Most participants agreed that performing a regular periodic complete ophthalmology examination should be applied in health centres for paediatric age to detect squint earlier (Table 7).

The overall mean of knowledge of all study groups was 76.01%.

Table 8: Independent t -test between the overall knowledge of participants related to squint's causes, symptoms, complications, treatment options and demographic variables

Correct score									
		N	Mean	Std. Deviation	Std. Error Mean	F	Sig.	95% Confidence Interval of the Difference	
								Lower	Upper
Nationality	Saudi	396	3.53	.901	.045	.12	0.72	-.573	.462
	Non Saudi	12	3.58	.793	.229			-.565	.453
Gender	Male	125	3.50	.981	.088	2.401	0.12	-.238	.141
	Female	283	3.54	.859	.051			-.248	.152
Educational Level	Less than secondary school	12	3.00	1.348	.389	5.982	.010	-1.040	.026
	Secondary school	92	3.67	.786	.082			-1.200	-.148
	University or above	304	3.51	.901	.052			-1.367	.354
Age Group	18 - 40	257	3.47	.964	.060	13.165	.000	-.353	.002
	41 - 60	150	3.65	.706	.058			-.340	-.012

There was a statistically significant association between the the overall knowledge of participants related to squint, causes, symptoms, complications and treatment options, educational level and age groups, P Value is < 0.05.

Contrarily, there was no statistically significant association between the the overall knowledge of participants related to squint's causes, symptoms, complications and treatment options, nationality and gender, P Value is > 0.05 (Table 8).

Discussion

The present study was carried out to assess the knowledge and attitude regarding strabismus in Ha'il, KSA. Strabismus is a treatable condition that requires identification and treatment at an early age. However, whether the treatment is given in a timely manner depends on parents and the population knowledge and attitude [13].

In the present work, there was a statistically significant association between the overall knowledge of participants related to squint as regards causes, symptoms, complications and treatment options, educational level and age groups, (P Value is < 0.05). This outcome was similar to that of Khojah et al, 2020 [13], who found that higher educational level has a better knowledge of strabismus treatability and treatment options otherwise it did not show any significant relationship between the knowledge of the definition of strabismus and age [13].

On the other hand, in the present study, there was no statistically significant association between the overall knowledge of participants related to squint's causes, symptoms, complications and treatment options, and nationality and gender, (P Value is > 0.05). However, in a previous study, there were significant associations between awareness and gender with males being 1.66 times less likely to be aware of strabismus than females [14]. The results reported by Bukhari et al in 2018,[15] showed females had better knowledge about strabismus than males although both genders had acceptable knowledge levels [15].

The present work found that 77.2% of participants had good knowledge of definition of strabismus which is an optical defect which meant that while one eye looks forwards to focus on an object, the other eye turns either inwards, outwards, upwards or downwards. Only 14% had chosen that squint could affect one or both eyes. A lower percentage of awareness was reported in a previous study in Western Province, Saudi Arabia. They reported that 52.8% of their participants stated the correct definition of strabismus [13].

In the present study, most of the participants were aware of the causes of squint where 12% had chosen heredity as one of causes, followed by refractive error 9%. This result was consistent with a previous study that took place in Jeddah, Saudi Arabia, where heredity was the most frequently identified etiology (68.9%), followed by trauma (61.3%) [15]. On the other hand, another work in Cheha District, Central Ethiopia found that 62.8% did not know the causes of strabismus and mentioned only misconceived causes like exposure to bright light [16].

Strabismus treatment aims to restore binocular vision. Eyeglasses can be prescribed and other treatment options may include patching of the dominant eye or even performing surgical procedures. The present study showed that 14.2% of the whole population knew that strabismus could be treated by glasses or contact lenses and 19% chose eye surgery. Isawumi et al in 2014 found 54% of the population in Nigeria did not know that strabismus can be treated [14].

The present research showed a high degree of awareness (80%) about complications of untreated strabismus. The reported complications were Cosmetic stigma (8%), psychological problems (5%) and 80% gave more than one complication. The results reported by Khojah et al in 2020 [13], supported the present result where they found that frequent complications of untreated strabismus were visual loss (4.6%), cosmetic stigma (3.9%), and poor self-image (2.4%); however, a clear majority (55.2%) chose "All of the above" [13].

Conclusion

The present study was done to assess the knowledge and attitude of strabismus in Hail, KSA; most participants were Saudis (97%), and females represented 69.4% of them. There was good knowledge and attitude about strabismus's symptoms, causes, and treatment in Ha'il region, KSA, with an overall mean of correct answers of 75.2%. The majority of participants could define strabismus (77.2%). Furthermore, there was a significant positive relationship between the overall knowledge of participants related to squint and educational level of participants. Higher educational level had a better knowledge of strabismus. Thus, health education is still needed to focus light on strabismus especially to lower educational level population, wishing to prevent strabismus complications.

Recommendation:

In the present study, we faced several limitations regarding the distributed survey through different channels of social media. In addition, the study was restricted to the Ha'il region of Saudi Arabia; thus, it could not be filled out by someone outside this region. Therefore, we recommend conducting the study among all Saudi Arabian residents in different areas. Health education about strabismus is extremely needed to throw light on this disease and the importance of early diagnosis and early treatment to save the vision of its victims.

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A Case Study on Addressing Nurses' Practice Gaps in Diabetic Peripheral Neuropathy and Hypertension Diagnoses in the Gulf Region

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Amar Salti et al. A Case Study on Addressing Nurses' Practice Gaps in Diabetic Peripheral Neuropathy and Hypertension Diagnoses in the Gulf Region. World Family Medicine. 2021; 19(5): 38-42 DOI: 10.5742/MEWFM.2021.94047

Abstract

Background: Diabetes, hypertension and common complications like diabetic foot are highly prevalent in the Africa and Middle East region. Nurses are involved in the prevention and early detection of diabetic foot complications and hypertension. However, due to a lack of knowledge and training regarding the latest guideline recommendations, there is a gap in nurses' clinical practice. This qualitative descriptive case study describes the implementation of training workshops for enhancing nurses' skills in accurate blood pressure (BP) measurement and screening for diabetic peripheral neuropathy (DPN).

Methods: Ninety nurses attended three full-day workshops conducted in Jeddah and Riyadh, Saudi Arabia and Dubai, United Arab Emirates. The workshops included learning modules on BP, DPN and diabetic foot care, a practical session on correct utilization of BP and DPN assessment tools and case study discussions. A feedback questionnaire was filled in by the participants and qualitative feedback was solicited from the participating hospitals on the impact on the nurses' skills.

Findings: The nurses reported that the workshop was relevant to clinical practice and expanded their skills and knowledge. They believed it provided value as they received hands-on training in DPN diagnostic tools and proper BP measurement technique. The discussion on hypothetical patient cases was applicable to their jobs and the participants would highly recommend the workshop to their colleagues. The participating hospitals reported greater nurse involvement in diabetes management.

Conclusion: The continuous education of nurses on the latest recommendations and tools must be encouraged to ensure better patient outcomes. Screening tools for DPN should be incorporated in the nurse triage for diabetic patients to enable early detection of diabetic foot complications. Similar workshops can be conducted and utilized as training modules to enhance the skills of caregivers and other healthcare professionals.

Funding: This study was sponsored by Upjohn – A legacy Division of Pfizer.

Key words: Nurse education, Diabetic foot, Gulf, DN4, practice gaps, nurse role, foot care

Background

Diabetes and hypertension are two important risk factors that lead to high mortality and morbidity(1). In 2019, the number of diabetic patients was 463 million worldwide and this number is estimated to increase to 578 million by 2030(2). In 2020, the International Diabetes Federation estimated the prevalence of diabetes in the United Arab Emirates (UAE) and Saudi Arabia at 15.4% and 18.3% respectively (3). Additionally, in 2015, hypertension was prevalent in 13% and 19% of the adult population in the UAE and Saudi Arabia respectively(4).

Diabetes is a progressive disease(5) and over time, damages blood vessels and can lead to complications such as neuropathy, retinopathy and nephropathy; while hypertension can result in coronary artery disease, heart failure, stroke, chronic kidney disease, peripheral arterial disease and retinopathy(6, 7). The National Institute for Health and Care Excellence (NICE) recommends that diabetics undertake nine health checks annually(8, 9). Similarly, regular blood pressure (BP) measurements using the recommended protocol are required every two years for non-hypertensive patients and annually for patients with borderline BP(10).

The multidisciplinary team-based approach for the management of hypertension and diabetes is recommended by most international guidelines (11-14). This team can include primary care physicians, specialists, nurse practitioners, physician assistants, nurses, pharmacists, dieticians, vascular surgeons, physiotherapists, ophthalmologists, cardiologists, podiatrists and mental health professionals(12, 15-17). As part of the multidisciplinary team, nurses play a crucial role in not only the treatment of diabetic and hypertensive patients, but also in screening and educating them(18).

The prevalence rate of diabetic peripheral neuropathy (DPN) in the Middle East and North Africa region ranges from 9% to 53% in diabetics(19). Peripheral neuropathy, a common complication of diabetes, is the cause of more than 80% of foot ulcers(20). The primary goal of screening for the multidisciplinary team is to evaluate the integrity of protective sensation of the feet and to identify patients at risk of foot ulcers, and the early detection and treatment of foot problems(21). Nurses specializing in foot care are responsible for the examination and education of patients regarding foot care, wound dressing and preventing foot problems and injuries. Nurses, therefore, require special training to equip themselves with the latest recommendations of diabetic foot care in order to effectively facilitate diabetic patient health(20).

Similarly, hypertension guidelines recommend that nurses should have adequate knowledge regarding the diagnostic process of hypertension and the correct BP measurement technique(10). Current guidelines recommend out-of-office BP measurements, including home BP measurements to confirm hypertension diagnosis(13). Therefore, it is essential that the patient is correctly educated about the techniques involved in self-monitoring and uses validated and properly calibrated equipment. Trained nurses can educate patients regarding self/home BP monitoring techniques and the equipment involved in the diagnosis and monitoring of hypertension(10).

The purpose of this case study is to qualitatively describe a training course that advances nurses' skills in accurate BP measurement and screening tools to diagnose painful diabetic neuropathy. A workshop was designed to train nurses on BP measurement according to the recent American College of Cardiology/ American Heart Association guideline recommendations and a simple tool used to diagnose painful DPN(13). The Douleur Neuropathique 4 (DN4) questionnaire is used to diagnose painful DPN with high specificity and sensitivity. A working knowledge of these two tools was expected to help nurses participate in the diagnosis of hypertension and diabetes.

Methods

Setting and participants

Three full-day workshops were conducted in three cities across Saudi Arabia and the UAE. The first workshop was held in November 2019 in Dubai, UAE, with nurses attending from key hospitals across Jeddah, Riyadh and Dammam, Saudi Arabia and Dubai, UAE. The second workshop took place in January 2020 in Jeddah, Saudi Arabia, and the participants included nurses from the International Medical Center and other key hospitals in the city. The third workshop was held in February 2020 in Riyadh, Saudi Arabia and was attended by nurses from key private hospitals in Riyadh. Overall, 90 nurses working in triage or diabetic centers were trained through the workshops.

Workshop implementation

The overall purpose of the workshops was to train nurses to support patients in the diagnosis of DPN and accurate BP measurement technique. The workshop agenda included an academic lecture-based section and a practical clinical section with case studies. The workshop faculty consisted of a hospital chairman acting as a moderator, a physician speaker for BP and another for DPN, and a nurse speaker for diabetic foot care. The lecture modules were prepared by the speakers of each session.

For the practical training session, the participants of each workshop were divided into groups of 6-8, where they practiced utilizing the digital sphygmomanometer with the proper BP measurement tech-nique, the DN4 questionnaire, the monofilament, pin and brush. The groups were also involved in discussions on case studies that were assigned to each group. Each group chose one member on behalf of the group as the speaker, who discussed the cases with the workshop faculty.

Outcome metrics/measures

At the end of the workshops, the participants filled in a feedback questionnaire on their opinion and experience of the workshop (Table). Qualitative feedback was also solicited from the participating hospitals on the impact of the workshops on the nurses' skills and knowledge.

Results

The feedback questionnaire results showed that the response to the workshop was positive. The participants responded that the speakers were experts in their fields and the content presented was easy to grasp. According to the participants, the speakers presented their topics in a clear and sequential manner by first introducing the disease; its burden and impact; and the current guidelines, recommendations and treatment options. The lectures reserved a big section for the role of the nurse in the screening, diagnosis and management of the disease. At the end of the lecture, time was allocated for questions and answers, and the participants' queries were addressed.

The level of the workshop was 'intermediate' as it provided the participants with hands-on training of the diagnostic tools of DPN. The workshop expanded their skills and educated them on how to detect pain in diabetic patients and guided them on the proper BP measurement technique.

The workshop was applicable to their job since the DN4 questionnaire is a core diagnostic tool for DPN and was available in a printed format. The participants also had the opportunity to discuss hypothetical patient case studies to familiarize themselves with the use of the diagnostic tools.

The participants reported that they would 'highly recommend' the workshop to their peers and the information provided could be applied to practice in terms of the role of nurses in detecting DPN. The workshop provided value to the participants as it included case studies that were designed by the speakers. The case studies included patients with peripheral neuropathy, along with the patient history, signs and symptoms. This enabled the participants to better engage in the discussion because of their own experience and helped the nurses prepare for cases they might encounter in their own clinics. The cases discussed in each group were shared with all the groups; therefore, the participants were exposed to different case studies with several diseases and varied outcomes.

Overall, the training workshops had a positive impact on the nurses' education due to the incorporation of clinical knowledge. They were trained on practical tools used for the assessment of DPN and accurate BP measurement technique, and acquired knowledge required to educate patients regarding symptoms and potential complications, such as verbal descriptors of neuropathic pain, red flags for severe hypertension, etc.

The participating hospitals provided feedback that the trained nurses became more aware of the im-portance of screening diabetic patients for the risk of diabetic foot. During their triaging, the nurses became more involved in flagging patients at risk and were confident in educating patients at risk and their families. There were administrative changes implemented in the participating hospitals after the training workshops. The hospital nursing management team advised to nominate 'champions' from the nursing team to facilitate the in-house training and education of the nurses as a continuity of educational events outside the hospital. Additionally, the management team established service-based key performance indicators to assess the improvement and performance of the nurses. Proposals for similar workshops for nurses in other institutes have been well-received with the objective of regional collaboration and exchange of experiences.

Table. Topics included in the feedback questionnaire provided to workshop participants

Topic	Questions in the feedback questionnaire
Speakers and content	• Were the speakers knowledgeable in their content areas & replied well to questions? • Was the content presented in an organized manner & within the time allocated?
Workshop	• What was the length of the workshop (short, right length, long)? • What was the level of the workshop (introductory, intermediate or advanced)? • Was the workshop applicable to your job? • Are you interested in teaching this course program at your workplace? • Can the information discussed here be applied to practice? • What was the value as a result of attending this workshop on your job, practice & skills?

Discussion

Nurses are an invaluable part of multidisciplinary teams in the healthcare system and play a key role in the management of chronic diseases(12, 14). However, nurses' awareness of neuropathic pain is lacking and their involvement in diabetic foot management is limited(22, 23). Basic and continuous education of nurses in this area should be enhanced and the active participation of nurses in pain management must be encouraged. This can be achieved through the integration of the DN4 questionnaire in the nurse triage for diabetic patients or those at risk for diabetes. The training workshops provided nurses with hands-on training and education on diabetic foot management, and correct BP measurement technique. Additionally, the nurses were exposed to discussions on case studies seen in clinical practice, which were relevant to their professional practice. The results of the feedback questionnaire indicate that the workshops were successful and provided value to the participants.

Effective communication between nurses and patients is critical to ensure that patients achieve successful clinical outcomes. The nurse should be able to create an environment of trust, show interest in the patient, and should develop a harmonious relationship with the patient(24). Many patients may be fearful or anxious in a hospital environment and nurses must be adequately trained in creating a calming and open environment(25). Training workshops should focus on teaching nurses communication skills to approach anxious patients and provide support to them.

The interdisciplinary approach to education ensures an enhanced understanding of multiple disciplines and thereby, improved delivery of care and patient outcomes(26). The workshops described in this study facilitated discussion between healthcare professionals from different fields. Future workshops can include a wider panel of experts such as pain physicians, endocrinologists, neurologists, internists and nurses to provide other perspectives to clinical care.

Training workshops for healthcare professionals in the future can incorporate collaboration between groups from different hospitals or different countries to further facilitate learning through interaction and communication between participants. Interaction between nurses from different countries has been found to increase exposure to different practices and clinical experiences and instill critical thinking in terms of learning(27). Our workshops can also be utilized as part of continuous training programs and on platforms for caregivers to enhance their knowledge through clinical updates and learning novel tools.

Strengths and Limitations

Our training workshops provided the nurses with the knowledge and skills for the assessment of DPN and the appropriate technique for BP measurement. To the best of our knowledge, our workshops were the first local initiative to highlight the gap in management of diabetic neuropathy and to strengthen the nurses' role in screening and diagnosis of DPN. The workshops incorporated interdisciplinary learning through the interaction with speakers from different specialties and the case study discussions. Additionally, the case study discussions promoted collaboration and cooperation between the nurses. The success of the workshops has facilitated an increased interest in the education and training of nurses outside the hospitals.

Future workshops can incorporate a quantitative pre- and post-assessment to demonstrate impact with a quantitative indicator. The workshops can be recorded to enable skill maintenance and retention post-training and will serve as a guide when the nurses conduct trainings in their institutions. Further, the trainings described can be incorporated into continuous learning modules to ensure consolidation of the techniques and acquired skills. In the future, similar workshops can be conducted for larger groups of participants to enable widespread dissemination of information and training on blood pressure measurement and DPN screening.

Conclusion

Our study indicates that the workshops provided the nurses with hands-on training on diabetic polyneuropathy assessment tools and accurate BP measurement techniques. The exchange of practical tips in the diagnosis of DPN and hypertension helped in improving nurses' skills in their workplace. The workshops enabled the nurses to perform proper triaging of patients and effective communication in the screening of chronic diseases. The active role of nurses in diabetic foot management should be encouraged and their knowledge must be continuously improved through regular training. The success of these and future workshops is reliant on the involvement of the participating nurses and their willingness to enhance the knowledge of their colleagues in their place of work. The creation of team spirit is also highlighted through the successful collaboration between the nurses during the workshop. This study has reiterated the value of interdisciplinary discussions in the education and practice of healthcare professionals in the service of patients.

Funding

This study was sponsored by Upjohn – A legacy Division of Pfizer.

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Knowledge, Behavior and Practice Toward Paediatric Tonsillectomy Among Parents in Aseer region, Saudi Arabia (2020)

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Ali Maeed Sulaiman Al-Shehri et al. Knowledge, Behavior and Practice Toward Paediatric Tonsillectomy Among Parents in Aseer region, Saudi Arabia (2020). World Family Medicine. 2021; 19(5): 43-50 DOI:10.5742/MEWFM.2021.94048

Abstract

Background: Tonsillectomy is defined as the surgical excision of the palatine tonsils. Tonsillectomy is performed less often than it once was, but it is still among the most common surgical procedures performed in children in the United States. In 1959, 1.4 million tonsillectomies were performed in the United States. This number had dropped to 260,000 by 1987, when it was the 24th most common indication for hospital admission.

Methods: Data were collected from participants using an electronic pre-structured questionnaire. The researchers developed the questionnaire with the help of field experts and after intensive literature review. The tool was reviewed using a panel of 3 experts for validation and applicability. The questionnaire was uploaded online using social media platforms by the researchers and their friends during the period from 1st June 2020 till 30th of December -2020. Convenience sampling method was used.

Results: Out of a total 239 respondents the mean (SD) age of the respondents was 32.71(10.71). 65% were fathers and 35% were mothers. From the data we observed that 15.5% of the children of the respondents had passed through the tonsillectomy process.

Conclusion: The educational level and socioeconomic status of the parents were the key factors associated with these positive behaviors. These results indicate that conducting educational programs on tonsillectomy can be beneficial.

Key words: knowledge, behavior, practice, tonsillectomy process

Background

Tonsillectomy is defined as the surgical excision of the palatine tonsils 1. Tonsillectomy is performed less often than it once was. It is still among the most common surgical procedures performed in children in the United States. In the UK, few children with evidence-based indications undergo tonsillectomy and seven in eight of those who do (32 500 of 37 000 annually) are unlikely to benefit. (2). Tonsillectomy is a popular surgical procedure for children. Tonsillectomy is a surgical procedure that varies in frequency from one area to the next, as well as from one country to the next. Family characteristics and patient performance also influence the decision to perform tonsillectomy(3-4).

Tonsillectomies among children under the age of 15 years differ significantly between countries and regions, with 19 per 10,000 children in Canada, 50 in the United States, and 118 per 10,000 children in Northern Ireland registered in 1998. In 2006, published rates still varied widely across the world (5-6).

As per one study in terms of tonsillectomy, Saudi Arabian otolaryngologists tend to meet international guidelines(7). The most common reason for dissection was recurrent tonsillitis. Complications are often not shared with, or made clear to, the clinician during surgical consultation. According to a Taif based study in children, tonsillar disease is one of the common causes of primary care visit to physicians and the choice of treatment is often tonsillectomy(8-9).

Traditional medicine has a long tradition in Asir (the valley between the Red Sea and the Sarawat mountains in the Southwestern region of Saudi Arabia). The curing practices used there include skin cautery, herbs, and a variety of other techniques. Tonsils are being manually manipulated or cut by local healers, something we are reporting on and drawing attention to. Therefore, the study aims to evaluate the knowledge, behavior, and practice of parents regarding tonsillectomy process for children in Aseer region, Saudi Arabia. In addition, a multicenter randomized clinical trial found that a large number of children with obstructive sleep apnea would have their symptoms resolved over time without tonsillectomy(10-12).

As a consequence, the surgical decision for the parents may be complicated and multifaceted, and they may seek knowledge from external (e.g., online) sources to help them make the best decision possible(13-15).

Because of the related morbidities, parents have mild disagreement over the surgical decision. Extreme postoperative discomfort, bleeding, or vomiting, as well as complications of general anesthesia, such as respiratory failure and, in rare circumstances, death, are both hazards and effects of tonsillectomy(16-18).

In Aseer region of Saudi Arabia we do not have much published data to address our topic therefore we conducted the study with the aim to evaluate the knowledge, behavior, and practice of parents regarding tonsillectomy process for children in Aseer region, Saudi Arabia.

Methods

Data were collected from participants using an electronic pre-structured questionnaire. The researchers developed the questionnaire by the help of field experts and after intensive literature review. The tool was reviewed using a panel of 3 experts for validation and applicability. Tool reliability was assessed using pilot study of 25 participants with reliability coefficient (α-Cronbach's) of 0.81 for awareness and knowledge section. The questionnaire included the following data: participants' socio-demographic data like age, gender, work, and education and then awareness and knowledge questions. The questionnaire was uploaded online using social media platforms by the researchers and their friends during the period from 1st June 2020 till 30th of December 2020. Convenience sampling method was used. The questionnaire was distributed to the parents in Aseer region; a total 250 questionnaires were distributed out of them there were 239 respondents (11 were missing); response rate was therefore 95.6%.

After data were extracted, it was revised, coded, and fed into Statistical Software IBM SPSS version 22 (SPSS, Inc. Chicago, IL). P value less than 0.05 was statistically significant. Descriptive statistics (mean, S.D, frequencies and percentages) were computed; to measure the differences between variables we used chi-square test at 5% level of significance.

Results

Out of a total 239 respondents the mean (SD) age of the respondents was 32.71(10.71). 65% were fathers and 35% were mothers. From the data we observed that 15.5% of the children of the respondents had passed through the tonsillectomy process.

Table 1 depicts that in the response to the question "A child whose tonsils have been removed has an immune system with the same efficiency before and after the operation" 33.99% opted the yes option while 32.6% opted No and interestingly 33.5% of the respondents have no idea about that. Table 2 depicts that that majority of the respondents (71.5%) have undergraduate and more level of study while in income group 25.1% belong to 10000-15000 SAR and above 15000 SAR monthly income. Figure 2 depicts that 59.0% of the parents have children

Figure 1

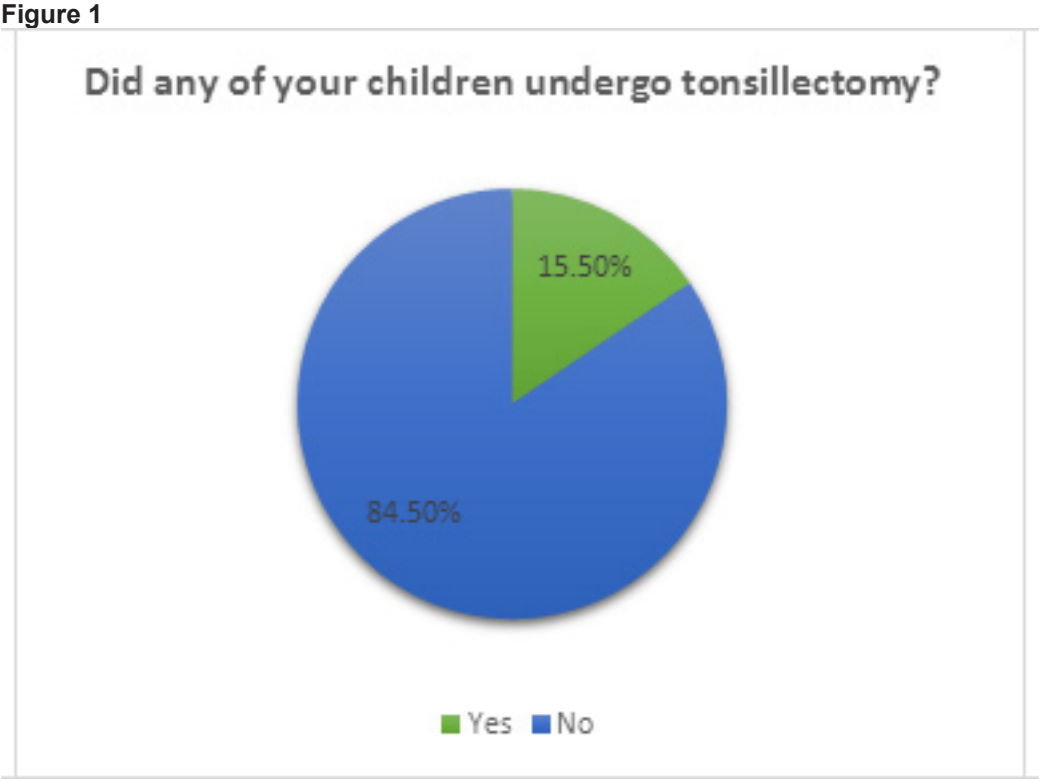

Table 1

A child whose tonsils have been removed has an immune system with the same efficiency before and after the operation.		
	Frequency	Percent
Yes	81	33.9
No	78	32.6
Do not know	80	33.5
Total	239	100.0

Table 2

Education Level		
	Frequency	Percent
Primary school	16	6.7
Secondary school	52	21.8
Undergraduate or more	171	71.5
Total	239	100.0
Average monthly household income in SAR		
	Frequency	Percent
Less than 5000	60	25.1
5000 - 10,000	59	24.7
10,000 - 15,000	60	25.1
More than 15,000	60	25.1
Total	239	100.0

Figure 2

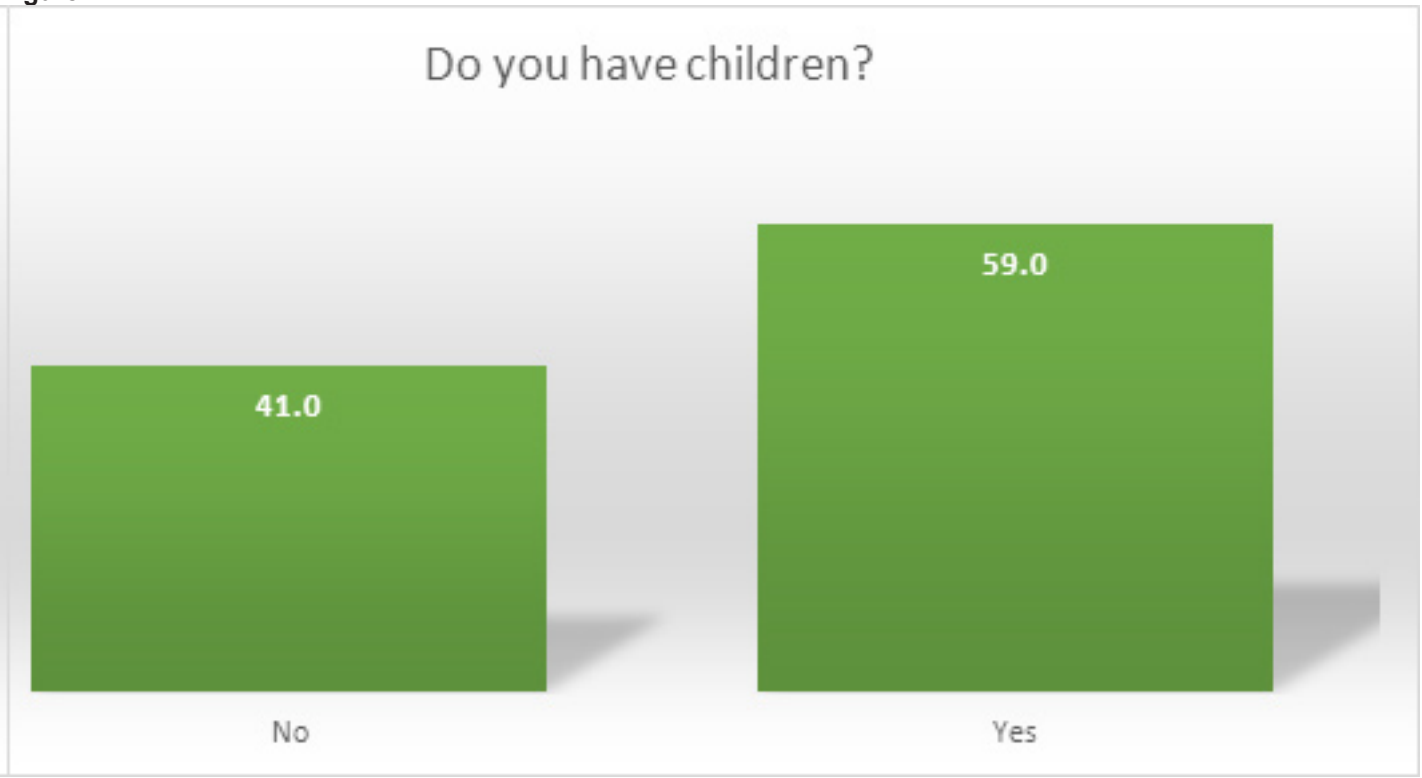

Table 3

Does tonsillectomy reduce the frequency and severity of recurrent sore throat?		
	Frequency	Percent
Yes	217	90.8
No	22	9.2
Total	239	100.0
After the procedure, it is preferable to provide cold food and ice cream for the child for a week.		
	Frequency	Percent
Agreed	212	88.7
Disagreed	27	11.3
Total	239	100.0
Aspirin and ibuprofen may be given within 10 days before the procedure		
	Frequency	Percent
Agreed	94	39.3
Disagreed	145	69.7
Total	239	100.0

According to Table 3, 90.8% agreed that tonsillectomy reduces the frequency and severity of recurrent sore throat?, 88.7% agreed that after the procedure, it is preferable to provide cold food and ice cream for the child for a week, 69.7% disagreed that Aspirin and ibuprofen may be given within 10 days before the procedure.

Figure 3

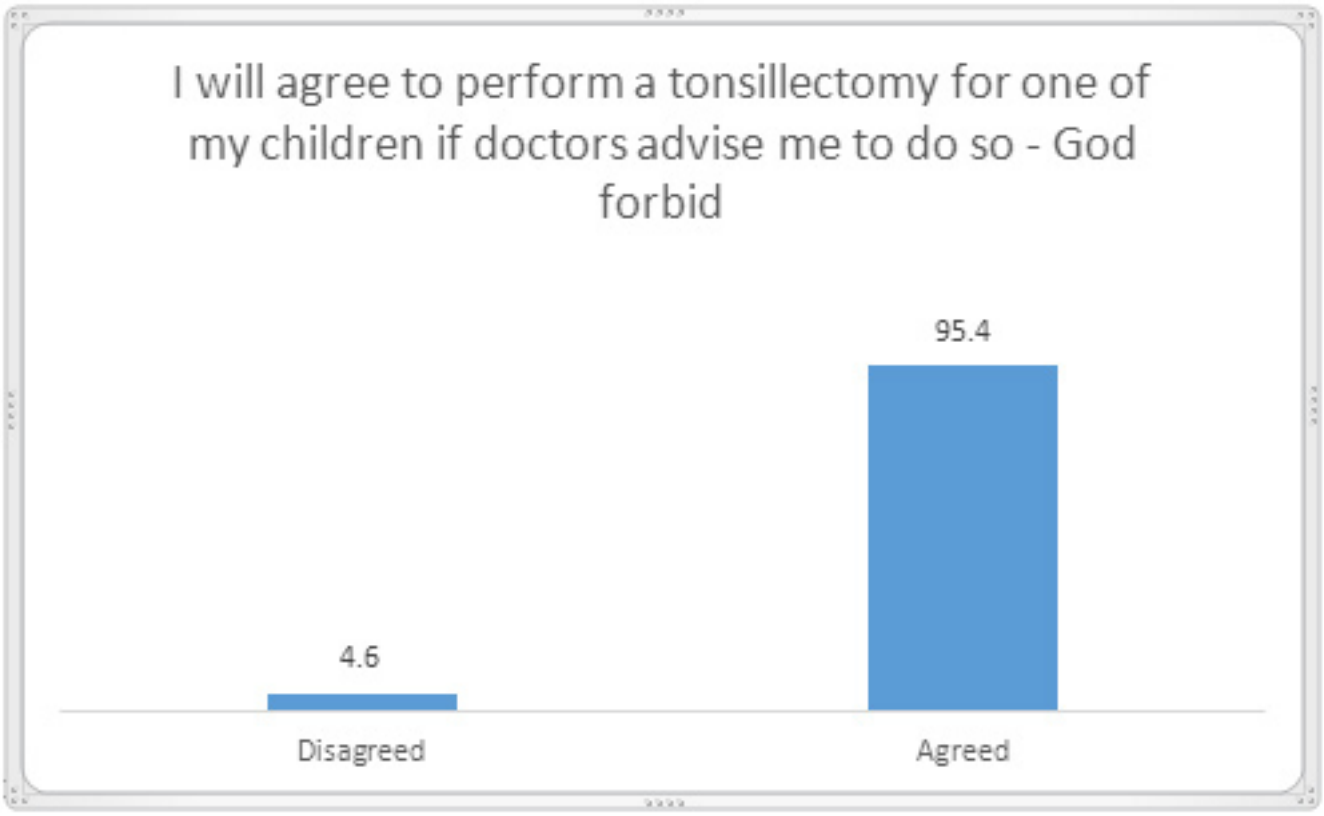

Figure 3 depicts that 95.4% of the respondents would agree to perform a tonsillectomy for one of their children if doctors advise them to do so - God forbid

Figure 4

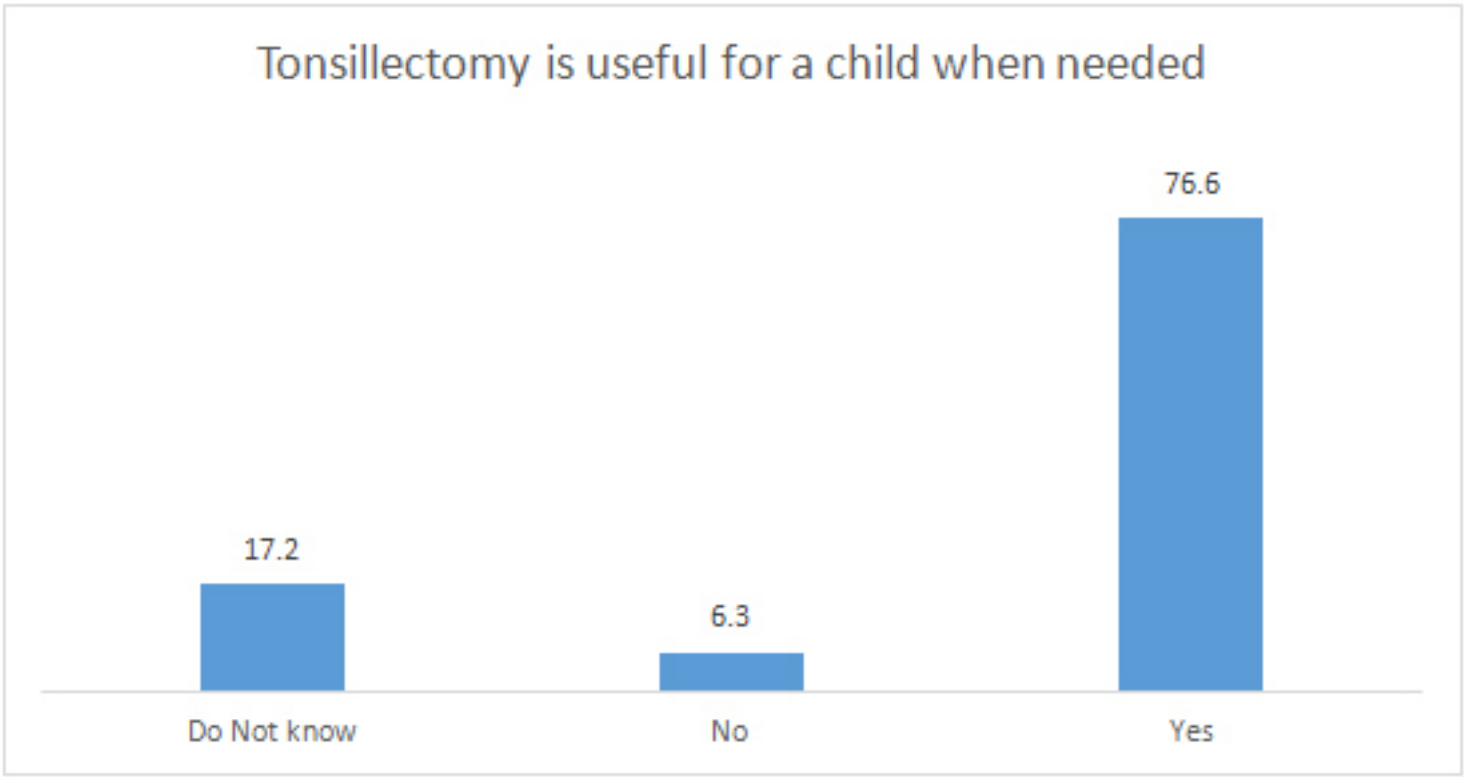

Figure 4 depicts that parents agreed that Tonsillectomy is useful for a child when needed.

Table 4

Table 4:		Is tonsillectomy performed in the case of recurrent acute tonsillitis?		Total	
		Agreed	Disagreed		
Did any of your children undergotonsillectomy?	Yes	35	2	37	
	No	174	28	202	
Total		209	30	239	
p=0.119					
		Is the operation to remove tonsils in the case of tonsil abscess		Total	
		Agreed	Disagreed		
Did any of your children undergotonsillectomy?	Yes	29	8	37	
	No	148	54	202	
Total		177	62	239	
p=0.334					
		The complications of the operation are either few or none			Total
		Agreed	Disagreed	Do not know	
Did any of your children undergotonsillectomy?	Yes	26	3	8	37
	No	104	29	69	202
Total		130	32	77	239
p=0.107					
		Tonsillectomy is useful for a child when needed			Total
		1.00	2.00	3.00	
Did any of your children undergotonsillectomy?	1.00	35	1	1	37
	2.00	148	14	40	202
Total		183	15	41	239
p=0.005					

In Table 4 we compared variables “Did any of your children undergo tonsillectomy?” with “Tonsillectomy is useful for a child when needed” “The complications of the operation are either few ornone ”, “Is the operation to remove tonsils in the case of tonsil abscess”, “Is tonsillectomy performed in the case of recurrent acute tonsillitis?” And we have observed significant difference between only “Did any of your children undergo tonsillectomy” with “Tonsillectomy is useful for a child when needed”

Table 5

		Did any of your children undergo tonsillectomy?		
		Yes	No	Total
Average monthly household income	Less than 5000	5	55	60
	5000 - 10,000	5	54	59
	10,000 - 15,000	12	48	60
	More than 15,000	15	45	60
Total		37	202	239
p= 0.022				
		Did any of your children undergo tonsillectomy?		
		1.00	2.00	Total
Educational level	Primary school	1	15	16
	Secondary school	7	45	52
	Undergraduate education and more	29	142	171
Total		37	202	239
p=0.475				

In table 5 we compared education level and social status with “Did any of your children undergo tonsillectomy?” And we observed a significant difference among social status and “Did any of your children undergo tonsillectomy?”

Discussion

The main objective of this study was to evaluate parental knowledge / awareness about the process of tonsillectomy. 15.5% of the children of the respondents underwent the process of the tonsillectomy which is in line with the Denmark study. Between 1980 and 2001, 6 to 9% of people under the age of 20 in Denmark had their tonsils removed (19-20). Tonsillectomy rates, on the other hand, differ dramatically during childhood, with peaks in early childhood (age 4-5 years) and adolescence (age 16-17 years). The findings of our study are in line with a study conducted in the Riyadh where the majority of parents in Riyadh, Saudi Arabia, had positive awareness, attitudes, and practices about pediatric ear infections, according to this report. Other factors that boost ear infection awareness, attitude, and behaviors should be analyzed in future studies(20-21).

Even if the child had medical benefits, poverty was related to the inability to pay for healthcare and transportation costs. When compared to parents with lower levels of education, parents with higher levels of education were more likely to have more awareness and constructive care-seeking behaviors However, there was no discernible connection between attitude and educational attainment(20-25). These findings are in line with the findings of our study that social status produced the significant impact over the selection of tonsillectomy process. In our study the majority (77%) agreed that tonsillectomy is helpful when it is required, which is in line with a study that stated that shared decision making, whereby physicians present all treatment alternatives and make joint decisions with parents on the basis of the preferences and values of the child and family, is known to reduce decision conflict (15-28). Shared decision making, in which doctors present all care options to parents and make joint decisions based on the child’s and family’s interests and values, has been shown to minimize decision conflict.

Because parents are the primary caregivers for the pediatric patient (45) the surgeon may advise parents to anticipate the potential difficulties, probe for parental concerns when discussing the surgical decision, and offer recommendations when needed(29-30).

Acknowledgement:
We acknowledge the efforts of Mr. Muhammad Abid Khan for data analysis and valued inputs.

Conclusion

In this report, the majority of Saudi Arabian parents had strong knowledge of, attitudes toward, and care-seeking activities for tonsillectomy. The educational level and socioeconomic status of the parents were the key factors associated with these positive behaviors. These results indicate that conducting educational programs on tonsillectomy can be beneficial.

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The growing epidemic of Social and cultural Iatrogenesis in Pakistan

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Muhammad Farooq et al. The growing epidemic of Social and cultural Iatrogenesis in Pakistan. World Family Medicine. 2021; 19(5): 51-59 DOI: 10.5742/MEWFM.2021.94049

Abstract

Objective: The focus of this research was to explore the incidence of iatrogenesis due to errors by physicians, adverse drug reactions (ADRs) and unhygienic conditions in the hospital environment.

Methodology: The main hypothesis for the present study was "higher the errors in diagnosis, prescription, and adverse reactions of drugs, higher will be the risk of Iatrogenesis". Survey research was conducted by developing a questionnaire. The data was collected from 300 hospitalized and outdoor patients from hospitals of District and Tehsil Head Quarters Hospitals of Bhakkar.

Results: The value of Cronbach's Alpha for 17 items of "Iatrogenesis" is .879 which ensures the strong reliability of the tool and consistency of responses; having N =300, with a mean = 55.34 and std. deviation = 12.354. The results show that respondents are well aware that their health is more at risk because of errors in Physician's diagnosis and prescription and iatrogenesis incidence is prevailing due to a high dosage of drug taken; adverse reactions of drugs and unhygienic conditions of hospital environment.

Conclusions: Health professionals are creating unrealistic demands for consumption of more and more medicine and medical treatment.

Key words: Iatrogenesis, Iatrogenic injury, Social iatrogenesis, Cultural Iatrogenesis, drugs

Introduction

"Cure the disease and kill the patient". Francis Bacon (1561-1626)

A few centuries ago, the healer was considered as god in many societies due to his role in curing a person from even those diseases which were considered incurable. But with the passage of time the professional ethics of medicalization has lost their importance and new medical values and ethics have emerged in industrialized and materialized societies where monetary profits and gains have more values for medical establishment rather than serving humanity in its real essence. With the development of medical technology, vaccination and the techniques of sterilization diseases including diphtheria, polio, syphilis; pneumonia and tuberculosis have vanished. The decrease in suffering and accredited better medical care have equated to changes in health status. These changes are variable and dependent on political and technological transformation, which is reflected in terms of what doctors do and say. As a result, "Iatrogenesis" is a new disease that has emerged in the twentieth century which is recognized as a growing epidemic all over the world. Iatrogenic is a Greek word which is the combination of two words, one is Iatro and second one is genen or genesis. The word 'Iatro' means "Physician or Doctor" and "Genen" or "genesis" means "as a result" or origin; so iatrogenic injuries are those injuries and ailments where doctors, physicians, consultants, drugs, hospitals, diagnostics and other medical institutions act as "sickening agents" or "pathogens" (Illich, 1975); the World Health Organization defined it as a harmful, unintentional, and undesired effect of any drug (WHO, 1972). Iatron, is a place where doctors of prehistoric times kept their surgical and medical instruments and apparatus, attended their patients, performed operations, handled their wounds and fractures (Silva, Pacheco. 1970). Iatrogenic disease can be named and treated differently by different authors. Lacaz (1970) termed it as a man-made pathological process, drug induced disease and therapy induced disease. Iatrogenic disease should be those diseases which are only caused by doctors when, in discussion with patient, during consoling and calming them down, far from clearing it up, they unwittingly cast doubts in their mind, arousing fears, neurotic ideas and distress (Pacheco Silva 1970); while others relate it with risk associated with medical intervention and the side effects of drugs which are also termed as adverse drug reactions (ADRs).

So it can be inferred that iatrogenic injury can be the result of complications in treatment, or physician error or drug effects, or problems within the health system. It not necessary that iatrogenic events are always the result of medical errors; they may and may not be. (Sharek and Classen, 2006; Klugelman et al, 2008). Man has been aware of the perils of the doctor patient relationship since Hippocrates time when he admonished his adherent, "Primum non nocere" (first, do no harm). Once Napoleon expressed to a physician "I don't want two diseases - one nature made, one doctor made".

Literature on medical and clinical errors is sparse and symbolizes only the tip of the iceberg (Leape, 1994). Since the beginning of health and healing, thousands of medical errors which are in form of diagnosis; drug prescription, the amount of dose taken; surgeries and clinical harm; the test advised, the accuracy of results of a laboratory test and their actual understanding, have mostly gone unreported and unrecognized. The medical culture of training and practice in which health professionals are groomed has taught them that mistakes and errors are unacceptable. Leape (1994) viewed mistakes as failure of their personality whereas an error connotes their negligence. Healthcare professionals conceal their medical errors due to the fear of penalties (Dekker and Laursen, 2007). Iatrogenic events and injuries contribute significantly and alarmingly to service receiver morbidity and mortality (Kohn et al, 2000). From the perspective of professionalism, it is expected from healthcare professionals and clinicians to do their maximum effort to avoid mistakes and errors and remain vigilant regarding threats of real or possible iatrogenesis (Tomas J. Silber, 2011), and followed by apology and disclosure when errors occur. Mostly, the clinicians feel an overwhelming remorse and regret after an iatrogenic event (Hilfiker, 1984).

Hospitals are the places which are considered a major source of acquiring infection due to the contaminated hospital environment. This contamination is not only in the form of food, air, instruments, fluids, and medications but also in the form of medical personnel who may be the carriers of infections.

Extent of iatrogenesis

A renowned paper, "Error in Medicine" by Lucian L. Leape depicted that one fifth of hospital patients (Schimmel Report, 1964) while more than one third of hospitalized patients (Steel Report, 1981) experienced iatrogenic injury. Harvard Medical Practice Study Report, (1991) mentioned that 180,000 Americans die every year due to iatrogenic injuries (Brennan TA, Leape LL, Laird N, et al. 1991; Leape LL, Brennan TA, Laird N, et al. 1991). Different research shows that less than one quarter (14-25%) of the hospitalized patients had iatrogenic injury, while one third (33 %) of patients acquired iatrogenic injury over age 65 (de la Sierra et al. 1989; Sampereiz Legarre et al. 1994; Madeira et al. 2007; Mohebbi et al., 2010); more harm is brought by the pharmaceutical industry to the patients than previously thought (Angell's, 2004); infection caused by healthcare system affects about 1.4 million patients at any given time; healthcare-associated infection affected 5%–10% of patients in developed countries, and nearly a quarter in developing countries (WHO, 2009); 5%–8% of deaths worldwide are due to ADRs (Rajesh V, 2013); many countries reported that Adverse Drug Reactions are the foremost reason of death (Shamna. M, 2014). In the USA, iatrogenic incidents and reactions of medical treatments are taking more lives than heart disease or cancer (Dale, 2015). Iatrogenic disease due to medical adverse reactions include drugs, surgery and medical accidents accounting for more than 13% of fatality rates.

Significance of the study:
This study will show that provision of healthcare is a complex system and errors associated with it can be minimized by minimizing the physician errors in diagnosis and prescription, through effective communication between healer and the patient, drugs taken and their side effects and through improving the hospital environment.

Objectives:
- To explore the incidence of iatrogenesis due to errors in diagnosis and prescription by physicians.
- To know the level of awareness that people have regarding the usage and adverse effects of medicines/ drugs and the medical care they take.
- To identify the presence of contamination in the hospital environment and its effects on risk to the human body.

Literature Review

Peer, Rafia Farooq and Shabir, Nadeem (2018) reviewed the nature, extent and distribution of healthcare hazards and established the facts that the determinants of disease are built within the health care environment so rational and well-thought-out changes in the health environment can positively impact the extent, nature and distribution of disease. Modern medicine benefitted the human by curing ailments but one should focus and address the side effects and risk associated with medication. Through literature, the researchers established the fact that nowadays modern medicine is a major threat to the human body and world health. Giardina, Claudia et al. (2018) have observed the adverse reactions of drugs in patients and commented that the patients who become victim of ADRs during hospitalization, stay longer in hospitals as compared to patients without ADRS. He concluded that ADRs are more common among females and those patients who take many medications.

Moutaouakkil, Y. et al, (2017) explained the severity of drug iatrogenesis which refers to any undesirable situation for the patients induced by use of one or more medicines which accounts for iatrogenic injuries. It is a serious health problem and should be addressed accordingly. There is a need of development of appropriate preventive strategies and their implementation for health professionals and for the patients. Bouvy J. C et al. (2015) have conducted an analysis of all epidemiological studies which were computing adverse reactions of drugs in the European region and were published between 2000-2014. This research includes three kinds of studies; firstly where patients were hospitalized due to adverse reaction of drugs; secondly, patients who became victim of adverse drugs reactions during hospitalization and thirdly, adverse drug reactions in outpatients. A review of 47 articles establishes the fact that adverse drug reactions that lead to hospitalization and those which arose during hospitalization are significant.
Maaskant JM et al (2015) describes that many hospitalized patients are affected by Medication Errors (MEs) which leads to harm, discomfort and even death. These Medication errors are more hazardous and harmful for children than adults. Tim K. Mackey (2015) explored the likely destruction or damage to the patient from the internet or related technologies which he termed as 'Digital Iatrogenesis" where patients have open access to online drugs that are injurious to health. Khaskheli M. et al (2014) have conducted research to observe the effects of iatrogenic factors and outcomes on acute maternal morbidity and mortality. The findings from this cross sectional study depict that out of 51 women admitted to ICU, 33 (64.70 %,) were because of adverse effects of medical treatments and 18 (35.29%) because of Surgical issues. Out of these 51, 37(72.54%) women recovered from iatrogenic complications while 14(27.45%) expired. The major iatrogenic factors that lead to complication were errors during pregnancy, child birth and postpartum period, quantity of anesthesia and negligence and errors during blood transfusions.

Research conducted by Martins M et al. (2011) to assess the association between adverse events and deaths in Brazil illustrates that adverse events are prevalent, and lead to serious harm and even death. Mendes et al (2009) have conducted research to assess the events caused by adverse drug reactions in Brazil and describe that adverse drug events were similar at the three hospitals under study. Fantino B et al (2006) explained that iatrogenesis could be eliminated by the cognizance of general practitioners (GPs). Hierarchical logistic models were used to study the relationship between GPs behavior and patients' risk of iatrogenesis. The researcher concluded that when there is a greater risk of iatrogenesis, GPs tended to be more cautious. The classic paper "The hazards of hospitalization" by E M Schimmel (2003) highlights the hospital-induced complications and risks associated with time duration during hospitalization. Daly MP et al (1994) in his research depicts that people over the age of 65 are the victim of polypharmacy (taking more than seven drugs) which is increasing the risk of iatrogenic disease. Research by Kable AK et al (2002) in Australia on admitted surgical patients showed that 48% of Adverse Events (AEs) were preventable out of a total 14,719 medical records reviewed.

Spread of hepatitis virus is associated with iatrogenic causes but still the health professionals are reluctant to use the term iatrogenic hepatitis. Arif, I et al (2017) state iatrogenic factors like hospital admission, surgery, intravenous infusions and injections, dental procedures, birth delivery and cesarean section can be a significant risk factor among nondrug users. Mohsen A et al. (2015) state hepatitis C virus (HCV) is more common where there are health care exposures to unsafe injections and have poor infection control practices. Dore GJ, (2012) state most common risk factors for Hepatitis C in developing countries are hospital admission, blood transfusion, complicated deliveries, injection therapy, surgeries, endoscopy, and dental treatment. Medhat A, et al (2002) and Lazarou J, et al. (1998) concluded that in US hospitals the occurrence of severe and incurable adverse drug reactions were very high and estimated that in 1994 severe and incurable ADRs were the top sixth leading cause of death.

Research hypothesis

The hypotheses for the present research are:
H 1: Higher the errors in diagnosis and prescription by physician, higher will be the risk of iatrogenesis
H 1: Higher the level of the dosage of drug taken, higher will be the risk of iatrogenesis
H 1: Higher the level of adverse reactions to drugs, higher will be the iatrogenesis
H 1: More the unhygienic hospital environment, more will be the risk of iatrogenesis

Research methodology

Survey research was conducted by developing a 17- item questionnaire. Likert scale was used having the response categories from strongly agree to strongly disagree. The data was collected from 300 hospitalized and outdoor patients from hospitals of District Bhakkar. Two hundred patients were taken from District Head Quarter (DHQ) hospital Bhakkar, 100 patients were taken from three Tehsil Head Quarter (THQ) Hospitals of Mankera, Darya Khan and Kalorkot of district Bhakkar.

Frequency Distribution of Respondent by Demography:

Table 1: Socio-demographic characteristics of respondents

Characteristics	Frequency	Percentage
Gender		
Male	142	47.3
Female	158	52.7
Age		
Up to 20	14	4.7
21-30	60	20.0
31-40	104	34.7
41-50	80	26.7
51-60	29	9.7
61 & above	13	4.3
DHQ Hospitals(hospitalized patients)	100	33.3
DHQ Hospitals(outdoor patients)	100	33.3
THQ Mankera (outdoor patients)	30	10.0
THQ Darya Khan (outdoor patients)	40	13.3
THQ Kalorkot (outdoor patients)	30	10.0
Monthly Income of the family		
10,000-30,000	121	40.3
30,001-50,000	100	33.3
50,001-70,000	28	9.3
70,001-90,000	18	6.0
90,001 plus	33	11.0

Interpretation:
Table 1 shows the frequency distribution of respondents according to gender, age, hospital and income. The data shows that 158 (53.7%) female respondents participated compared to 142 (47.3%) males. In terms of hospitals, 100, 100 patients i.e. 33.3% respondents belonged to DHQ Hospitals (hospitalized patients), DHQ Hospitals (outdoor patients) respectively. 34.7%, 26.7% and 20% of the respondents have ages of 31-40, 41-50 and 21-30 respectively. In terms of income, 40.3% respondents belong to income category of 10,000-30,000 while 33.3% belong to 30,000-50,000 income categories.

Table 2: Reliability of Research tools

	Cronbach's Alpha	N	Mean	Std. Deviation	No. of Items
Iatrogenesis (Total Instrument)	.879	300	55.34	12.354	17
Iatrogenesis by physician	.760	300	13.33	3.867	04
Iatrogenesis by drugs and adverse reaction of drugs	.762	300	19.47	5.074	06
Iatrogenesis by hospital environment	.847	300	22.54	6.214	07

Reliability of Research Instrument: The value of Cronbach's Alpha for 17 items of "Iatrogenesis" is 0.879 which ensures the strong reliability of the tool and consistency of responses; having N =300, with a mean = 55.34 and std. deviation = 12.354.

Table 3: Mean, Standard Deviation and Frequency Distribution of Respondents by Iatrogenic Injury due to Physician diagnosis, prescription, incomplete knowledge and incompetence

Physician	Iatrogenesis by Physician						
	SDA f (%)	DA f (%)	N f (%)	A f (%)	SA f (%)	Mean	St dev.
Errors in diagnosis	30 (10)	78 (26.0)	40 (13.3)	96(32.0)	56(18.7)	3.23	1.295
Errors in prescription	27 (9.0)	68(22.7)	46(15.3)	112(37.3)	47(15.7)	3.28	1.230
Unaware of side effects of therapy	25 (8.0)	54(18.0)	44(14.7)	105(35.0)	72(24.0)	3.48	1.263
Incompetency in managing therapy	35 (11.7)	48(16.0)	60(20.0)	97(32.3)	60(20.0)	3.33	1.283

Interpretation:
The above table shows the frequency distribution of respondents by Iatrogenic Injury due to Errors in Physician diagnosis, prescription, incomplete knowledge and incompetence. Out of 300, almost one third (33 percent) of the respondents "Agree" with the statement that they received an iatrogenic injury due to "Errors in Physician diagnosis, prescription, incomplete knowledge and incompetence" while about 17 % (47), 19 % (56) and 20 % (60) of the respondents "Strongly Agree" with the statement that they received an iatrogenic injury due to "errors in prescription of drugs", "errors in Physician diagnosis" and "physician incompetence" respectively.

Table 4: Mean, Standard Deviation and Frequency Distribution of Respondents by Iatrogenic Injury due to Drug Related Issues

Drugs	Iatrogenesis due to Drugs						
	SDA f (%)	DA f (%)	N f (%)	A f (%)	SA f (%)	Mean	St dev.
quantity of drug taken	31 (10.3)	71 (23.7)	53 (17.7)	99 (33.0)	46 (15.3)	3.19	1.249
allergic reaction to drugs	24 (8.0)	46 (15.3)	54 (18.0)	125 (41.7)	51 (17.0)	3.44	1.174
prolonged usage of any drug	27 (9.0)	75 (25.0)	49 (16.3)	99 (33.0)	50 (16.7)	3.23	1.248
drug-drug interaction	35 (11.7)	78 (26.0)	69 (23.0)	74 (24.7)	44 (14.7)	3.05	1.2250
adverse reactions of drugs	38 (12.7)	60 (20.0)	52 (17.3)	105 (35.0)	45 (15.0)	3.20	1..274
lack of awareness regarding usage of drug	28 (9.3)	66 (22.0)	49 (16.3)	85 (28.3)	72 (24.0)	3.36	1.310

Interpretation:
The above table explains the frequency distribution of respondents by Iatrogenic Injury due to Drug related issues. Out 0f 300, almost one third (33 percent) of the respondents "Agree" with the statement that they received an iatrogenic injury due to "quantity of the dose of drug taken , prolonged usage of drug, side effects of the drugs even having the knowledge of side effects ". More than 42 % (125) of the respondents "Agree" with the statement that they received an iatrogenic injury due to "allergic reaction" of the drugs.

Table 5: Frequency Distribution of Respondents by Iatrogenic Injury due to Hospital Environment

Drugs	Iatrogenesis by Hospital environment						
	SDA f (%)	DA f (%)	N f (%)	A f (%)	SA f (%)	Mean	St dev.
unhygienic conditions	21(7.0)	62 (20.7)	53(17.7)	92 (30.7)	72 (24.0)	3.44	1.251
carriers	26 (8.7)	62(20.7)	60 (20.0)	115 (38.3)	37 (12.3)	3.25	1.171
surgical instruments used	25 (8.3)	76 (25.3)	60 (20.0)	89 (29.7)	50 (16.7)	3.21	1.229
infected food	43 (14.3)	72 (24.0)	54 (18.0)	88 (29.3)	43 (14.3)	3.05	1.297
solid waste	31 (10.3)	76 (25.3)	59(19.7)	82 (27..3)	52 (17.3)	3.16	1.270
handling of wounds/fractures	25 (8.3)	79 (26.3)	63(21.0)	98 (32.7)	35 (11.7)	3.13	1.174
complication in health system	20 (6.7)	69 (23.0)	67 (22.3)	89 (29.7)	55 (18.3)	3.30	1.201

Interpretation:
The above table shows the frequency distribution of respondents by "Iatrogenesis by Hospital environment" and depicts that 54% respondents "Strongly Agree" and "Agree" (72, 92) that they received an injury due to unhygienic conditions in hospitals, 51 % "Strongly Agree" and "Agree" that iatrogenic injury was caused due to carriers in hospital environment while about 47% of respondents strongly agree and agree that they received an iatrogenic injury due to surgical instruments.

Table 6: One-Sample t-Test

	Test Value = 16					
Iatrogenesis by Physician	T	df	Sig. (2-tailed)	N	Mean	Std. Deviation
	-12.010	299	.000	300	13.3100	3.87953
	Test Value = 24					
Iatrogenesis by Drugs	T	df	Sig. (2-tailed)	N	Mean	Std. Deviation
	-15.46	299	.000	300	19.4700	5.07427
	Test Value = 28					
Iatrogenesis by Hospital environment	T	df	Sig. (2-tailed)	N	Mean	Std. Deviation
	-15.21	299	.000	300	22.5433	6.21371

Interpretation:
One sample test was run on Iatrogenesis by Physician, Iatrogenesis by Drugs and Iatrogenesis by Hospital environment to explore the mean of Iatrogenesis by Physician, Iatrogenesis by Drugs and Iatrogenesis by Hospital environment scores. The results show that the mean is significantly lower than test value at all levels, having df = 299, p <.001.

Ho= Male and Female have different opinion regarding iatrogenesis by physician
Ha= Male and Female have same opinion regarding iatrogenesis by physician
Ho= Male and Female have different opinion regarding iatrogenesis by drugs
Ha= Male and Female have same opinion regarding iatrogenesis by drugs
Ho= Male and Female have different opinion regarding iatrogenesis by hospital environment
Ha= Male and Female have same opinion regarding iatrogenesis by hospital environment

Table 7: Independent Samples Test by Gender

	Gender	N	Mean	Std. Deviation	t	Df	Sig. (2-tailed)
Iatrogenesisby physician	Male	142	13.1056	3.93332	-.865	298	.388
	Female	158	13.4937	3.83372			
Iatrogenesisby drugs	Male	142	19.0704	5.13871	-1.294	298	.197
	Female	158	19.8291	5.00470			
Iatrogenesisby hospital	Male	142	22.7254	6.04257	.480	298	.631
	Female	158	22.3797	6.37831			

Interpretation:
Independent Sample test was run on "Iatrogenesis by Physician", "Iatrogenesis by adverse reactions of Drugs", "Iatrogenesis by Hospital environment" by gender to explore the significance and the mean difference. The value indicates that there is no difference between opinion of males and females regarding the above three mentioned themes. So all Ho are rejected hence Ha is accepted.

Table 8: ONE-WAY ANOVA by Hospitals

		Sum of Squares	df	Mean Square	F	Sig.
Iatrogenesisthrough physician	Between Groups	56.637	4	14.159	.940	.441
	Within Groups	4443.533	295	15.063		
	Total	4500.170	299			
Iatrogenesisthrough drugs	Between Groups	292.242	4	73.060	2.910	.022
	Within Groups	7406.488	295	25.107		
	Total	7698.730	299			
Iatrogenesisthrough hospital contamination	Between Groups	519.942	4	129.985	3.478	.009
	Within Groups	11024.495	295	37.371		
	Total	11544.437	299			

Discussion and Conclusion

The debate on "Moving from Information transfer to Information exchange" in health and healing is further elaborated by this study on iatrogenesis. Many of the adverse events today are the result of errors in doctors' diagnosis, prescriptions, incompetence, and the way one handles and manages patients and wounds. Further, ignorance of the patient by the healthcare system, prolonged used of medicine and its side effects, and allergic reactions to drugs complicated the situation and the risk associated to life of a person is added many times. The unhygienic environment of the Pakistani hospitals, stains on the walls, availability of infected foods in hospital premises, the conditions of the laboratories and blood sample collection centers are all questionable. Iatrogenic injuries and deaths associated with them are growing day by day and no mechanism exists which tells us about the exact figures of deaths and injuries. This study opens a debate on the rights of the patients to inform about their treatment and the risk associated with their life due to specific treatments, surgeries and side effects of medicines. Patients have no control in decision making during healing and this practice should be reversed so that iatrogenic injuries should be minimized. Many of the iatrogenic injuries and deaths can be overcome through minimizing the language barriers. Health professionals have to talk with patients in lay man language.

A National database should be developed that stores all the information regarding incidents reported in each health facility and the steps taken to deal with those issues satisfactorily. A database should be designed in such a way that cross comparison of incidents should be possible to be reported in any health facility with their diagnosis, medical prescription, lab-test suggested and the adverse reactions associated with this process. Iatrogenic Injury Surveillance Unit should be developed to monitor and to address all iatrogenic injuries and to produce high quality research that addresses the causes and provides steps to tackle this menace of iatrogenic injury. A system should be developed for provision of indemnity, legal aid and compensation to those who suffer because of health system failure or medical failure. Pharmacists have to play their role as co-drivers along with health professionals

and consultants in avoiding and preventing potential threats to health caused by polypharmacy and inappropriate drug use and their side effects. Many times patients take those medicines which may react with one another and cause iatrogenic illness.

The incidents of iatrogenesis should be considered important by ethical as well as by legal means. Health care professionals mostly don't take into account or document events or release details of an iatrogenic injury. All cases of iatrogenesis should be identified, addressed, documented and disclosure publically so that similar errors and mistakes should be overcome in the light of past experiences. It must be mandatory to inform the patients and their families about such unfortunate events and their aftermath. It helps not only the young health professionals and medical community as a whole in error free treatment but also the patients by minimizing their suffering. The government has to review preventive strategies, facilitate the environment of medical training because insufficient training may be the cause of iatrogenic injury, and develop and implement an effective healthcare system because many iatrogenic injuries occur as a result of system failures. An online database should be developed where every event and incident is reported and analyzed that gives rise to adverse medical reactions or pose a threat to a patient's life, for ensuring the reduction and elimination of risk and as a result strategies are developed and modified to reduce the incidence and severity of iatrogenic injuries. A system of transparency and accountability should also be initiated against those whose negligence leads to iatrogenic injuries and even death. A system is required where every part of the medical establishment is responsible and accountable for diagnosis, therapeutic treatment and administrative decisions.

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Glycaemic Control and Dyslipidemia among patients with type 1 diabetes mellitus in diabetes center Al-Baha region, Saudi Arabia

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Riyadh Abdullah Alghamdi et al. Glycaemic Control and Dyslipidemia among patients with type 1 diabetes mellitus in diabetes center Al-Baha region, Saudi Arabia. World Family Medicine. 2021; 19(5): 60-67
DOI: 10.5742/MEWFM.2021.94050

Abstract

Background: Dyslipidemia is very common in patients with type 1 diabetes mellitus. Dyslipidemia is a substantial risk factor for having cardiovascular disease (CVD) and is associated with higher percentages of morbidity and mortality in patients with type 1 DM. Several studies have shown that poor glycaemic control (PGC) and high level of glycated haemoglobin A1c (HbA1c) in patients with T1DM are associated with lipid peroxidation and oxidative stress, both of which contribute to atherosclerosis.
Aim: To assess Glycaemic Control and Dyslipidemia in type 1 diabetic patients in diabetic center Al-Baha region, Saudi Arabia.

Methodology: A record based descriptive cross sectional study was conducted at diabetes center in Al-Baha region, located in the southern area of Saudi Arabia. The study was conducted by reviewing medical files of type 1 diabetic children during the period from 15th of December 2020 to 1st of March 2021. Recently diagnosed type 1 diabetic cases (< 3 months), and those with missing data were excluded. Files fulfilling the inclusion criteria were included using systematic random sampling technique by selecting each 3rd file. The data extracted included child personal data including age and gender, child duration of diabetes, diabetes control by measuring HbA1c, and laboratory investigations including lipid profile.

Results: The study included 225 children with type 1 DM. Children's ages ranged from 1 to 21 years with mean age of 10.4 ± 3.5 years old. Exact of 120 (53.3%) diabetic children were males. The majority of the diabetic children had the disease for 1-4 years (63.6%; 143). Exactly 132 (58.7%) children had hypercholesterolemia with average cholesterol level of .5 ± 0.95 mmol/ L. As for LDL level, it was abnormal among 9 (4%) diabetic children with average level of 2.74 ± 0.91 mmol/L. Exactly 12 (5.3%) children had abnormal TG level with average level of 1.55 ± 0.51 mmol/L. HDL was below normal among 17 (7.6%) children with average level of 1.46 ± 0.40 mmol/L. Exactly 69.2% of diabetic children aged 10 years or more had dyslipidemia compared to 50.6% of those who were below the age of 20 years with recorded statistical significance (P=.006).

Conclusions: In conclusion, the current study revealed that dyslipidemia is a common finding among diabetic cases including type 1 diabetes mellitus. Also, there is a significant association between glycaemic control and having abnormal lipid profile especially for cholesterol and HDL.

Key words: Dyslipidemia, type 1 DM, lipid profile, glycaemic control, IDDM, relations

Background

Type-1diabetes (T1D), previously known as Juvenile Diabetes is an autoimmune disease with genetic background in its pathology, featured by damage of pancreatic β-cells, causing absolute insulin deficiency [1, 2]. Insulin is a hormone required for the body to use blood sugar. Before treatment this results in high blood sugar levels in the body [3, 4]. Worldwide, nearly 425 million adults (20–79 years) had diabetes in 2017, with about 5% to 10% diagnosed with T1D [5]. The major causes of morbidity and mortality in patients with T1D are attributed to diabetes complications. Intensive insulin therapy showed a significant role in preventing progression of diabetes-related complications, thus resulting in good glycaemic control [6].

Among the leading causes of death in patients with diabetes, are atherosclerotic complications [7]. Therefore, it is crucial to detect risk factors, including lipid profile, which explains their cardiovascular risk. The lipid profile of patients with type 1 diabetes mellitus is mainly affected by their glycemic control. Cases with poorly controlled type 1 diabetes had high levels of total triglyceride and total cholesterol with varying levels of high-density lipoprotein cholesterol (HDL-C) [8-10].

Glycemic control, as expressed by mean blood glucose concentrations and percentage of glycated haemoglobin, is significantly amended with the introduction of insulin infusion pumps compared with the non-optimized insulin injection therapy that was dominant in management of diabetes until a relatively few years ago [11, 12]. However, unlike type 2 diabetes, epidemiological data on the prevalence of dyslipidemia and phenotype distribution in type 1 diabetes mellitus are scarce and are mostly based on total triglyceride and total cholesterol concentrations alone [13]. However, glycemic control is a vital modifiable risk factor that affects the progressive rate of diabetic complications. Though, hypoglycemia is a serious worry for diabetic patients, and fear of hypoglycemia can negatively affect the acceptance of insulin therapy and the capability to lower HbA1c levels effectively through intensive treatment [14].

Also, the lipid profile of patients with type 1 diabetes mellitus depends mainly on glycemic control. Patients with poorly controlled T1D reported high levels of total triglyceride and total cholesterol and variable concentrations of high-density lipoprotein cholesterol [15-18]. The current study aimed to assess prevalence and determinants of dyslipidemia, glycaemic control and dyslipidemia in type 1 diabetic patients in a diabetic center Al-Baha region, Saudi Arabia.

Methodology

A record based descriptive cross sectional study was conducted at diabetes center in Al-Baha region, located in the southern area of Saudi Arabia. It has an area of 9,921 km², and a population of 476,172 (2017). Its capital is Al-Baha [19]. The study was conducted by reviewing medical files of type 1 diabetic children during the period from 15th of December 2020 to 1st of March 2021. Type 1 diabetic patients, including those who are using insulin pump, who had regular follow-up at diabetic center, and their l file had complete data.were included. Recently diagnosed type 1 diabetic cases (< 3 months), and those with missing data were excluded. Files fulfilling the inclusion criteria were included using systematic random sampling technique by selecting each 3rd file and were then reviewed for data extraction using pre-structured data extraction sheet to avoid error and minimize interrater bias. The data extracted included child personal data including age and gender, child's duration of diabetes, diabetes control by measuring HbA1c, and laboratory investigations including lipid profile.

Dyslipidemia

According to American Diabetes Association (ADA), [20] dyslipidemia was defined as having hypercholesterolemia and hypertriglyceridemia (LDL-C >4.13 mmol/L [>160 mg/dL] and triglyceride >2.25 mmol/L [>200 mg/dL], respectively), Low HDL-C concentrations were less than 0.9 mmol/L (<35 mg/dL) for men and less than 1.1 mmol/L (<45 mg/dL) for women and dyslipidemia was considered present if one or more of these lipid or lipoprotein levels are abnormal [21, 22].

Data Analysis

After data were collected, it was modified, coded and entered 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 considered to be statistically significant. Descriptive analysis based on frequency and percentage distribution was done for all variables including demographic data, diabetes data, and laboratory findings. Cross tabulation was used to test for the distribution of dyslipidemia by children's bio-demographic data. Pearson chi-square test was used to test for relations significance. Exact tests were used to assess significant association between dyslipidemia and diabetic children lipid profile.

Results

The study included 225 children with type 1 DM. Children's ages ranged from 1 to 21 years with mean age of 10.4 ± 3.5 years old. Exactly 120 (53.3%) diabetic children were males. The majority of the diabetic children had the disease for 1-4 years (63.6%; 143) and 31 (13.8%) had the disease for less than 1 year. As for diabetic control, it was poorly controlled among 148 (65.8%) of the children while 9 children (4%) had good diabetic control (Table1).

Table 1: Personal data of type 1 diabetic children, Al-Baha, Saudi Arabia

Personal data	No	%
Age in years		
< 10 years	79	35.1%
> 10 years	146	64.9%
Gender		
Male	120	53.3%
Female	105	46.7%
DM duration in years		
< 1 year	31	13.8%
1-4	143	63.6%
5-9	51	22.7%
Diabetic control (HA1c)		
Good	9	4.0%
Fair	68	30.2%
Poor	148	65.8%

Table 2 shows lipid profile among type 1 Diabetic children. Exactly 132 (58.7%) children had hypercholesterolemia with average cholesterol level of .5 ± 0.95 mmol/ L. As for LDL level, it was abnormal among 9 (4%) diabetic children with average level of 2.74 ± 0.91 mmol/L. Exactly 12 (5.3%) children had abnormal TG level with average level of 1.55 ± 0.51 mmol/L. HDL was below normal among 17 (7.6%) children with average level of 1.46 ± 0.40 mmol/L. Totally, dyslipidemia was detected among 141 (62.7%) of the included diabetic children with type 1 DM (Figure 1).

Table 2: Lipid profile among type 1 Diabetic children, Al-Baha, Saudi Arabia

Lipid profile	*No*	*%*	*Mean ± SD*
Hypercholesterolemia			
Normal	*93*	*41.3%*	4.5 ±0.95 mmol/ L
Abnormal	*132*	*58.7%*	
HDL			
Normal	*208*	*92.4%*	1.46 ±0.40 mmol/L
Abnormal	*17*	*7.6%*	
LDL level			
Normal	*216*	*96.0%*	2.74 ±0.91 mmol/L
Abnormal	*9*	*4.0%*	
Hypertriglyceridemia			
Normal	*213*	*94.7%*	1.55 ±0.51 mmol/L
Abnormal	*12*	*5.3%*	

Figure 1: Prevalence of dyslipidemia among children with type 1 DM, Al-Baha, Saudi Arabia

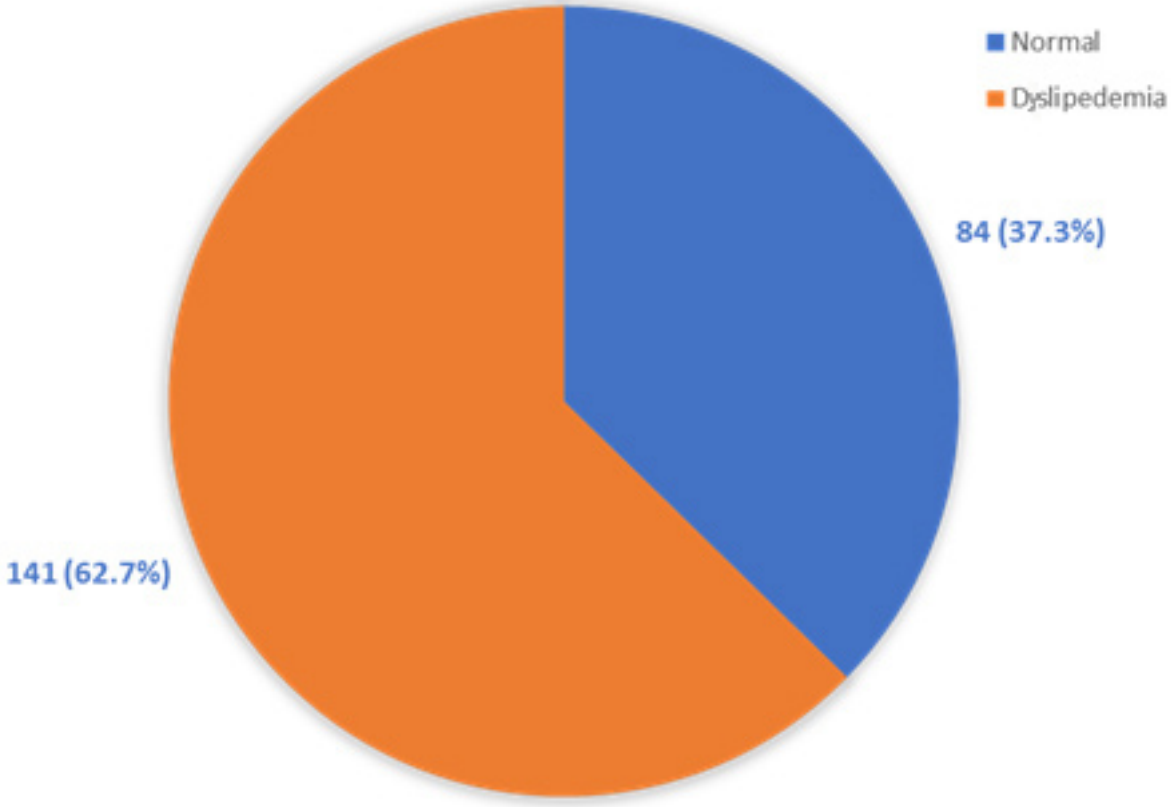

Table 3. Distribution of dyslipidemia among children with type 1 DM, Al-Baha, Saudi Arabia

Personal data	Dyslipidemia				P-value
	Normal		Dyslipidemia		
	No	%	No	%	
Age in years					
< 10 years	39	49.4%	40	50.6%	.006*
> 10 years	45	30.8%	101	69.2%	
Gender					
Male	44	36.7%	76	63.3%	.825
Female	40	38.1%	65	61.9%	
DM duration in years					
< 1 year	12	38.7%	19	61.3%	.134
1-4	59	41.3%	84	58.7%	
5-9	13	25.5%	38	74.5%	
Diabetic control					
Good	6	66.7%	3	33.3%	.048*
Fair	29	42.6%	39	57.4%	
Poor	49	33.1%	99	66.9%	

P: Pearson X2 test
* P < 0.05 (significant)

Table 3 illustrates distribution of dyslipidemia among children with type 1 DM. Exactly 69.2% of diabetic children aged 10 years or more had dyslipidemia compared to 50.6% of those who were below the age of 20 years with recorded statistical significance (P=.006). Also, 66.9% of children with poor diabetic control had dyslipidemia in comparison to 33.3% of those with good diabetes control (P=.048). Diabetic child gender and duration of diabetes were insignificantly associated with dyslipidaemia.

Table 4. Distribution of lipid profile according to dyslipidemia among type 1 diabetic children

Lipid profile	Dyslipidemia				P-value
	Normal		Dyslipidemia		
	No	%	No	%	
Hypercholesterolemia					
Normal	84	100.0%	9	6.4%	.001*
Abnormal	0	0.0%	132	93.6%	
HDL					
Normal	84	100.0%	124	87.9%	.001*
Abnormal	0	0.0%	17	12.1%	
LDL level					
Normal	84	100.0%	132	93.6%	.018*
Abnormal	0	0.0%	9	6.4%	
Hypertriglyceridemia					
Normal	84	100.0%	129	91.5%	.006*
Abnormal	0	0.0%	12	8.5%	

P: Exact probability test
* P < 0.05 (significant)

Regarding distribution of lipid profile according to dyslipidemia among type 1 diabetic children (Table 4), it was noticed that 93.6% of children with dyslipidemia had abnormal cholesterol level, 12.1% had abnormal HDL level, 6.4% had abnormal LDL level, and 8.5% had abnormal TG level, all with recorded statistical significance (P< 0.05).

Table 5. Distribution of lipid profile according to glycaemic control among type 1 diabetic children

Lipid profile	Diabetic control				OR (95% CI)
	Poor		Fair/ good		
	No	%	No	%	
Hypercholesterolemia					
Normal	57	38.5%	36	46.8%	1.4 (1.0-2.4) *
Abnormal	91	61.5%	41	53.2%	
HDL					
Normal	134	90.5%	74	96.1%	2.6 (0.9-9.3) *
Abnormal	14	9.5%	3	3.9%	
LDL level					
Normal	144	97.3%	72	93.5%	0.4 (0.10-1.5)
Abnormal	4	2.7%	5	6.5%	
Hypertriglyceridemia					
Normal	138	93.2%	75	97.4%	2.7 (0.58-12.7)
Abnormal	10	6.8%	2	2.6%	

* P < 0.05 (significant)

Table 5 shows distribution of lipid profile according to glycaemic control among type 1 diabetic children. Children with poor diabetic control recorded 1.5 times more likelihood for hypercholesterolemia compared to those with good control (OR: 1.4; 95% CI: 1.0-2.4). Also, those with poor glycaemic control had 2.6 times more likelihood for abnormal HDL level compared to others with good control (OR: 2.6; 95% CI: 0.9-9.3). No significant relation between glycaemic control and LDL or TG level was reported.

Discussion

The current study aimed to assess dyslipidemia and its relationship with glycaemic control among type 1 diabetic children. Children with type 1 diabetes are susceptible for many other systemic disorders due to lipid profile changes including cardiovascular disease (CVD) [23-25]. The American Heart Association classifies type 1 diabetic children in the highest level for cardiovascular risk and proposes lifestyle modification besides pharmacological therapy for those with high cholesterol levels [26, 27]. Also, Global IDF/ISPAD Guideline, 2014 advocated checking for fasting blood lipids for diabetes in Childhood and Adolescents for diabetes duration exceeding 10 years. In cases of positive family history of hypercholesterolaemia, CVD, screening should start at age 2 years. If results are normal, screening should be repeated every 5 years [28]. In the current study, two thirds of the children (62.7%) had dyslipidemia where cholesterol was the highest reported lipid profile as more than half of the diabetic children had high cholesterol level (above normal). Other lipid profiles were not high among a significant portion of the children mainly LDL and triglycerides which were high among 4% and 5.3%, respectively. Dyslipidemia was significantly higher among diabetic children aged more than 10 years. The surprising finding was that it was not significantly associated with diabetes duration, but it was insignificantly higher among children who had type 1 diabetes for 5-9 years than those who were recently diagnosed (less than one year). Dyslipidemia was also significantly associated with all lipid profiles especially cholesterol level and HDL. These findings were consistent with Mona HM et al, [29] results who reported that 65% of type 1 diabetic children had dyslipidemia compared to 28% of non-diabetic control group. Also, the current study agreed with Rahma et al, [30] who found that 66% of the children with type 1 diabetes were dyslipidemic compared to 34% of the control group. Also, the current study findings were similar to others conducted by Wiltshire et al, [31] and Patiakas et al [32].

Regarding relation between dyslipidemia and diabetic control, the current study revealed that more than two thirds of the diabetic children with poor diabetic control were dyslipidemic compared to nearly half of those with fair control and only one third of those with good diabetic control. Also, the study revealed that poor diabetic control was associated with significantly more than doubled risk to have abnormal level of HDL and 40% more risk for having hypercholesterolemia. No significant relation between poor glycaemic control and LDL and TG level were detected in the current study. This may be somewhat confusing as in poorly controlled type 1 diabetes and even ketoacidosis, cases mostly have hypertriglyceridemia and reduced HDL [33]. Among type 1 diabetic patients, even with good glycaemic control, qualitative and functional abnormalities of lipoproteins are reported that are possibly atherogenic. These lipid profile abnormalities are risk factors for developing CV diseases. Though the mechanisms underlying type 1 diabetes associated dyslipidemia stay vague, the subcutaneous route of insulin administration, that is responsible for peripheral hyperinsulinemia, is likely to be an important factor [34, 35]. Mostofizadeh N et al, [36] found that hypercholesterolemia was the most reported dyslipidemia in 29.1% of diabetic children with optimal glycaemic control (OGC) compared to 39.1% of others with poor glycaemic control (PGC). Abnormal level of low-density lipoprotein was significantly higher in cases with PGC than those with OCG. Also, the magnitude of hypercholesterolemia, hypertriglyceridemia, and low levels of high-density lipoprotein were higher in the PGC group but did not reach the significant threshold. There are many literature studies which assured the significant association between glycaemic control (level of HbA1c) and abnormal lipid profile among diabetic patients, but the main uncertainty was for the thresholds of HbA1c beyond which lipid levels begin to change [37-40].

Optimal glycaemic control is significantly associated with improved lipid profile and associated co-morbidities with better survival in patients with type 1 diabetes, leading to advanced changes in the causes of mortality, especially cardiovascular disease [41, 42].

Conclusions and recommendations

In conclusion, the current study revealed that dyslipidemia is a common finding among diabetic cases including type 1 diabetes mellitus. Also, there is a significant association between glycaemic control and having abnormal lipid profile especially for cholesterol and HDL. Dyslipidemia was higher among children aged 10 years but not related to diabetes duration. Periodic screening for lipid profile among diabetic children is vital to help in early assessment of any abnormality and applying the appropriate intervention including health education for lifestyle and dietary habits which improves glycaemic control. Large scale studies are recommended to better understand the mechanism and pathogenesis of dyslipidemia and to assess the efficacy of good glycaemic control on improving rates of lipid abnormalities.

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Knowledge, Attitude and Practice of Primary Care Physicians Regarding Colon Cancer in Abha City, Saudi Arabia

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Saleh Ahmed Alshaikhi et al. Knowledge, Attitude and Practice of Primary Care Physicians Regarding Colon Cancer in Abha City, Saudi Arabia. World Family Medicine. 2021; 19(5): 68-80 DOI:10.5742/MEWFM.2021.94052

Abstract

Aim of Study: To assess primary care physicians' knowledge and practices regarding screening for colorectal cancer (CC) in Abha City.

Methodology: Following a cross-sectional design, this study was conducted at primary health care (PHC) centers in Abha City. It included 104 PHC physicians. The data collection sheet included sociodemographic data of participants and a modified form of the National Survey of Primary Care Physicians' Cancer Screening Recommendations and Practices, Colorectal and Lung Cancer Screening Questionnaire.

Results: Fecal occult blood test (FOBT) was the CC screening test most commonly recommended (76%). Cost of screening test is the most influential regarding PHC physicians' recommendations for CC screening (100%). Two-thirds of participants had poor knowledge grade regarding CC screening. The most frequently discussed CC screening test is fecal occult blood test (48.1%). The most frequently recommended test was colonoscopy alone (21.2%) or with FOBT (17.3%). The most frequently practiced item related to CC screening was provision of more than one test option for CC screening (69.2%). Most PHC physicians (81%) had poor practice grade regarding CC screening. Their knowledge grades regarding CC screening were significantly better among female physicians ($p<0.001$), and those with more experience in PHC ($p=0.009$). Practice grades were significantly better among males ($p<0.001$), those with more experience in PHC ($p=0.018$), and those who attended continuing medical education (CME) on cancer screening ($p=0.008$).

Conclusions: About two-thirds of them have poor knowledge grade regarding colorectal screening. FOBT is the CC screening test most commonly discussed and recommended by PHC physicians. Cost of screening test is the most influential regarding PHC physicians' recommendations for colorectal cancer screening. Practice grades are significantly better among those with more experience in PHC and among those who attended CME on cancer screening.

Recommendations: Provision of CME sessions to PHC physicians, with special emphasis on methods of screening for early detection of CC. The establishment of fully electronic medical records system at PHC centers. Fully subsidizing and financially supporting screening for CC.

Key words: Colon cancer; Primary care physicians, Knowledge, attitude, practice.

Introduction

Colorectal cancer is a term used to refer to malignant cells that develop in the tissues of the colon or the rectum (1). It is the third most common malignancy in the world and the second leading cause of cancer-related death in the United States (2). The highest colorectal cancer rates are observed in North America, Oceania, and Europe where colorectal cancer risk factors (obesity, diabetes, poor diet, physical inactivity, and smoking) are associated with Western culture (3).

Most colon cancers are adenocarcinomas that begin in cells which release mucus and other fluids. Symptoms of colorectal cancer depend on the lesion's location, type, extent and complications, and may include: fatigue and weakness, a change in bowel habit (altering constipation and increased stool frequency), stool streaked or mixed with blood and discomfort or pain in the lower abdomen (1).

Al-Ahwal et al. (4) noted that, despite its relatively low incidence, colorectal cancer is the second most common cancer in Saudi Arabia, ranking first among men (10.6%) and third among women (8.9%).

The Saudi Cancer Registry (5) reported that in 2013, there were 1,387 cases of colorectal cancer, accounting for 11.9% of all newly diagnosed cases, with a male to female ratio of 113:100. The five regions with the highest age-standardized incidence rate for males were in Eastern region at 17.6/100,000, Riyadh at 17.1/100,000, Aseer at 11.4/100,000, Tabuk at 10.5/100,000, and Madinah at 10.3/100,000. In females, the highest age-standardized incidence rates were in Riyadh region at 15.3/100,000, Eastern region at 13.1/100,000 then Makkah at 9.3/100,000, Aseer at 9.0/100,000 and Madinah at 8.9/100,000. The median age at diagnosis was 60 years among males (range between 13 and 98 years) and 56 years among females (range between 12 and 109 years).

Death rate from colorectal cancer in Saudi Arabia is 8.3%. An increase in colorectal cancer incidence occurred between 2001 and 2006, and almost doubled between 1994 and 2003 (6). Moreover, compared with Western countries, Saudi patients are more likely to present at a more advanced stage (7) and at a younger age (8).

Despite the great advances in medical diagnostics, cancer is often detected at advanced and late stages. The main reason for that is the limited understanding of the early symptoms that cancer patients present with in primary care (9-10).

There is growing evidence that screening or early detection of asymptomatic cancer results in a better prognosis for the patient. Not only does this mean a higher chance of being cured, but also less need for toxic treatments, fewer side effects, better quality of life and health–economic-related benefits (11-13).

More than two-thirds of all cancers are diagnosed in primary care (14-15). A general practitioner usually diagnoses the most common cancers (16). Patterns of increasing consultations before cancer diagnosis have been reported from primary care (17).

The professional challenge of general practitioners is to identify the relatively few cancer patients from among the many patients with symptoms that are mostly the same for benign diseases as well as for cancer. Cancer symptoms can present as alarm symptoms, such as a tumor or bleeding (18). Cancer can also present with unspecific symptoms, and it is the general practitioner's task to determine if cancer is an underlying cause (19).

Despite its relatively low incidence, colorectal cancer is the second most common cancer in Saudi Arabia (4), with Aseer Region as one of the highest in the Kingdom of Saudi Arabia with the highest age-standardized incidence rate (5).

Due to the insufficient knowledge of primary care physicians about early symptoms and other clinical signs of cancer colon, it is frequently detected at advanced and late stages (20).

Aim of Study

To assess primary care physicians' knowledge and practices regarding screening for colorectal cancer in Abha City in 2019.

Subjects and Methods

This study followed a cross-sectional research design at primary health care centers in Abha City. The target population for this study included all primary health care physicians at primary care centers in Abha City. The researcher planned to include all primary care physicians in this study (N=108 PHC physicians) (21).

In addition to sociodemographic data of primary health care physicians, data were collected using a modified form of the structured questionnaire of the National Survey of Primary Care Physicians' Cancer Screening Recommendations and Practices, Colorectal and Lung Cancer Screening Questionnaire (22).

The researchers met all primary care physicians at their primary care centers, using the study questionnaire (N=108). A total of 104 PHC physicians responded, with a response rate of 96.3%.

The personal consent of all potential participants was requested prior to pretesting. All participants were clearly informed that their participation in this study was completely optional. The wish of any primary health care physician not to participate was fully respected. Collected data were kept strictly confidential and used only for research purposes. All the necessary official permissions were fully secured before data collection. This study was completely self-funded by the researchers.

The Statistical Package for Social Sciences (SPSS ver 22.0) was used for data entry and analysis. Descriptive statistics were calculated and the appropriate tests of significance (e.g., X^2) were applied accordingly. A statistically significant difference was considered if p-values were less than 0.05.

Results

Table (1) shows that almost half of participants (49%) were aged 30-35 years, while 27.9% were <30 years old, and 23.1% were >35 years old. About two thirds of participants were males (65.4%). Most participants (62.5%) were MBBS qualified, while 16.3% had Master Degree and 21.2% were MD/Fellowship qualified. Most participants (67.3%) had <5 years' experience in primary care. Only 13 participants (12.5%) attended continuing medical education on cancer screening. About two thirds of primary care centers of participants (65.4%) had 6-16 physicians, while 23.1% had <6 physicians and 11.5% had >15 physicians. Most primary care centers of participants (87.5%) had at least two nurse practitioners, while 3.8% had one nurse practitioner and 8.7% had no nurse practitioners. The medical record system of most primary care centers (88.5%) were paper charts, while 11.5% were partial electronic medical records.

Table (2) shows that the fecal occult blood test (FOBT) is the colorectal cancer screening test most commonly recommended by primary care physicians (76%), followed by colonoscopy (75%) and flexible sigmoidoscopy (69.2%). On the other hand, the least recommended screening tests were double contrast barium enema (7.7%), virtual colonoscopy (6.7%) and fecal DNA testing (2.9%).

Table (3) shows that most participant primary care physicians were knowledgeable regarding the starting age for colorectal cancer screening by FOBT, flexible sigmoidoscopy and colonoscopy (92.3%, 93.3% and 92.3%, respectively). However, they were less knowledgeable regarding frequency of testing and age after which testing is not recommended. On the other hand, primary care physicians were least knowledgeable regarding colorectal cancer screening using double contrast barium enema, virtual colonoscopy and fecal DNA testing.

Table (4) shows that almost all participant primary care physicians were knowledgeable regarding colorectal cancer screening of 50-year olds or 65-year olds. However, they had lower knowledge regarding colorectal cancer screening of those 80-years old.

Table (5) shows that the cost of screening test is the most influential regarding primary care physicians' recommendations for colorectal cancer screening (100%), followed by clinical evidence in published literature (89.4%). On the other hand, the least influential factors were cancer screening guidelines (13.5%), and availability of reimbursement by third party payers (29.8%).

Figure (1) shows that about two-thirds of participant primary care physicians had poor knowledge grade regarding colorectal cancer screening.

Table (6) shows that the most frequently discussed colorectal cancer screening test is fecal occult blood test (48.1%), followed by colonoscopy (36.5%) and sigmoidoscopy (17.3%). On the other hand, the most frequently recommended test(s) are colonoscopy alone (21.2%) or with FOBT (17.3%). However, almost half of primary care physicians (46.1%) do not recommend screening tests.

Table (7) shows that the most frequently practiced items related to colorectal cancer screening were: Provision of more than one test option for colorectal cancer screening (69.2%), Referring patients to another provider for screening sigmoidoscopy (42.3%) and Conducting FOBT for screening purposes (35.6%). On the other hand, the least conducted items were implementing guidelines of colorectal cancer screening (19.2%), referring patients for virtual colonoscopy (19.2%), referring patients for double contrast barium enema (17.3%), attending screening by sigmoidoscopy (14.4%) or ordering colorectal cancer screening with fecal DNA (3.8%).

Figure (2) shows that most participant primary care physicians (81%) had poor practice grade regarding colorectal cancer screening.

Table (8) shows that participants' knowledge grades regarding colorectal cancer screening were significantly better among female physicians (p<0.001). Knowledge grades were significantly better among those with more experience in primary care (p=0.009). However, participants' knowledge grades regarding colorectal cancer screening did not differ significantly according to their age group, qualification or attending continuing medical education on cancer screening.

Table (9) shows that participants' knowledge grades regarding colorectal cancer screening were least among those at PHC centers with <6 physicians (p<0.001). Similarly, participants' knowledge grades were least among those at PHC centers with no nurse practitioners (p=0.021). However, their knowledge grades did not differ significantly according to the records system at the PHC center.

Table (10) shows that participants' practice grades regarding colorectal cancer screening were significantly better among male physicians (p<0.001). Practice grades were significantly better among those with more experience in primary care (p=0.018) and among those who attended CME on cancer screening (p=0.008). However, practice grades did not differ significantly according to their age group, or qualification.

Table (11) shows that participants' practice grades regarding colorectal cancer screening were least among those at PHC centers with >15 physicians (p=0.010). Moreover, their practice grades were less among physicians with paper charts medical records systems at their PHC centers. However, participants' practice grades did not differ significantly according to number of nurse practitioners at PHC center.

Table 1: Personal characteristics of participant primary care physicians

Personal characteristics	No.	%
Age groups		
• <30 years	29	27.9
• 30-35 years	51	49.0
• >35 years	24	23.1
Gender		
• Male	68	65.4
• Female	36	34.6
Qualification		
• MBBS	65	62.5
• Master	17	16.3
• MD/Fellowship	22	21.2
Experience in primary care		
• <5 years	70	67.3
• ≥5 years	34	32.7
Attending CME on cancer screening		
• Yes	13	12.5
• No	91	87.5
No. of physicians at PHC center		
• <6	24	23.1
• 6-15	68	65.4
• >15	12	11.5
No. of nurse practitioners at PHC center		
• 0	9	8.7
• 1	4	3.8
• 2+	91	87.5
Type of medical record system at PHC center		
• Paper charts	92	88.5
• Partial electronic medical records	12	11.5

Table 2: Colorectal cancer screening tests commonly recommended by primary care physicians

Recommended screening test	No.	%
Fecal occult blood test (FOBT)	79	76.0
Colonoscopy	78	75.0
Flexible sigmoidoscopy	72	69.2
Double contrast barium enema	8	7.7
Virtual colonoscopy	7	6.7
Fecal DNA testing	3	2.9

Table 3: Participants' correct responses regarding their recommendations to asymptomatic, average-risk patients (in good health for their age) for colorectal screening

Colorectal cancer screening items	No.	%
Fecal occult blood test (FOBT)		
• Starting age	96	92.3
• Frequency of testing	64	61.5
• Age after which testing is not recommended	11	10.6
Flexible sigmoidoscopy		
• Starting age	97	93.3
• Frequency of testing	59	56.7
• Age after which testing is not recommended	16	15.4
Colonoscopy		
• Starting age	96	92.3
• Frequency of testing	65	62.5
• Age after which testing is not recommended	20	19.2
Double contrast barium enema		
• Starting age	21	20.2
• Frequency of testing	6	5.8
• Age after which testing is not recommended	2	1.9
Virtual colonoscopy		
• Starting age	19	18.3
• Frequency of testing	14	13.5
• Age after which testing is not recommended	2	1.9
Fecal DNA testing		
• Starting age	17	16.3
• Frequency of testing	2	1.9
• Age after which testing is not recommended	2	1.9

Table 4: Participants' correct responses regarding their recommended colorectal cancer screening test

Colorectal cancer screening items	No.	%
Healthy 50-year old	102	98.1
Healthy 65-year old	103	99.0
Healthy 80-year old	60	57.7
50-year old treated for ischemic cardiomyopathy who experiences dyspnea with ordinary activity	94	90.4
65-year old treated for ischemic cardiomyopathy who experiences dyspnea with ordinary activity	101	97.1
80-year old treated for ischemic cardiomyopathy who experiences dyspnea with ordinary activity	53	51.0
50-year old with unresectable non-small cell lung cancer	104	100.0
65-year old with unresectable non-small cell lung cancer	87	83.7
80-year old with unresectable non-small cell lung cancer	39	37.5

Table 5: Participants' responses regarding to what extent different factors are influential in their recommendations for colorectal cancer screening

Influencing Factors	No.	%
Cost of screening tests for patients with no third-party coverage	104	100.0
Clinical evidence in published literature	93	89.4
U.S. Preventive Services Task Force recommendations	69	66.3
Availability of providers to whom patients can be referred for screening other than fecal occult blood test	47	45.2
Patients' preferences for colorectal cancer screening	37	35.6
How colleagues provide colorectal cancer screening for their patients	32	30.8
Availability of reimbursement by third party payers	31	29.8
Cancer screening guidelines	14	13.5

Figure 1: Participant primary care physicians' knowledge grades regarding colorectal screening

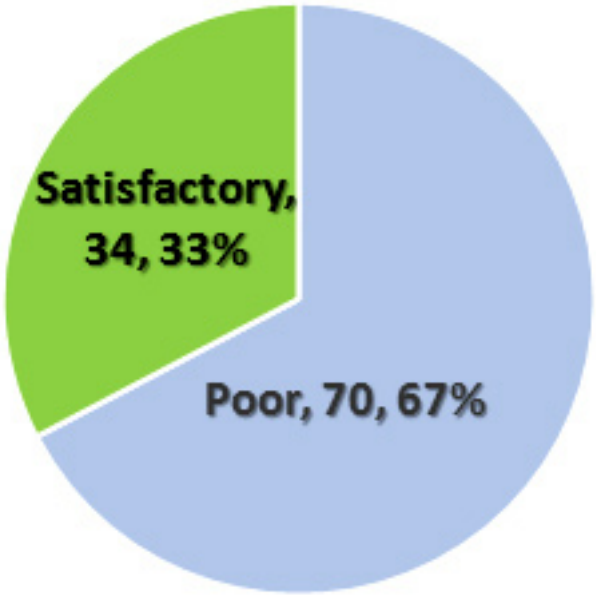

Table 6: Participants' most frequently discussed and recommended colorectal cancer screening tests to their patients

Colorectal cancer screening Tests	No.	%
Most frequently discussed with patients		
• Fecal occult blood test (FOBT)	50	48.1
• Colonoscopy	38	36.5
• Sigmoidoscopy	16	15.4
Most frequently recommended to patients		
• Colonoscopy	22	21.2
• Fecal occult blood test (FOBT)	8	7.7
• Sigmoidoscopy	2	1.9
• FOBT + Colonoscopy	18	17.3
• FOBT + Sigmoidoscopy	6	5.8
• Nothing	48	46.1

Table 7: Primary care physicians' practices related to colorectal cancer screening

Practice items	No.	%
Provision of more than one test option for colorectal cancer screening to asymptomatic average-risk patients	72	69.2
Refer patients to another provider for screening sigmoidoscopy	44	42.3
Conducting FOBT for screening purposes	37	35.6
Implement guidelines of colorectal cancer screening	20	19.2
Refer patients for virtual colonoscopy	20	19.2
Refer patients for double contrast barium enema	18	17.3
Attend screening by sigmoidoscopy	15	14.4
Order colorectal cancer screening with fecal DNA testing for asymptomatic, average-risk patients	4	3.8

Figure 2: Participant primary care physicians' practice grades regarding colorectal cancer screening
Practice grades

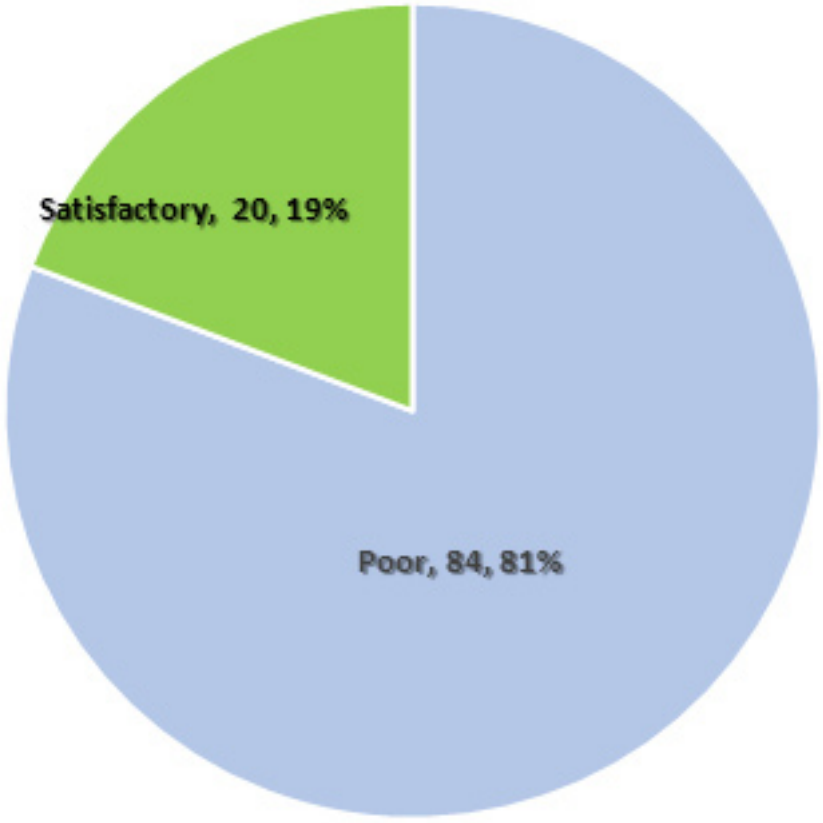

Table 8: Participants' knowledge grades regarding colorectal cancer screening according to their personal characteristics

Personal characteristics	Poor		Satisfactory		P Value
	No.	%	No.	%	
Age groups					
• <30 years	17	58.6	12	41.4	
• 30-35 years	32	62.7	19	37.3	
• >35 years	21	87.5	3	12.5	0.052
Gender					
• Male	55	80.9	13	19.1	
• Female	15	41.7	21	58.3	<0.001
Qualification					
• MBBS	39	60.0	26	40.0	
• Master	14	82.4	3	17.6	
• MD/Fellowship	17	77.3	5	22.7	0.115
Experience in primary care					
• <5 years	53	75.7	17	24.3	
• ≥5 years	17	50.0	17	50.0	0.009
Attending CME on cancer screening					
• Yes	10	76.9	3	23.1	
• No	60	65.9	31	34.1	0.429

Table 9: Participants' knowledge grades regarding colorectal cancer screening according to their primary health care center characteristics

PHC center characteristics	Poor		Satisfactory		P Value
	No.	%	No.	%	
No. of physicians at PHC center					
• <6	24	100.0	0	0.0	
• 6-15	37	54.4	31	45.6	
• >15	9	75.0	3	25.0	<0.001
No. of nurse practitioners at PHC center					
• 0	9	100.0	0	0.0	
• 1	1	25.0	3	75.0	
• 2+	60	65.9	31	34.1	0.021
Type of records system at PHC center					
• Paper charts	60	65.2	32	34.8	
• Partial electronic medical records	10	83.3	2	16.7	0.208

Table 10: Participants' practice grades regarding colorectal cancer screening according to their personal characteristics

Personal characteristics	Poor		Satisfactory		P Value
	No.	%	No.	%	
Age groups					
• <30 years	24	82.8	5	17.2	
• 30-35 years	42	82.4	9	17.6	
• >35 years	18	75.0	6	25.0	0.715
Gender					
• Male	48	70.6	20	29.4	
• Female	36	100.0	0	0.0	<0.001
Qualification					
• MBBS	50	76.9	15	23.1	
• Master	15	88.2	2	11.8	
• MD/Fellowship	19	86.4	3	13.6	0.433
Experience in primary care					
• <5 years	61	87.1	9	12.9	
• ≥5 years	23	67.6	11	32.4	0.018
Attending CME on cancer screening					
• Yes	7	53.8	6	46.2	
• No	77	84.6	14	15.4	0.008

Table 11: Participants' practice grades regarding colorectal cancer screening according to their primary health care center characteristics

PHC center characteristics	Poor		Satisfactory		P Value
	No.	%	No.	%	
No. of physicians at PHC center					
• <6	22	91.7	2	8.3	
• 6-15	56	82.4	12	17.6	
• >15	6	50.0	6	50.0	0.010
No. of nurse practitioners at PHC center					
• 0	9	100.0	0	0.0	
• 1	3	75.0	1	25.0	
• 2+	72	79.1	19	20.9	0.303
Type of records system at PHC center					
• Paper charts	84	91.3	8	8.7	
• Partial electronic medical records	0	0.0	12	100.0	<0.001

Discussion

In Saudi Arabia, cases of colorectal cancer usually present late, with metastasis and obstruction in percentages more than what is reported in western communities (23). Among cases diagnosed with cancer, colorectal cancer ranked the first among males and the third among females (24).

Several studies have been done in Saudi Arabia in regard to colorectal cancer, and all of them concluded and highlighted the importance of screening (7-8; 23; 25). Therefore, primary care physicians should play a key role in screening for early detection of colorectal cancer (26).

The present study aimed to assess primary care physicians' knowledge and practices regarding screening for colorectal cancer in Abha City.

The present study revealed that primary care physicians had poor knowledge grade regarding colorectal cancer screening. Their knowledge gaps were mainly related to colorectal cancer screening according to age, and health status of screened persons. Moreover, they were least knowledgeable regarding screening using double contrast barium enema, virtual colonoscopy and fecal DNA testing.

This finding is in accordance with those reported by several studies. In Nodora et al. (27) 51.7% of primary care physicians correctly reported the recommendations. In Tehran, Iran, Sabet et al. (28) showed that only 17.3% of general practitioners correctly mentioned the appropriate age for screening. In Jordan, Omran et al. (29) reported that 49% of primary care physicians had unsatisfactory knowledge about guidelines for colorectal cancer screening.

In Riyadh, Saudi Arabia, Demyati (23) found that most family physicians in National Guard Health Affairs consider colonoscopy to be the most effective screening test, followed by flexible sigmoidoscopy. Only one-third of family physicians found FOBT to be "very effective." In contrast, FOBT is the most used test followed by colonoscopy, which is similar to what Klabunde et al. (30) and Federici et al. (31) found. This might be due to more patients' acceptance or the availability of the FOBT in comparison to colonoscopy (23).

Sharma et al. (32) argued that despite aggressive continuing medical educational efforts, knowledge of primary care physicians about colorectal cancer screening is still less than optimal. There may also be uncertainty about the most appropriate screening and surveillance tests for particular categories of patients.

Results of this study indicated that most primary care physicians had poor practice grade regarding colorectal cancer screening. FOBT was the screening test most commonly discussed and recommended by primary care physicians, followed by colonoscopy and flexible sigmoidoscopy. The most frequently discussed screening test was FOBT, followed by colonoscopy and sigmoidoscopy. On the other hand, screening tests least recommended by primary care physicians were double contrast barium enema, virtual colonoscopy and fecal DNA testing.

These findings are in agreement with those reported by several studies. Thanapirom et al. (33) stated that only two-thirds of primary care physicians routinely recommend colorectal cancer screening to their asymptomatic average-risk patients. Moreover, they provide suboptimal standard in recommending colorectal cancer screening, e.g., recommending at the inappropriate age or recommending incorrect interval. They explained this finding by the poor distribution of screening guidelines and training programs by professional organizations.

In Malaysia, Norwati et al. (34) reported that only 20% of physicians had been doing colorectal cancer screening based on guidelines. In a survey conducted in Balearic Islands and in a part of the metropolitan area of Barcelona, Spain, Ramos et al. (26) reported that 68% of family physicians advised colorectal screening according to guidelines as the first-line. In a survey conducted in New Jersey, USA, Hudson et al. (35) reported that 82% of patients received recommended screening by their primary care physicians. In Chicago, USA, Brown et al. (36) reported that 87.9% of physicians believed colonoscopy was the best way of colorectal cancer screening, while only 24.6% agreed on stool examination as a screening method.

Although guidelines for effective screening have been published and widely endorsed, compliance remains a major problem, and the physicians' role is crucial (37-38).

Sharma et al. (32) noted that many primary care physicians are basically wrong in their choice of screening tests for colorectal cancer, and their decisions are frequently inappropriate. Kim et al. (39) noted that virtual colonoscopy is an accurate screening method for the detection of colorectal cancer in asymptomatic average-risk adults. It is a minimally invasive imaging examination of the entire colorectal and rectum and requires full cathartic bowel preparation and restricted diet similar to colonoscopy.

In Montreal, Canada, Sewitch et al. (40) reported that primary care physicians lack knowledge of periodicities of recommended screening modalities to screen average-risk individuals. Although 87.6% of physicians knew the correct periodicity for FOBT, only 40% knew it for other screening methods. Moreover, primary care physicians preferred FOBT and colonoscopy more than other screening modalities.

Shapiro et al. (41) reported that only half of the screen-eligible population in USA had either a colonoscopy or sigmoidoscopy. Wong et al. (42) stated that colonoscopy became the test of choice in the general population. However, colonoscopy is associated with an increased cost as it is more expensive than other screening modalities (43).

Cost of screening test in the present study was the most influential regarding physicians' recommendations for colorectal cancer screening, followed by clinical evidence in published literature.

Sharma et al. (32) noted that annual FOBT has the lowest potential effectiveness and is the least costly, whereas colonoscopy every 10 years has the greatest potential effectiveness, but is currently the most costly.

Rex et al. (44) stated that the major disadvantages of the fecal DNA test are a substantial decrease in specificity and the high cost relative to FOBT. The cost of the fecal DNA test is approximately $500-600, i.e., about 10 times the direct costs of annual FOBT. Moreover, there is a further increase in relative costs related to higher numbers of colonoscopies per test.

Practice grades of primary care physicians in the present study were significantly better among those who attended CME on cancer screening. Nevertheless, this study revealed that only 12.5% of participants attended a continuing medical education on cancer screening. Moreover, participants' practice grades were significantly better among those with more experience in primary care and among male physicians. On the other hand, practice grades were least among those at PHC centers with >15 physicians and also among physicians with paper medical records systems at their PHC centers, which was the most common medical records system at primary care centers in Abha City (88.5%).

Continuing medical education of physicians on colorectal cancer screening results in their increased performance (45-46). The low proportion of continuing medical education for primary care physicians in the field of cancer screening may reflect an unjustifiable lack of interest toward cancer prevention among primary care physicians. More training opportunities should be provided to primary care physicians so as to improve their knowledge and practice related to early cancer detection in general and cancer colon screening in particular. This is expected to be reflected on early cancer detection and better prognosis for cancer patients (26).

Thanapirom et al. (33) noted that primary care physicians should be knowledgeable about all available screening methods for colorectal cancer so that patients can be informed about their possible options and make better decisions. Moreover, the availability of electronic medical records system at primary care centers is expected to organize and facilitate screening for cancer of the colon. One of the advantages of electronic medical records system is the easy provision of reminders both to the physician and the patient for both screening and follow up of cases, since commonly reported reasons for non-participation in colorectal cancer screening include forgetting or not getting around to completing the screening test kit or being too busy (47-48).

In addition, the low practice grades among those at primary care centers with >15 physicians may be explained by the greater workload, and consequently more registered patients and more busy primary health care providers at big-sized primary care centers.

Nodora et al. (27) found that female physicians were more in line with the guidelines for cancer colon screening. Similarly, Jacob (1) reported that female primary care physicians were more likely to report compliance with screening guidelines. In contrast, findings of the present study showed that female physicians, who had significantly better knowledge grade than male physicians, had significantly lower practice grade. This may be explained by the fact that, Saudi Arabia is known by its highly conservative community, where more practice and training opportunities may be more readily available for males than females.

In conclusion, about two-thirds of PHC physicians have poor knowledge grade regarding colorectal screening. PHC physicians' knowledge grades regarding colorectal cancer screening are better among females, and those with more experience in PHC, but least among those at PHC centers with <6 physicians. FOBT is the colorectal cancer screening test most commonly discussed and recommended by PHC physicians, followed by colonoscopy and flexible sigmoidoscopy. Most PHC physicians have poor practice grade regarding colorectal cancer screening. Practice grades are significantly better among male physicians, among those with more experience in PHC and among those who attended CME on cancer screening, but least among those at PHC centers with >15 physicians.

- Based on findings of this study, it is recommended to provide CME sessions to PHC physicians, with special emphasis on methods of screening for early detection of colorectal cancer.
- To establish fully electronic medical records system at PHC centers.
- To fully subsidize and financially support screening for colorectal cancer.
- Provide health education to the public through mass media messages so as to raise their awareness regarding colorectal cancer and its early detection

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Pneumococcal and Influenza vaccination amongst diabetics in the GCC: Exploring barriers and strategies for improvement

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Sahar Naz, Ali Khalid, Robin Ramsay. Pneumococcal and Influenza vaccination amongst diabetics in the GCC: Exploring barriers and strategies for improvement. World Family Medicine. 2021; 19(5): 81-86
DOI: 10.5742/MEWFM.2021.94053

Abstract

The alarming rise in the prevalence of diabetes mellitus (DM) within the Gulf Co-operation Council (GCC) has become a major public health concern. Respiratory infections in diabetics can result in a high morbidity and mortality rate, hence all the Arab states recommend pneumococcal and influenza vaccination for patients with diabetes. The few studies that have measured the rate of vaccination of within the GCC have consistently reported it to be poor. This is a cause for concern given the exponential rate at which diabetes is increasing within the region. The aim of this article is to highlight the importance of vaccination in diabetic patients, elaborate on the barriers faced in their promotion and propose strategies to improve vaccination rates.

Key words: pneumococcal and influenza vaccination, diabetics, GCC, barriers, strategies

Introduction

The prevalence of diabetes mellitus (DM) in those aged 20-79 years, in each of the Gulf Co-operation Council (GCC) countries is higher than the global prevalence of 9.3% (1). The highest is in the United Arab Emirates (UAE) at 16.3% followed by Saudi Arabia at 15.8%, Qatar at 15.6%, Kuwait at 12.2% and lastly Oman at 10.1%. The International Diabetes Federation (IDF) has reported that as of 2019, within the Middle East and North Africa (MENA) region 55 million individuals suffer from diabetes; this is expected rise to 105 million by 2045 which indicates an alarming increase of 96%, the second highest globally(2).

Respiratory infections, especially those caused by Influenza and Streptococcus Pneumoniae can make patients with DM six times more likely to be hospitalized and increases mortality rate by three-fold (3-5). Since these infections are vaccine-preventable, organizations such as the American Diabetes Association (ADA), National Institute of Clinical Excellency (NICE), and Centre of Disease Control (CDC) recommend annual Influenza vaccination and pneumococcal vaccination for diabetic patients (6-9). The GCC states have also adopted similar immunization policies for diabetic patients. Despite this, studies measuring vaccination uptake within the GCC are scarce and have consistently reported inadequate uptake (10,11).

Importance of vaccination

Pneumococcal vaccine

Pneumococcal infection is one of the most common causes of vaccine preventable deaths (12,13). Diabetics are 20 times more likely to suffer from an invasive pneumococcal infection and the mortality rate can be as high as 50% (14,15).

A population-based retrospective cohort study of 66,790 diabetic elderly patients investigated the risk of pneumococcal infection in pneumococcal polysaccharide vaccine 23 (PPSV23) vaccinated and unvaccinated patients. This study found that vaccine recipients suffered from a lower incidence of invasive pneumococcal disease, respiratory failure and had a shorter duration of hospitalization (16). Similarly, a Cochrane review of 18 randomized controlled trials (RCT) and 7 non-RCT with a total of 127,146 participants found consistently strong evidence regarding the efficacy of PPSV23 vaccine in reducing the risk of invasive pneumococcal disease (17).

Influenza vaccine

Influenza affects all countries, communities and individuals (18). There are 1 billion cases of Influenza yearly which results in nearly 3-6 million Influenza-related deaths especially in high-risk individuals (19).

Regarding the efficacy of influenza vaccine amongst diabetics, a comprehensive systematic review of 15 studies reported that its immunogenicity was similar to that of healthy individuals, with the sero-conversion rate and sero-protection rate of more than 40% and 70%, respectively, which indicates that the vaccine is effective in this high-risk group (23). Most importantly, five of the studies reported a decrease in all-cause mortality and all-cause hospitalization particularly in vaccinated patients, and particularly in those aged more than 65 years.

Remschmidt et al. (24) conducted a meta-analysis of 11 observational studies, consisting of a total of 170,924 participants, on the use of influenza vaccine to prevent seasonal influenza in diabetic patients. The study reported a reduction in all-cause hospitalization with a pooled vaccine effectiveness (VE) of 58% whereas hospitalization due to pneumonia and influenza was reduced by 43%.

Vaccination uptake within the GCC

There is insufficient published data with regards to the rate of vaccination amongst the diabetic population in the GCC.

Alqahtani et al. (10) conducted a cross sectional study to determine the influenza and pneumococcal vaccination uptake rate amongst the general population in the GCC. The study was conducted through a smartphone application in order to improve accessibility across the region. Out of the 1,812 respondents, most were from Saudi Arabia (n=1105). Within all the diabetic participants across the GCC only 20% (n=32/152) received the pneumococcal vaccine and 21% (n=31/152) received the influenza vaccine. Unfortunately, this study is susceptible to recall bias as it is a self-reported survey.

In a family medicine clinic in the Security forces hospital in Saudi Arabia, the pneumococcal and influenza vaccination status was investigated for 360 diabetic patients (11). The study reported that only 47.8% were vaccinated against Influenza and only half of the respondents were aware that it was necessary in DM. Investigation of the pneumococcal vaccination status revealed alarming results; only 7.1% of diabetic patients had received the vaccine while 88.9% of the respondents were unaware of its importance. One of the limitations of this study was the small sample size of 360 participants and lack of data from multiple health centres therefore their results may not be a true representation of the overall Saudi population, however it is able to provide insight into the possibility of a generally poor uptake rate.

Barriers influencing vaccination uptake

Understanding the barriers that influence vaccination uptake is key to designing and tailoring interventions to improve vaccination rates and there are a wide range of factors involved.

Patient- related barriers

Luger (27) has aptly described how Rosenstock's health belief model can be utilized to gain insight into the reasons that can influence a patient's decision to accept preventive services such as vaccinations. It consists of the five domains: perceived susceptibility, perceived threat, perceived severity, perceived benefit and perceived barriers.

Diabetics are more likely to accept vaccination if they believe that they are susceptible to infection. In AlMusalam et al. (11) study, 83.8% of those vaccinated against influenza were aware that it was important for DM and therefore had a higher vaccination rate whereas those who believed that pneumococcal vaccine was not important had a much lower vaccination rate. A meta-analysis of 34 studies investigating the impact of perception of threat on vaccination behaviour concluded that it is significantly related to vaccination behaviour (28).

With regards to perceived barriers, in a survey of vaccine access and drivers in MENA region, AlAwaidy et al. (29) reported that some of the barriers included low perceived vaccine effectiveness, fear of side effects and lack of recommendation by physicians.

Cost of vaccination is likely to be a key barrier for vaccination uptake within the GCC as these countries consist of a large expatriate population as compared to their own citizens. Even though diabetes is common in both population groups, expatriates are more like to pay out-of-pocket for vaccinations compared to citizens, for whom healthcare services are subsidized or free. This may influence the health economics within the country and could potentially lower overall vaccination rates (30).

Healthcare provider (HCP) related barriers
A cross sectional study on the attitudes and barriers towards influenza vaccination amongst HCPs in 6 major hospitals in Saudi Arabia by AlShammari et al. (31) reported that 75% (n = 184) of the 242 respondents were unaware of the Advisory Committee on Immunization Practices (ACIP) or CDC guidelines on influenza immunization, while almost one third of the HCPs did not educate their patients about the importance of influenza vaccination. This could potentially be related to their finding that 80% of the respondents reported lack of training with regards to the importance and benefit of influenza vaccination in the preceding 12 months (31). Abu-Gharbieh et al. (32) study of 1,500 HCPs across UAE, Kuwait and Oman also reported that 49% of the participants were unaware of the CDC guidelines on influenza vaccination.

Physicians also may prioritize the main purpose of the clinic visit such as acute or chronic medical illness over preventive services such as vaccine promotion. Szilagyi et al. (33) noted that one of the most important barriers to vaccination uptake was when the primary reason of the clinic visit took over the consultation, providing inadequate time for education. In an electronic survey of 1,121 family physicians in Los Angeles, the number one physician reported challenge with regards to vaccine administration was the lack of time (34).

Clinic-related barriers
Clinic policies mandating physician consultation and examination pre-vaccination and appointment-only vaccination services can lead to long waiting times which can deter patients from accessing vaccination services (35).

Lack of adequate vaccinations storage and administration equipment can present as a logistical barrier for the clinic. In a study by AlShammari et al. (31) 43% of the HCPs reported the non-availability of vaccine as the reason for not providing it to patients.

Strategies for improvement

Keeping the barriers in mind, a multicomponent intervention can be implemented at a patient, provider and clinic level in order to increase vaccination rates. The following recommendations are based on an analysis of the literature.

Patient level
Utilizing the health belief model when educating patients about vaccination importance can motivate them to take the vaccine. This increases their awareness of the importance of vaccination and the process of exploring their perceptions and alleviating their fears is an integral part of the shared decision making and increases the likelihood of vaccination acceptance.

Healthcare Provider level:
AlShammari et al (31) reported that 69% of the HCPs were keen on receiving continuing education courses relating to the importance of influenza vaccination suggesting that education and training programs for immunisation providers should be provided as part of HCPs continuing professional development.

Healthcare providers can facilitate vaccination uptake by offering it during routine visits. Time constraints during consultations can be managed by offering leaflets to patients, setting up a vaccination appointment at a future date or by designating the nursing staff to provide vaccine education after the consultation.

Reminder systems have been noted to be one of the strongest methods to improve immunization rates. A review of 34 studies by Shefer et al. (36) reported that utilization of reminder/recall systems improved the likelihood of immunization from 9% to 55%. Incorporating vaccine reminders in the form of flagging the patient file electronically can ensure that healthcare providers are inclined to offer the vaccine during routine visits. In addition, reminders can be issued to patients who are due or overdue for a vaccine through various modes of communication such as telephone calls, email, text or post cards.

Clinic level:
The implementation of Standing Order Programs (SOP) enables non-physician medical staff such as nurses, diabetic educators or physician assistants to educate the patient and administer the vaccine will allow for faster and more efficient vaccination delivery (37). This can eliminate long waiting times and make the vaccination process more efficient.

Improving access to immunization services can be achieved by providing it weekends or evening hours. Clinics that lack immunization services can refer the patient to nearby clinics that provide such a service.

In order to sustain improvements, regular assessment of the immunization levels within the patient population of primary healthcare centres is required. This can be achieved through audits which will include a retrospective analysis of patient files, provider performance, missed opportunities and immunization rates (38).

A vaccine coordinator can be designated with the responsibility of overseeing vaccine storage and handling services as they would be required to ensure that vaccines are ordered in a timely manner and as per demand in order to reduce wastage and added clinic costs.

Conclusion

There is no question that immunization can prevent adverse outcomes from influenza and pneumococcal infection in diabetic patients. The alarming rise in the prevalence of diabetes within the GCC region accompanied with poor vaccination rates has highlighted the importance of ensuring that the immunization policies are implemented at a primary healthcare level. Awareness of barriers to vaccination services at a patient, provider and clinic level

is the first step in creating change. This would ideally be followed by adopting a multicomponent intervention as depicted above in order to increase vaccination rates. However, future research is required to analyse their outcome so that such interventions can be successfully replicated across all the Gulf states.

Acknowledgement:
The authors would like to sincerely thank the University of Edinburgh for inspiring this manuscript, as a part of it relates to the first author's dissertation of the Masters in Family Medicine program under the school of Molecular, Genetic & Population Health Sciences at the College of Medicine and Veterinary Medicine. The first author is also grateful to Dr Sunitha Bidari who was the dissertation supervisor. The views expressed in this manuscript are those of the authors and not the University of Edinburgh.

Abbreviations

DM	Diabetes Mellitus
GCC	Gulf Cooperation Council
IDF	International Diabetes Federation
MENA	Middle East and North Africa
ADA	American Diabetes Association
NICE	National Institute of Clinical Excellency
CDC	Centre of Disease Control
RCT	Randomized controlled trial
PPSV23	Pneumococcal polysaccharide vaccine 23
HCP	Healthcare provider
ACIP	Advisory Committee on Immunization Practices
SOP	Standing Order Programs

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The Role of Project Management in Public health

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Razan Abyad. The Role of Project Management in Public health. World Family Medicine. 2021; 19(5): 87-96
DOI: 10.5742/MEWFM.2021.94054

Abstract

The research into the factors that influence project management performance and success has been ongoing for several years, and as a result, the literature on this subject is fairly extensive. While success is a central concept in project management (PM), the literature on topics related to PM success is relatively extensive and generalist. Numerous metrics and factors affecting the success of a project are common across industries, although some are unique. The focus of public health action projects and programs is on the protection of the health of specific target groups or populations, and many of them address issues of survival. Public health projects, on the other hand, have a different focus; they are concerned with creating the conditions necessary for people to be healthy, and they are critical for population welfare. Their unique characteristics justify the need for research to develop a unique model of success factors to assist top management and project managers with planning and operational management. A model of success factors would assist in identifying, controlling, and mitigating issues that increase the likelihood of going in the wrong direction, while strengthening those that add value or increase the likelihood of succeeding. It would also be beneficial as a predictive and diagnostic tool for objectively and gradually reducing the probability of project failure, thereby assisting in project performance improvement. The success of public health projects requires a systematic approach and the application of a comprehensive set of success criteria. This article provides a concise overview of the literature on the use of project management in public health.

Key words: project management, public health

Introduction

The majority of people would agree that the environment of the twenty-first century requires organizations to perform with fewer resources. Fiscal constraints, in particular, are compelling healthcare organizations worldwide to implement change processes (Casebeer & Hannah, 1998). As a result, retooling strategies are putting pressure on organizations to integrate, merge, acquire, downsize, or close. To achieve an integrated healthcare system, strong organizational change and project management capabilities are required.

Organizational change is not uncommon when attempting to integrate a healthcare system. However, any change initiative that involves integrations must have a common set of objectives that satisfy a variety of stakeholders (Chreim et al., 2010).

According to the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK), a project is a temporary endeavor undertaken to produce an original product, service, or result. The term "project management" refers to the process of applying knowledge, abilities, tools, and techniques to project activities in order to meet the project's requirements. Project management, which is used across disciplines, is the systematic planning, organizing, and then execution of a predetermined set of steps in order to maximize resource utilization and accomplish specific objectives.

Despite the growth of PMO establishments across industrial sectors, the PMO has not seen increased use in the health and public sectors. Project management has risen to prominence as a critical business skill in our time due to its ability to help control costs, mitigate risk, and improve outcomes.

Project management has risen to prominence as a critical business skill in the modern era.

As healthcare continues to evolve in response to mounting cost and quality pressures, the importance of project management becomes increasingly apparent. Understanding and applying project management principles can significantly improve outcomes in a variety of health care delivery settings. Over the last few decades, healthcare management and public health have grown significantly. Thus, in order to improve public health services and to improve public health performance, several healthcare projects must be redefined.

The world has made enormous and unprecedented strides in the health of human populations over the last 50 years (Medlin et al., 2006). Numerous types of public health interventions have been developed and can be classified as providing standardized products to a population (e.g., immunizations, drugs), providing clinical services (e.g., primary health care services), promoting personal behavioral change (e.g., strategies to prevent sexual disease transmission), or addressing environmental hazards (e.g., air quality control measures). Recognizing the importance of identifying the most cost-effective interventions, it is recognized that actions lacking objective evidence of added value should be evaluated, reviewed, and discontinued if they are found to be ineffective (Sakellarides et al., 2005). Thus, successful public health projects must be identified, promoted, and funded; those that fail should be thoroughly analyzed to determine the factors that contributed to their failure.

Because success is a central concept in project management, the literature on the criteria and factors that contribute to project success is relatively extensive and generalist. However, critical success factors vary according to the characteristics of the project (Pinto et al., 1988). The expected outcomes, for example, in projects developed in private organizations with a profit motive may differ from those developed in non-profit organizations. This logic applies to public health initiatives aimed at preventing disease, promoting health, and extending life for the general population (WHO, 2014). Indeed, the intangibility of the majority of outcomes and the difficulty of quantifying effects are some of the distinguishing characteristics of health promotion projects.

Why We Need Project Management in Healthcare

Healthcare delivery is one of the largest industries on the planet, and it is growing and changing at a breakneck pace. Another significant issue is cost. These issues, combined with the introduction of new electronic health record systems, regulations, and technologies, have heightened the importance of project management in healthcare. Organizations are undertaking projects to incorporate new elements into their workflows, to improve processes across the continuum of care, and to enhance their facilities, all while improving outcomes and lowering costs. According to the Massachusetts Hospital Association, the advantage of project management in healthcare is that it enables organizations to “stay one step ahead of any potential risk” as they complete this diverse array of projects.

Additional complexities, such as regulatory constraints and a diverse set of stakeholders, amplify the importance of project management in healthcare. Project managers must adhere to a plethora of procedures and regulations pertaining to patient safety, quality, and privacy. Each industry has its own set of rules, but healthcare is particularly complicated, with the government and private organizations such as the Joint Commission keeping a close eye. These increased constraints emphasize the critical nature of project planning and execution.

Public health is concerned with assessing and monitoring the health of communities and vulnerable populations, developing public policies to address identified problems, and allocating resources. It works to ensure that everyone receives appropriate and cost-effective care, including services for health promotion and disease prevention (WHO, 2014). Quality is critical in this context, as many projects are concerned with survival, the government is frequently a stakeholder, and public funding is critical (Schwalbe, 2013).

During integrated planning, project managers cannot ignore the impact of change on the healthcare sector. Golden (2006) develops a framework for change management in healthcare organizations, taking into account the complexity of processes and variables in healthcare. Drucker (1993) asserts that the most complex organizational structure exists in healthcare. This is due to the fact that there are numerous stakeholders, multiple missions, decision makers with professional autonomy, and a dearth of information when managing a change process (Golden, 2006). Without a doubt, effective organizational change is a project in and of itself (Englund et al., 2003). Organizational change and project management have four critical characteristics in common. Both entail a deliberate process, an identified leader, well-defined objectives, and a well-defined timeline (Englund et al., 2003).

Within health systems, change management aims to connect change processes to implemented outcomes (Casebeer & Hannah, 1998). Due to fiscal constraints in the twenty-first century, it is unavoidable that healthcare organizations must evaluate their current processes in terms of efficiency and economies of scale. VanDeusen Lukas et al. (2007) conducted an analysis of organizational transformation among 12 health service providers and identified five elements necessary for change: external pressure to transform; executive commitment to quality; employee engagement through quality improvement initiatives; goal alignment through resource allocation at all organizational levels; and implementing the change process; on the other hand, it necessitates a commitment to the stages of change. While Kotter (1995) discussed eight stages of change, Golden (2006) focused on four for healthcare organizations.

While project management has been practiced for thousands of years, the discipline of project management is relatively new to the field of research. Project management has developed into a profession (Kenny, 2003), capturing the interest of the majority of organizations in the twenty-first century. PMI publishes an international standard for project management methodologies. It is A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (Project Management Institute, 2008), which details the project processes that management should take into account. They include the phases of initiating, planning, carrying out, controlling and monitoring, and concluding. Global attention has been piqued as a result of the realized return on investment experienced by senior managers when project management practices are implemented (Kwak & Ibbs, 2000). Recently, the importance of project management in the medical field has prompted the adoption of a project-based approach to managing healthcare infrastructure and patient needs (Sa Couto, 2008).

Financial constraints are compelling healthcare organizations worldwide to implement change processes (Casebeer & Hannah, 1998). The construct of healthcare integration, in particular, has gained prominence over the last two decades as a result of Stephen Shortell's seminal work introducing the concept of an organized delivery system (ODS) in healthcare. Although the reform of healthcare has been framed in terms of ODS, the path to achieving an ODS is through effective integration (Shortell et al., 1993). Shortell et al. (1993) propose strategies for overcoming integration barriers. Integrated models are the most effective way to support superior organizational performance, when combined with rigorous quality improvement initiatives (Dey & Hariharan, 2006). Dey and Hariharan (2006) develop a logical framework for healthcare systems that is uniform and is based on the integration of clinical and non-clinical practices; however, practical guidance on the integration of clinical and non-clinical practices within health systems is lacking (Suter et al., 2009).

When implementing integrated healthcare processes, a project management framework that complements the facets of change management is required, as there is no alignment between change management and project management for the purposes of healthcare integration initiatives. The perceived best practices in project management were broadly defined as the methodology that a project team must adhere to in order to promote integrated healthcare changes.

Integration of healthcare must be viewed as a project management initiative that results in system changes. However, any change initiative that involves integrations must have a common set of objectives that satisfy a variety of stakeholders (Chreim et al., 2010). As it is succinctly stated, "the nature of project management is change" (Griffith-Cooper & King, 2007, p. 14). While there is no doubt that the PMBOK® Guide's Knowledge Areas focus on the control element of change requests to the project, they neglect to address the human aspects of change (Griffith-Cooper & King, 2007). According to King and Peterson (2007), it is critical to incorporate change agents and stakeholder engagement into the project planning process. Due to the high failure rate of change projects, academic interest has shifted to a better understanding of the complexities associated with transformational change (Burnes, 2005).

The importance of project management in health care is becoming increasingly clear.

Additionally, healthcare lacks a straightforward buyer-seller relationship. Rather than that, numerous parties are involved. If the product is care, the recipients are patients and the providers are doctors and nurses, but the buyers are health insurance payers and the government. The greater the number of stakeholders, the more complicated the situation becomes. Similarly, healthcare project teams may be larger and more diverse as a result of the inherent cross-functional nature of patient care, necessitating the availability of a project manager who is adaptable and willing to consider all perspectives. Health care projects may require additional approvers or buy-in; it is critical to identify all stakeholders during the planning stage to avoid delays during the execution stage.

In general, healthcare requires more project managers and project management. In a rapidly changing and growing industry, project management can provide structure and discipline. By implementing this tried-and-true methodology, the field will be able to accomplish more in less time, conserve resources, and foster collaboration.

Health Project types

In health, projects are recognized as an especially effective way to introduce innovations, address new challenges, or find solutions to problems that cannot be accommodated by existing procedures and routines. There are several distinct types of health projects:

- Research projects with the objective of increasing knowledge that can be used to make "evidence-based" decisions;
- Development projects, which entail the design and pre-testing of an intervention aimed at resolving a specific issue in a specific population or target group;
- Implementation projects, which focus on disseminating and implementing an existing intervention among a specific target group or population. Schwalbe (2013) [6] describes the following characteristics of other health projects:
    - Quality is critical: health projects are typically developed to address or prevent a specific health problem; many are also concerned with survival issues;
    - The government plays a critical role: the state is frequently the project's financier or the impetus for the development of a health project.
    - Individuals' perspectives on health are highly individual: their behavior, willingness to pay for healthcare, and the types of services they use vary.

• A health department establishes a wellness program for maternal and child health
• A hospital establishes a program to reduce readmissions by identifying and monitoring high-risk patient discharges

Thus, despite the fact that we are well aware of the unique characteristics of these types of projects, the literature review is deficient in referencing studies that include health projects. Success models were developed specifically for the information technology and software development industries, and when compared to other types of projects, information technology (IT) projects are unique (Leonard & Zyl D, 2014). These studies are primarily concerned with general descriptions of project manager and project organization factors and frequently appear to overlook project team characteristics, external environmental factors, and unique characteristics of the area in which the project is developed.

Change Management in the Health Sector

Over the last decade, project management processes have gained recognition for their ability to manage change. According to Kumpf and Wittelsberger (2005), formal project management is prevalent in the healthcare information technology (IT) sector; however, healthcare projects outside of IT also require a formal project management system due to the cumulative impact of systems, processes, and people. There is a wealth of research on the application of project management in healthcare information technology; however, little attention has been paid to the application of project management strategies in other facets of healthcare planning. As a result, when formal project management processes are not implemented, project costs, timelines, and scope creep have the potential to escalate. Due to the high failure rate of change projects, academic interest has shifted to a better understanding of the complexities associated with transformational change (Burnes, 2005).

Project management practices are being adopted in response to increased fiscal constraints, integration opportunities, and a growing population. According to one study, senior citizens are the fastest growing age group in Canada and the United States (Gale, 2012). As a result, an effort has been launched to establish a senior-friendly emergency department at Mount Sinai School of Medicine in New York city, New York (Gale, 2012). Similarly, the Calgary Health Region in Calgary, Canada, hired a project team of healthcare architects to improve hospital design in order to more closely resemble a family-centered care facility, rather than the traditional institutional resemblance (Buchanan, 2008). Government organizations are embracing project management strategies such as earned value management (EVM) to improve project performance measurement (Kwak & Anbari, 2011). EVM enables project managers to identify early warning signs of poor performance, allowing for more time to implement mitigations, resulting in more efficient resource allocation and planning (Anbari, 2003). Claudio (2005) discusses a collaboration between the Project Management Institute's Healthcare Project Management Special Interest Group and the National Association for Public Health Information Technology (NAPHIT). NAPHIT held two project management sessions in the summer of 2005 and stated unequivocally that healthcare managers are responsible for demonstrating project management practices to healthcare funders (Claudio, 2005).

Kumpf and Wittelsberger (2005) report on a study in which the AMERIGROUP Corporation's project management practices were evaluated. The AMERIGROUP Corporation provides healthcare services through a network of health maintenance organizations. At first, it was discovered that AMERIGROUP managed healthcare projects with an unclear scope, unpredictable outcomes, and a failure to identify required resources, resulting in scheduling concerns (Kumpf & Wittelsberger, 2005). To address these concerns, an external consulting firm was retained. Twenty stakeholders in AMERIGROUP were interviewed. The data indicated that highly motivated individuals had a favorable perception of project management. Additionally, there was no standard project management planning process in place, there was ambiguity surrounding the project management office, there were no defined roles and responsibilities, and project managers lacked the necessary skill set. Six recommendations were made in response to these issues. These included the creation of a framework for project management processes, the implementation of project management tools, the creation of project management job descriptions, the design and implementation of a project management function, the identification of a plan to enhance project managers' skill sets, and the identification of coaching and mentorship opportunities for project managers (Kumpf & Wittelsberger, 2005).

Integration of Healthcare: A Synthesis

Integrative healthcare is frequently defined as a multidisciplinary approach, colloquially referred to as integrative medicine (Bell et al., 2002); however, the term "integration" has been much debated (Atun et al., 2010). According to Lehman (2008), the term "integration" is frequently used when searching for information on change management. Integration is a transformational strategy that entails the engagement of multiple intra-organizational levels in multifaceted functions (VanDeusen Lukas et al., 2007). Similarly, projects are actually change initiatives (Wideman, 1995). This is largely because integration improves coordinated care, which has been defined as a collection of fragmented services (Ogles et al., 1998). For instance, a centralized patient intake system, care management, and coordinated teams are all examples of this (Ogles et al., 1998). Integration models arose as a result of such fragmentation, in which health services are organized around functions rather than around patients' direct needs. As a result, functional units created territorial silos within the health system, oblivious to the patient's quality of experience, resulting in low patient satisfaction ratings and increased costs (Leatt et al., 2000).

Integrated healthcare models have evolved to place a premium on the continuum of care and the manner in which health services are coordinated to accommodate it (Leatt et al., 2000). Integrated models are the most effective way to support superior organizational performance, when they are supplemented by rigorous quality improvement initiatives (Dey & Hariharan, 2006). In other words, integration improves an organization's performance when quality improvement is a priority. While Dey and Hariharan (2006) developed a logical framework for healthcare systems that is consistent and is based on the integration of clinical and non-clinical practices, there is a dearth of practical guidance on how to apply integration within health systems (Suter et al., 2009).

The literature reviews the evolution of integrations in healthcare. Vertical and horizontal integrations gained popularity in the latter half of the twentieth century. According to Burns and Pauly (2002), vertical integration occurs through the acquisition of primary care physicians; physician alliances are formed between hospitals and organizations that manage services and have an established organizational culture focused on patient health maintenance. Horizontal integrations, on the other hand, occur when mergers and strategic alliances result in the development of a multi-hospital system (Burns & Pauly, 2002). Integrated delivery systems (IDS) gained popularity toward the end of the twentieth century, particularly in the healthcare industry (Longest, 1998). IDS provide coordinated service delivery across the continuum of care, enabling organizations to structurally integrate and provide a range of services to customers (Longest, 1998). Regardless of the approach taken, the geneses of integration activities were an attempt to address the fragmented and uncoordinated nature of services (Levesque et al., 1999). Integration is motivated by the desire to overcome barriers associated with information sharing, duplication of services, resource competition, cycle time, and a holistic treatment approach that improves patient satisfaction and wellness (Levesque et al., 1999). One must be cautious not to view integration as a cost-cutting measure, but rather to focus on the barriers people face when seeking health care. Burns and Pauly (2002) state unequivocally that hospital mergers achieve little in the way of economies of scale and cost savings. However, while clinical consolidations during horizontal integrations will result in cost savings, they will face political and geographic obstacles in attempting to address fragmentation.

When leading integrations, it is critical to determine which services should be integrated. According to conventional wisdom, hospitals should be responsible for acute and subacute care (Lega, 2007). Integration efforts indicated that a number of services could be provided in the community by general practitioners or other health authorities rather than being confined to hospitals. These changes have an effect on how health organizations are governed. Lega (2007) notes that governance models are put to the test when integrations occur, owing largely to the voices of external stakeholders advocating for integration. Among these external stakeholders are the dominant political ideology, communities, employed professionals, and lobbying organizations (Lega, 2007). This is demonstrated further in a change management study of ten organizations, where it was discovered that almost all of the changes were attributed to the political environment, whether within government or external relations, prompting companies to make significant changes (Quinn, 1978). However, organizational change effectiveness is contingent on the concept of readiness, which encompasses two messages: communicating to stakeholders a comparison of the current state to the desired state and the competencies associated with individual and collective efforts to effect the change (Armenakis et al., 1993). Thus, a driving force behind integration is the collective advocacy of external stakeholders for a new service system that clearly mitigates identified fragmentation and lack of coordination in the new service delivery system.

Criteria for Project Success

The success of a public health project is determined primarily by its global impact on the target population, which is difficult to quantify because the results are frequently intangible. This inability to quantify effects poses a significant challenge for project and program managers.

Success is a multifaceted concept that can be defined in either an objectivist or subjectivist paradigm, and it is influenced by a number of cultural, leadership, project, management, and behavioral factors (Shore, 1998).

Project success is a critical aspect of project management that has been studied extensively over the years but remains poorly defined in terms of its concept and the paths required to achieve it. For many years, the prevailing view of project success was centered on timely and cost-effective completion in order to generate results that met the organization's criteria, variables highlighted in the famous "triangle of virtue" that has been extensively described in the literature. Currently, our understanding of what constitutes project success or failure is much more complicated, and there is little agreement on what "project success" and "project failure" mean (Ika, 2009), owing to the fact that the literature contains a variety of viewpoints, perspectives, and approaches to this issue.

To begin, it is critical to differentiate between project success and project management success. While project success is determined by the achievement of the project's objectives or the impact of the project's final product, project management success is determined using traditional performance measures (cost, time, and quality) and is thus easier to quantify (Baccarini , 1998). When the project's long-term outcomes are projected beyond the project's completion date or the effect size is difficult to quantify (e.g., health promotion projects), the evaluation of these projects is frequently more focused on project management success. Thus, while project management success can result in project success, the

converse is not true: while it is reasonable to accept that project management failure can result in project failure, except in exceptional circumstances, the project can fail despite successful project management (Freeman & Beale , 1992).

Freeman and Beale (1992) identified seven primary criteria for project success based on a literature review: technical performance, project efficiency, organizational and management outputs (including customer satisfaction), personal growth, project completion, technical innovation and business performance, and manufacturing feasibility.

Wideman and Shenhar (1996) discuss the strong correlation between project success and customer satisfaction and argue that different time points should be used to measure project effects. In the short term, project objectives should be measured during execution; in the medium term, project direct contribution should be measured; and in the long term, future growth opportunities should be measured.

Ika (2009) places a premium on efficiency and effectiveness in assessing project success, building on an older concept [14] that project success is determined by its efficiency and effectiveness. The same author notes the evolution of additional dimensions associated with the concept of project success over time. The first period (1960s–1980s) was defined by the iron triangle (time, cost, and quality); the second period (1980s–2000s) recognized the importance of client satisfaction, organizational benefits, end user satisfaction, stakeholder benefits, and project team benefits. Indeed, success is also contingent upon the extent to which the project serves the project owner's strategic objectives and the success of the business.

In a 2008 study (Simpson, 2008) conducted in the United States, two major American consultants, Jama Software and Ravenflow, surveyed 808 employees from various industry sectors and discovered that customer satisfaction is the most important metric of project success for 86 percent. The following are some of the factors to consider: quality assurance (52%), investment return (46.1%), and cost savings (40 percent).

Schwalbe (2011) summarizes several perspectives on success found in the literature and identifies the following traditional criteria for project success:

• Scope, time, and cost objectives are met: the estimates provided for these three variables are met until the project is completed;
• Meeting customer and sponsor expectations: it is frequently more important to satisfy end users and sponsors than to strictly adhere to established cost, schedule, and scope goals;
• Project main objectives are achieved

Project Success factors

While success criteria define how success should be measured, success factors are inputs to the management system that contribute to project success either directly or indirectly. From the literature review, the Pinto and Slevin (1988) and Belassi and Tukel (1996) studies stand out because they provide a broader perspective on the use of information about success factors. To begin, the notion that the significance of each success factor varies according to project phase (WHO, 2014). That is, factors such as the project's mission, top management support, and project planning are critical during the project planning phase, strategic planning, defining the project's objectives and the process for achieving them; and factors such as customer engagement, the project team, technical functions, customer acceptance, monitoring and feedback, communication, and problem solving are critical during the subsequent phase - imitative planning. Monitoring these variables enables the project's strategy and tactical levels to be defined, thereby acknowledging that strategy effectiveness has an effect on tactical performance.

Belassi and Tukel (1996) conducted a review of the literature on success factors and examined their relationship to project success through the use of a questionnaire administered to project managers. For example, it was concluded that resource availability is far more critical than top management support for completing the project to the quality specified at the start, whereas if the focus is on completing the project on time, project manager skills and effective communication processes within the project team are both critical dimensions. The success factors identified in the literature review were classified into four categories, and a framework was developed that enables, for example, a rapid diagnosis of whether the project is failing due to issues related to the project manager or exogenous factors beyond his control (Table 1 - next page).

Success in Public Health Projects

Public health projects focus on creating healthy environments for people and are critical for population welfare. The scant literature in the field of public health describes findings that differ from those previously presented. Medlin et al. (2006) analyzed the factors that contributed to the development and implementation of cost-effective interventions in healthcare and emphasized the importance of strong leadership, effective management, realistic financing arrangements, country ownership, openness and receptivity to learning by doing, and constantly improving strategies and processes through the incorporation of new research findings. Another study (Tempfer & Nowak, 2011) examined organizational development in healthcare and identified the following success factors: adequate financing; collaborations; advanced project logistics; small-scale projects; and adequate internal and external communication.

Table 1: Groups of project success factors (Belassi & Tukel , 1996)

Project manager	- Ability to delegate authority - Ability to make choices - Ability to coordinate - Perception of their role and responsibilities- Commitment
Organization	- Support from top management - Project organizational structure - Support from functional managers; - Project "champion".
Project	- Size and value - Uniqueness of project activities (versus standard activities) - Density of network design - Project life cycle - Urgency of results
External environment	- Political context; - Economic context; - Social context; - Technological context; - Client; - Competition; - Sub-contracts

Being a critical topic in project management and possessing unique characteristics for public health projects, it is widely recognized in public health that the quality of a project is determined by the relevance of the products or services created, the technical and methodological quality with which these products or services are produced, and the manner in which this process is managed. Thus, a model of success factors would be extremely beneficial [EU, 2011], identifying the factors that contribute to the development and implementation of successful disease prevention and health promotion projects. To begin, this knowledge can be used as a predictive and diagnostic tool, allowing for an objective and gradual (over time) assessment of the probability of project failure and thus assisting in its improvement. Secondly, developing a broad understanding of public health success factors enables the identification, control, and minimization of issues that increase the likelihood of going in the wrong direction and the strengthening of those that add value or increase the likelihood of succeeding. This adds value to the planning of projects, particularly in terms of identifying risks and opportunities. Thirdly, it may help define a link between project success factors and project success criteria. Additionally, it may aid in identifying significant relationships between project attributes and success, as well as providing project managers with pertinent information about success factors critical to the successful completion of the project or project phase.

Final Thoughts

Change management is a proactive approach that involves stakeholders in the decision-making process, including monitoring their concerns and empowering them to take action to alleviate them. Wells (2012) conducted a qualitative study to ascertain the benefits and support provided by project management methodologies (PMM) in the information technology and information systems industries. The study discovered that 47.9 percent of respondents viewed strict adherence to PMM as a barrier to project delivery. PMM, according to the project managers, focuses on management, compliance, and control, rather than guidance and support, when embarking on projects.

Change-initiating projects can create ambiguity. Project managers must feel at ease working in this environment. According to Hagen and Park (2013), project managers who successfully manage change in ambiguous environments demonstrate innovation, entrepreneurial traits, and adaptability. Similarly, improvisational approaches are advantageous when working on a change project (Leybourne, 2006). Due to the fact that the health sector is not a static environment, project planning within integrated healthcare planning requires improvisation due to the necessary management of stakeholder engagement. This study indicates that agile techniques may be a critical consideration for project teams to adopt, as nearly half of respondents advocated for their use. Agile methodologies received consideration due to their ability to adapt to fast-paced and volatile environments, particularly in the software industry. However, proponents of agile techniques argue that they are more appropriate as a people-centered approach when projects result in environmental adaptations (Syed-Abdullah et al., 2006). Additionally, agile has been a popular methodology due to the inherent flexibility it brings to projects (Christopher, 2000).

Conclusion

Government organizations have been impacted by the twenty-first century's economic constraints, which have resulted in downsizing, a lack of in-house expertise, and agency restructuring (Soni, 2004). This type of pressure has resulted in government actions such as integrations, mergers, downsizing, and closures. In the Canadian province of Ontario, healthcare integration has been widely accepted as a necessary process for improving patient care and addressing fiscal constraints. Change management has become a critical issue for healthcare organizations. During project management implementation, one cannot ignore the impact of change on the healthcare sector.

The field of project management has expanded beyond engineering, construction, and information systems since its inception (Kloppenborg & Opfer, 2000). Project management practices have been integrated into government organizations as a result of new hires from such vocations bringing their expertise and practices with them. Managing change in a healthcare setting presents unique challenges associated with managing projects that rely on stakeholder support.

Given the dynamic nature of the health sector, projects must be approached iteratively. Public health projects are fundamentally different from engineering or information technology projects. Public health is concerned with assessing and monitoring the health of communities and vulnerable populations in order to identify health problems and priorities, developing public policies to address identified local and national health problems and priorities, and ensuring that all populations have access to appropriate and cost-effective care, including disease prevention and promotion. Additional research is needed to advance our understanding of the factors that contribute to the success of public health projects and how to optimize them. It is believed that knowledge will be relevant and will contribute significantly to the theoretical and practical value of health public strategy planning and strategic and operational management of public health projects. We propose that as future work, we develop a model of success factors for public health projects.

Despite the sector's unique characteristics, its economic and social significance in global society, the significant investments made by health ministries worldwide in projects and programs that contribute to the National Health Plan, the funding opportunities available for cross-country initiatives, and the large number of private project-oriented organizations that operate.

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Gastro-esophageal reflux disease and poorly controlled asthma in pediatric population: are they linked? Effect of anti-reflux treatment

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Samer Abdullatif Ali. Gastro-esophageal reflux disease and poorly controlled asthma in pediatric population: are they linked? Effect of anti-reflux treatment. World Family Medicine. 2021; 19(5): 97-110 DOI: 10.5742/MEWFM.2021.94056

Abstract

Gastro-esophageal reflux disease GERD is the backward flow of stomach acids into the esophagus. When this acid enters the lower part of the esophagus, it can produce a burning sensation, commonly referred to as heartburn. (GERD) is the most common esophageal disorder in children. It causes various pulmonary manifestations and bronchial asthma is one of them. The relationship between GERD and pulmonary manifestations is quite challenging and ongoing research efforts have focused on the elucidation of the pathogenesis of GERD induced asthma.

The aim of this article is to assess the prevalence of GERD in a group of moderate persistent or severe persistent asthma and to evaluate the clinical response of asthma to anti-reflux treatment.

Methods: Using internet search, a comprehensive literature review was done and words such as Bronchial asthma, gastro esophageal reflux disease, Asthma; Proton pump inhibitors; were searched.

The references of the relevant articles on this subject were also searched for further information.

Results: Analyses of results of various studies from various parts of the world were considered and their prevalence was noted to access the correlation between asthma and GERD.

Conclusion: The results of review research indicate a relationship between gastroesophageal reflux and asthma, patients with persistent asthma should be screened for reflux and receive treatment for better control of their asthma.

Key words: Gastro-esophageal reflux disease, asthma, pediatric population, anti-reflux treatment

Introduction

Gastroesophageal reflux, defined as the passage of gastric contents into the esophagus, is distinguished from gastroesophageal reflux disease (GERD), which includes troublesome symptoms or complications associated with GER [1]. Differentiating between GER and GERD lies at the crux of the guidelines jointly developed by (NASPGHAN) / (ESPGHAN) [1]. Therefore, it is important that all practitioners who treat children with reflux-related disorders are able to identify and distinguish those children with GERD, who may benefit from further evaluation and treatment, from those with simple GER, in whom conservative recommendations are more appropriate. Studies on normal infants demonstrated episodes of reflux as much as 73 times per day [2]. Infant reflux becomes evident in the first few months of life, peaks at 4 months old and disappears in up to 88% by 12 months old and almost completely by 24 months old [3]. About 60% of children with asthma have concomitant gastroesophageal reflux disease (GERD)[4] . In children, GER can present with respiratory manifestations for example chronic coughing, asthma, laryngeal spasm, apnea, stridor, pulmonary dysplasia. Nocturnal wheezing or coughing, with inadequate response to medical treatment for asthma, negative family history of atopia and early onset of bronchial hyper-reactivity characterize patients who should be studied for GER and wheezing can be the only manifestation of reflux in some children, indicating occult GER[5]. The prevalence of symptoms of GERD among individuals with asthma is substantially higher than in the normal population and similarly the prevalence of asthma in individuals with GER is also higher than in controls [6]. Gastroesophageal reflux (GER) may cause chronic respiratory disease by vagal response and tracheal aspiration of gastric contents [7]. Aspiration of gastric contents changes pulmonary resistance and causes reactive airway obstruction. Although older studies from the 1990s suggested that GERD may aggravate asthma, recent publications have suggested that the impact of GERD on asthma control is considerably less than previously thought [8].

The prevalence of GERD is higher in children suffering from obesity, neurological diseases, congenital heart disease, gastrointestinal tract abnormalities, congenital diaphragmatic hernia, and chromosomal abnormalities; also obesity is known to be a risk factor for increased reflux. Respiratory complications of GERD are common in the pediatric population, asthma being the most widely studied and whose occurrence is mainly attributed to vagal mechanisms, neurogenic inflammation, acid micro aspiration, and increased bronchial reactivity [8]. Furthermore, gastroesophageal reflux may contribute to airway inflammatory events, possibly by sensory nerve stimulation and the subsequent release of tachykinins into the airway [7]. A review of recent studies concerned the treatment of GER in asthmatics, both with pharmacological and surgical methods. Beneficial effect of anti reflux therapy on the course of asthma has been emphasized [9]. In addition, because GERD is a common condition, particularly in young children, the role reflux plays in the worsening of asthma symptoms and the potential benefit on asthma of anti-reflux therapy warrants further exploration[10]. Furthermore, medical treatment of asthma has been implicated in the pathogenesis of GERD especially theophylline has been implicated in an increase in gastric acid secretion and in a decrease of lower gastroesophageal sphincter pressure, enabling the appearance of GERD[11].

Pathophysiology of GERD-induced Asthma

Several proposed mechanisms about the pathophysiology of GERD-induced asthma exist, although these mechanisms are not completely understood. Proposed mechanisms of GERD-induced asthma include a vagally mediated reflex, heightened bronchial reactivity, micro aspiration and immune system modification. The pathways of some esophageal and airway sensory nerves terminate in the same regions of the CNS. It appears possible that synergistic interactions between esophageal nociceptors and airway sensory nerves may precipitate the asthma-like symptoms associated with GERD [12]. The esophagus and bronchial tree share embryonic origins and innervation through the vagus nerve; therefore, acid in the esophagus could stimulate esophageal receptors, initiating a vagally mediated reflex [13]. Many studies show that the vagally mediated reflex mechanism is important to GERD-induced bronchoconstriction, while others report conflicting data. Mansfield and Stein showed that patients with reflux had a 10% increase in airway flow resistance [14]. Wright et al measured airflow and arterial oxygen saturation before and after esophageal acid infusions in 136 individuals [15]. Measurements of airway flow, arterial oxygen saturation, and pulse rate were performed before and after intraesophageal infusion of sterile water, normal saline solution, and 0.1 N hydrochloric acid. Highly significant reductions in heart rate, airway flow, and arterial oxygen saturation were noted after infusion of normal saline and 0.1 N hydrochloric acid compared with baseline water infusion. It is concluded that acid-induced, vagally mediated esophagobronchial reflexes are present in humans [15]. Intraesophageal acid infusions caused a decrease in PEF in all groups without evidence of micro aspiration, implying a vagally mediated reflex may be involved [16]. Field analyzed 18 studies that reviewed the effects of GERD on pulmonary function in adults with asthma [17]. He concluded that the effects of esophageal acid on pulmonary function are minimal and only affect a minority of subjects. Another proposed mechanism of GERD-induced asthma is heightened bronchial reactivity. Herve et al[18] analyzed the effect of esophageal acid infusion on expiratory flow using voluntary isocapnic hyperventilation of dry air and methacholine challenge tests in asthmatics with and without GERD. The total dose of methacholine required to reduce the FEV1 by 20% was significantly lower when esophageal acid was infused vs normal saline solution[18]. Some data suggest that exposure to esophageal acid may increase bronchial activity to other stimuli. Perfusion of acid into the distal esophagus caused slight but significant

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In addition, increased gastroesophageal reflux and impaired function of the upper esophageal sphincter may contribute to more transpharyngeal spray and micro-aspiration, in turn leading to airway irritation, inflammation and hyper-responsiveness, which may cause or increase the severity of asthma [23].

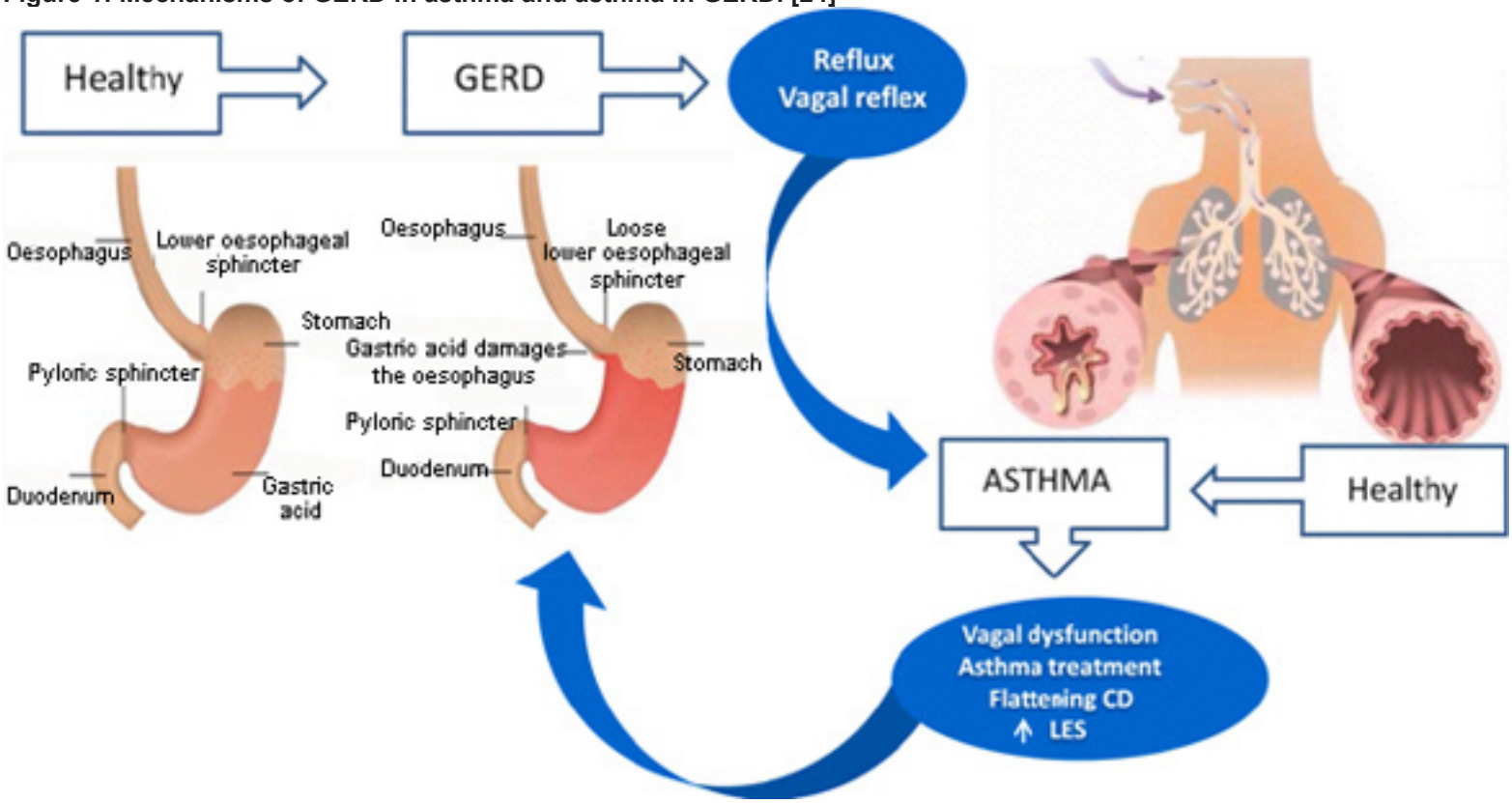
A recent study conducted at Duke University showed that GERD may alter the immune system's response to allergens, further strengthening the link between GERD and asthma [20]. Chronic aspiration has a profound effect on the nature of the immune response to aerosolized allergens in a model of experimentally induced airway hypersensitivity. The comparison group's response was more balanced, releasing both type 1 and type 2 helper T cells. This study shows that microaspiration may lead the immune system to generate an asthmatic response [21].

The prevalence of GERD in asthmatic patients

The association of asthma with gastroesophageal reflux disease has attracted particular attention because many patients with asthma have GERD. The prevalence of asthma has increased; however, the number of patients who die from it has decreased (1.3 per 100,000 patients in 2018) [25]. In the United States, an estimated 20 million people have asthma, and almost 20% of the U.S population suffers from the classic symptoms of GERD, such as heartburn and regurgitation, at least once a week [26]. Some studies have reported a higher prevalence of asthma among obese individuals [27]. Thus, obesity may be a strong predisposing factor for both GERD and asthma and a risk factor for both conditions.

Gastro-esophageal reflux is commonly noted in asthmatics, with a reported incidence of up to 60% in children with moderate-to-severe asthma [28]. It has been implicated as a cause of asthma exacerbations and increasing asthma symptoms. It was reported that GERD was diagnosed in 75% of children with chronic asthma who were refractory to medical treatment [29]. In a study for GERD in preschool children they found that (66.7%) had positive results (GERD positive group), in (80%) who underwent GERD therapy (famotidine), respiratory symptoms were decreased. In those patients the incidence of acid reflux during waking hours was more frequent than during sleeping hours [30]. Mays,[31] using a barium esophagogram, found that 13 of 28 (46%) asthmatics had evidence of reflux vs 23 of 468 (5%) normal control subjects.

Figure 1: Mechanisms of GERD in asthma and asthma in GERD. [24]



More recently Sontag et al [32] evaluated 186 consecutive adult asthmatics with endoscopy and esophageal biopsy and found that 79 (43%) had evidence of esophagitis or Barrett's esophagus. Among the 109 patients with asthma who participated in the study, 77% experienced heartburn and 55% experienced regurgitation; symptoms were higher than in the control groups. O'Connell et al also utilized a symptom survey to examine prevalence of GERD in 189 patients with asthma in a Veterans Administration (VA) hospital [33]. Seventy-two percent of the patients reported heartburn. A study by Chipps BE, Haselkorn found that a total of 341 (27.7%) patients were enrolled in TENOR II and were representative of the TENOR I cohort. The most frequent comorbidities were rhinitis (84.0%), sinusitis (47.8%), and gastroesophageal reflux disease (46.3%) [34]. These results suggest that the prevalence of GERD symptoms in patients with asthma is increased; however, it does not establish causality. However, as in the chronic cough population, some asthmatics may have significant GERD without classic reflux symptoms. Irwin et al [35] reported that GERD was clinically "silent" in 24% of asthmatics. So it would make sense to treat any concomitant gastro-esophageal reflux in patients with difficult severe asthma, but larger trials are needed to establish the value of this treatment in the poorly asthma patient.

Asthma as respiratory disease

Childhood asthma is not a singular disease, but rather a uniquely diverse disorder with variable presentation throughout childhood. Asthma affects 8.3% of children in the United States and is the most common chronic disease of childhood [36]. Three phenotypes have been identified in children with asthma: transient wheezing, non-atopic wheezing of the toddler and pre-school-aged child and IgE-mediated wheezing. Transient wheezing is associated with symptoms that are limited to the first 3-5 years of life, decreased lung function, maternal smoking during pregnancy and exposure to other siblings or children at daycare centers [37]. Classically, asthma is considered as a Th2- associated eosinophil-predominant atopic disease. However, the true pathophysiological picture is less straightforward, with asthma representing a complex group of conditions. Efforts have been made to define and classify phenotypes/endotypes based on the age of onset, duration, severity and presence of allergy amongst other factors [37]. Recently, a Th17-mediated neutrophil-predominant phenotype with more severe disease that may be less responsive to steroids was described, in which increased glucocorticosteroid receptor (GR) signaling and oxidative stress were suggested as mechanisms of steroid resistance [38].

The diagnosis of asthma requires the presence of episodic respiratory difficulties characterized by variable and reversible airway obstruction. It has a high prevalence worldwide and is traditionally considered to be an allergic disease. Most cases are responsive to treatment with bronchodilators and anti-inflammatories, as recommended by national and international guidelines; however, approximately 10% of asthmatic patients are refractory even to optimal therapy. Gastroesophageal reflux disease (GERD) is a common disorder in asthmatic patients and the two disorders may be linked pathophysiologically.

A patient presented with paroxysmal dyspnea, wheezing and repeated cough, particularly at night and in the early morning. Further testing demonstrated reversible airflow limitation: the diurnal variation in the peak expiratory flow rate was ≥ 20% and the forced expiratory volume in one second was increased by ≥ 12% and ≥ 200 mL in absolute volume by β2 agonist inhalation and a positive methacholine challenge test, respectively. In this case, the diagnosis of asthma can be readily established [39].
It is important to establish that the asthmatic has been provided with and indeed taken an appropriate dose of inhaled or oral corticosteroid therapy. Under-treatment is consistently recognized in fatal and near fatal asthma and is frequently the most important contributor to poor asthma control [40]. Patients with the highest levels of adherence to treatment have significantly fewer exacerbations than those with a confirmed record of poor compliance. Reported levels of compliance to treatment with inhaled corticosteroid therapy has ranged from as low as 30% in adolescents to 55% in adults [41], with similarly poor compliance with oral corticosteroids demonstrated in some studies.

Unfortunately, about 10% of asthmatics appear to have refractory disease despite receiving optimal therapy, leading to increased morbidity and increased costs associated with treatment[42]. In making the diagnosis of refractory asthma, it is important to consider and exclude other diseases in the differential diagnosis of wheeze, dyspnea, cough, and eosinophilia. Specifically, patients should be evaluated for other diseases such as chronic obstructive pulmonary disease, bronchiectasis (including allergic bronchopulmonary aspergillosis and cystic fibrosis), and vocal cord dysfunction [42].

Refractory asthma encompasses wide ranges in both clinical symptoms and in natural history. Patients may appear to have highly labile disease, with wide swings in peak flows, while others are more chronically and severely obstructed. Other patients produce copious amounts of phlegm, some have associated sinus disease and gastroesophageal reflux, while others do not [42]. In poorly controlled asthma, add on therapies used as part of combination treatment include bronchodilators, mainly long-acting β-agonists but also theophylline or new biological therapies, such as humanized antibodies against IgE, interleukin 5 and interleukin 4R/13; such therapeutic strategies offer hope to improve the quality of life and long-term prognosis of severe asthmatics with specific molecular phenotypes [43].

Does Asthma Predispose Patients To Get GERD?

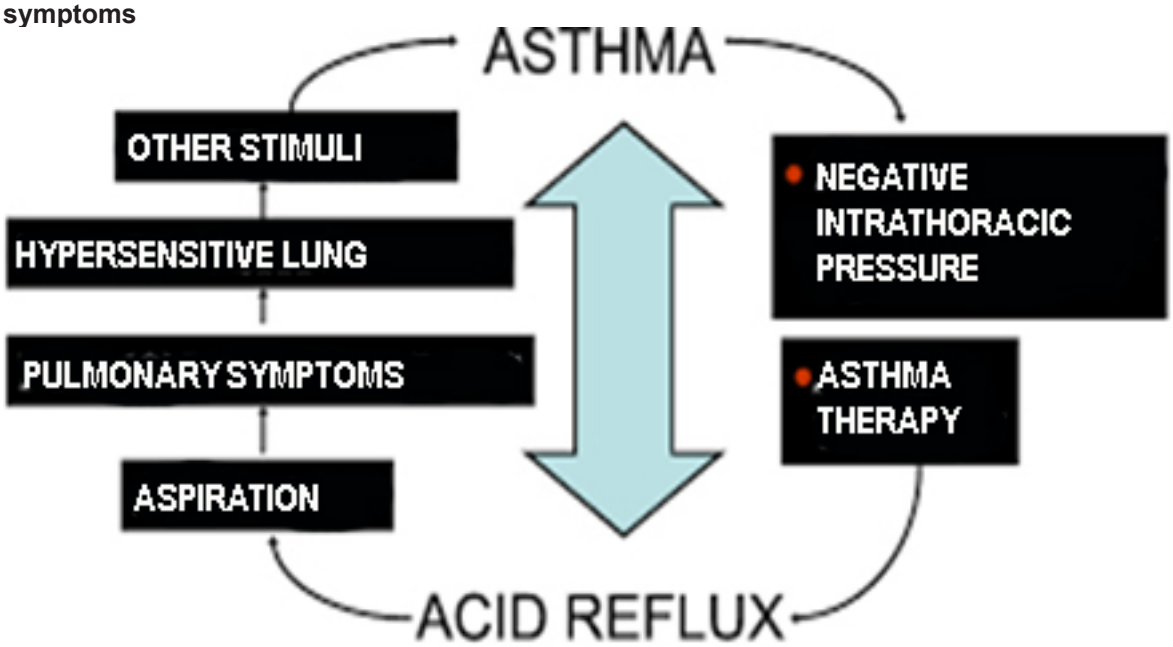
Pathophysiologically, asthma may predispose an individual to the reflux of gastroduodenal contents into the esophagus by a variety of mechanisms, including the following: increased intrathoracic pressure, vagus nerve dysfunction, altered diaphragmatic crural function, and decreased lower esophageal sphincter (LES) pressure due to medical therapies for asthma [44]. LES motility and esophageal pH were assessed in eight subjects with intermittent asthma and eight healthy volunteers during three consecutive 30-minute periods: baseline, methacholine-induced bronchospasm, and after inhalation of the beta2-agonist salbutamol. They concluded that in patients with asthma, methacholine-induced bronchospasm increases the rate of transient LES relaxation (TLESR) and the number of reflux episodes [44]. Airway obstruction may also predispose asthma patients to GERD by relaxing the lower esophageal sphincter (LES). Zerbib et al showed that airflow obstruction significantly increased the number of LES relaxations and the number of reflux episodes [44]. The number of LES relaxations decreased when airflow obstruction was reversed.

Negative pleural pressures can increase the pressure gradient between the thorax and abdominal cavity promoting reflux [45]. In a study that found that among the asthmatic group 22 patients (44%) had GER and the main mechanism for GER triggering asthma is the vagally mediated reflex initiated by acid in the distal esophagus [46].

Bronchodilator medications may also decrease LES pressure. The theophylline treatment caused a significant increase in total reflux time and reflux symptoms but did not worsen the asthma. Patients with sub-therapeutic serum levels showed significant improvement in lung function and those with therapeutic serum levels did not [47]. In a randomized, double-blind crossover study, Hubert et al [48] administered oral theophylline or placebo to asthmatics finding no difference in the number of reflux episodes or total acid exposure time while pulmonary function improved. In addition, Ekstrom and Tibbling [47] examined 25 asthmatics with GERD using 24-hour esophageal pH testing and found that asthmatics with therapeutic theophylline levels had a 24% increase in total esophageal acid exposure. It is concluded that theophylline, in view of its potential to exacerbate GO-reflux, should be used with caution as maintenance therapy in asthmatic patients with GO-reflux [47]. Inhaled albuterol reduced lower esophageal sphincter LES basal tone and contractile amplitudes in the smooth muscle esophageal body in a dose-dependent manner. Inhaled beta (2)-agonists may increase the likelihood of acid reflux in a subset of patients who receive cumulative dosing [49].

A study that measured the lower esophageal sphincter pressures and studied gastroesophageal reflux patterns over 24 hours using an ambulatory Gastroreflux Recorder (Del Mar Avionics, Irvine, CA) in 44 controls and 104 consecutive adult asthmatics, found that most adult asthmatics, regardless of the use of bronchodilator therapy, have abnormal gastroesophageal reflux manifested by increased reflux frequency, delayed acid clearance during the day and night, and diminished lower esophageal sphincter pressures [50]. On the other hand Field et al reported that no asthma medications were associated with an increased likelihood of having GERD symptoms[51]. However, in conclusion, these data suggest that asthma should be treated aggressively with bronchodilators and anti-inflammatory agents; however, theophylline should be used carefully in asthmatics with GERD.

Figure 2: Asthma and GERD may exacerbate each other. GERD may induce bronchospasm, and asthma may induce GERD. Breaking the cycle by aggressively treating both conditions is the key to mitigating patients' symptoms



Does GERD in infants increase asthma risk?

Gastroesophageal reflux (GER), the regurgitation of gastric contents into the esophagus or mouth, is a common phenomenon among healthy infants, with approximately 50% of 0- to 3-month-old infants and 67% of 4-month-old infants experiencing at least one episode of vomiting per day[52]. It is unknown whether gastroesophageal reflux disease (GERD) during infancy affects infant bronchiolitis severity or childhood asthma inception. Although bronchiolitis increases the risk of childhood asthma development, and childhood GERD and asthma are associated[53]. Cough was the most prevalent pulmonary symptom in infants with gastroesophageal reflux disease (GERD), according to findings presented at the CHEST Annual Meeting, held October 6-10, 2018 in San Antonio, Texas. Dr Silveyra and colleagues at NYU Winthrop Hospital in Mineola, New York, conducted a retrospective review of 262 patients with GERD (ages 0-12 months). A total of 138 (53%) patients had pulmonary symptoms and 124 (47%) did not have pulmonary symptoms. Cough was the most prevalent symptom at 47% vs wheezing or breathing difficulty. He found that patients with pulmonary symptoms had a higher incidence of early onset asthma (63%; median age at diagnosis, 8.4 months) and use of albuterol (92%) than patients without pulmonary symptoms [54]. It is not known if pre-existing GERD modulates the severity of infant bronchiolitis or is associated with increased risk of childhood asthma diagnosis. In a study among 432 infants with acute respiratory illness, 45 (10.4%) had parentally reported GERD. Infants with reported GERD were more likely to be white, have a parent with allergic rhinitis, and have a history of previous treatment for wheezing. Infants with reported GERD had a slightly lower median gestational age compared with infants without reported GERD [55]. Robert S. Valet studied four hundred thirty-two infants presenting with acute respiratory illness due to bronchiolitis or upper respiratory infection. Those studied with primary exposure had a parental report of a previous GERD diagnosis. He found that GERD during infancy may contribute to acute respiratory illness severity, but is not associated with asthma diagnosis at age 4 years[56].

Chronic cough and GERD

Chronic cough is a troublesome disorder in many ways. Cough is the most common reason why people seek medical help. Gastro-esophageal reflux (GER), in addition to asthma and postnasal drip syndrome (PNDS), is considered a common cause of chronic cough in all age groups. Chronic cough (> 4 weeks duration) [57] in children, a common presenting symptom to pulmonologists and allergists, is associated with burden (e.g. recurrent doctor visits and use of medications) and impaired quality of life to the child and their parents [58].

Whether gastroesophageal reflux (GER) or GER disease (GERD) causes chronic cough in children is controversial. GERD is commonly reported to be associated with chronic cough in adults [59]. It has not been commonly identified as the cause of pediatric cough [60]. It should be noted that many patients with chronic cough possibly due to gastro-oesophageal reflux disease do not have the typical symptoms associated with gastro-oesophageal reflux disease (i.e., heartburn and regurgitation) [61].

There are two proposed mechanisms of GERD associated cough: (1) acid in the distal esophagus stimulating an esophageal-tracheobronchial cough reflex, and (2) micro-aspiration or macro-aspiration of esophageal contents into the larynx and tracheobronchial tree. Irwin et al,[62] using dual-probe 24-hour esophageal pH testing with

the distal pH electrode placed at least 6 cm above the gastroesophageal junction and the proximal pH electrode in the proximal esophagus at least 2 cm above the thoracic inlet, noted that cough occurred simultaneously with acid in the distal esophagus 28% of the time vs 6% of the time in the proximal esophagus. In a study by Poe Robert [61] found that GERD was the single cause of cough in 24 patients (43%); twenty-nine patients (52%) had GERD plus another cause, and 3 patients (5%) had GERD with more than two causes; twenty-four patients (43%) had cough only, while 32 patients (57%) had other symptoms of GERD. When GERD causes cough, there may be no GI symptoms up to 75% of the time. While 24-hour esophageal pH monitoring is the most sensitive and specific test in linking GERD and cough in a cause-effect relationship [63]. On other hand some other studies concluded that acid may not be the sole mediator in gastric juice causing cough [64]. They also found that reflux occurred less often in the proximal than distal esophagus and that esophagitis was not necessary for coughing during acid infusions [64]. In conclusion, patients with chronic cough who also complain of typical and frequent GI complaints such as daily heartburn and regurgitation, especially when the findings of chest-imaging studies and/or clinical syndrome are consistent with an aspiration syndrome, the diagnostic evaluation should always include GERD as a possible cause [63].

Bronchopulmonary symptoms in GERD

In recent decades, GERD has become increasingly recognized as a potential cause of bronchopulmonary symptoms. While most studies have focused on asthma, many other pulmonary disorders have been linked to GERD, including aspiration pneumonia, interstitial pulmonary fibrosis, chronic bronchitis, and bronchiectasis. Pulmonary symptoms related to GERD include shortness of breath, wheezing, and chronic cough. Acid reflux should be considered if signs of GERD are present, symptoms are unexplained, or symptoms are refractory to therapy [65]. For many patients, pulmonary disorders may be the only indication that GERD is present.

Clinical presentations

Many patients with asthma report GERD symptoms (Table 1)[66], including heartburn, regurgitation, and dysphagia. Furthermore, respiratory symptoms related to reflux symptoms have been reported, as has the need for anti-reflux medication [67]. Additional to asthma, is vocal cord dysfunction syndrome. Vocal cord dysfunction syndrome has been associated with GER [68]. Paroxysmal laryngospasm, occurs with GER, with or without asthma, and may be confused with asthma. Nocturnal asthma symptoms are frequently present in patients with difficult-to-control asthma, raising the suggestion that GER contributes to both nocturnal symptoms and poor asthma control. Kiljander and colleagues reported that in patients with asthma with combined symptoms of GER and nocturnal asthma, treatment with esomeprazole resulted in a modest improvement in morning and evening peak flow [69].

Alternatively, some patients may have clinically silent GERD, especially in the context of difficult-to-treat asthma. A high degree of esophageal dysfunction has also been reported among patients with asthma, including esophageal dysmotility, LES hypotension, and a positive Bernstein test [70]. Specific esophageal motility abnormalities in asthma patients include ineffective esophageal motility, with a reported prevalence of 53.3%; nutcracker esophagus, with a prevalence of 7.6%; and low LES pressure, with a prevalence of 15.4% [71]. Endoscopy might also reveal esophagitis or Barrett's esophagus among patients with asthma, although most will not have esophagitis [72]. Compared with normal controls, patients with asthma have a higher frequency of reflux symptoms, more frequent LES hypotension by manometry, and increased esophageal acid contact times by 24-hour pH monitoring, which further supports the association between GERD and asthma [73].

Diagnosing GERD in Patients with asthma

All asthmatics should be carefully questioned about esophageal and extra-esophageal manifestations of GERD. Specific questions should include whether asthma symptoms occur after eating a large or a high-fat-containing meal, or with foods that are known to decrease LES pressure. It is also worthwhile to inquire if cough, dyspnea, or wheezing is associated with a reflux episode. Questions should also include whether frequent cough and hoarseness are present and whether asthma symptoms occur when lying down. In addition, inhaler use when experiencing GERD symptoms should be assessed [74]. Field et al [75] published an asthma and GERD questionnaire that can be incorporated into patient care. If the history is consistent with GERD and due to the poor sensitivity of endoscopy and pH monitoring, empiric therapy with proton pump inhibitors (PPIs) is now considered the initial diagnostic step in patients suspected of having GERD-related symptoms [76], so no further diagnostic workup is necessary. Empiric therapy is considered successful if asthma outcomes are improved. Further testing is recommended in patients in whom empiric therapy is unsuccessful or who have symptoms suggesting complicated GERD (esophagitis, esophageal stricture, Barrett's esophagus, or neoplasm) [74]. Of note, many asthma patients with GERD do not experience reflux symptoms; this subset of patients may be difficult to diagnose. Ultrasonography is not indicated for GERD diagnosis as the results are clearly investigator-dependent. The sensitivity of ultrasound in the 15 minutes postprandial is about 95% but the specificity is only 11% in comparison to pH-metry [77].

Regarding scintigraphy, sensitivity and specificity are only moderate, at 69% and 78%, respectively [78]. Besides demonstrating tracer that refluxes into the esophagus, scintigraphy evaluates gastric emptying and may also show pulmonary aspiration.

Table 1: extraesophageal symptoms of GERD [66]

Extraesophageal manifestations of GERD

Pulmonary presentations	Otolaryngologic presentations
Asthma	Hoarseness
Aspiration pneumonia	Chronic cough
Interstitial pulmonary fibrosis	Throat clearing
Chronic bronchitis	Chronic laryngitis
Bronchiectasis	Globus sensation
Neonatal bronchopulmonary dysplasia	Vocal cord ulcers and granulomas
Sudden infant death syndrome	Laryngeal and tracheal stenosis
	Laryngeal cancer
	Mouth soreness
	Halitosis
	Pharyngitis
	Otalgia
	Chronic sinusitis
	Croup
	Stridor
	Dysphonia
	Abnormal taste
	Dental erosions

Prolonged 24-hour esophageal pH testing plays a key role in diagnosing GERD, especially in asthmatics without classic reflux symptoms, or those who are difficult to treat. In a study In children 6 to 17 years old with mild or moderate persistent asthma on inhaled corticosteroids, without GER symptoms, abnormal pH probe diagnostic of GER disease is present in 43%[79].

The American Gastroenterological Association's medical position statement on the clinical use of esophageal pH recording recommends testing asthmatics suspected of having reflux-triggered asthma [80].

Clinical clues and tests used in the diagnosis of GERD-associated asthma (81]

Clinical clues

1. Adult onset of asthma
2. No family history of asthma
3. Reflux symptoms preceding asthma onset
4. Wheezing worsened by meals, exercise, or supine position
5. Nocturnal cough or wheezing
6. Asthma worsened by theophylline or beta2-agonists
7. Asthma requiring prolonged systemic steroid therapy

Esophageal pH monitoring
Best test for GERD-related asthma; > 50% of adults with asthma have abnormal acid reflux. Most episodes of wheezing do not occur during reflux episodes, suggesting that multiple factors are involved

Barium studies
Helpful if they show hiatal hernia or reflux into proximal esophagus
Considerable variation in prevalence of esophagitis

Overnight gastroesophageal scintigraphy
More helpful in children than in adults

Uptake in chest (from stomach) suggests micro aspiration

The effect of GERD treatment on asthma patients

The 2007 National Asthma Education and Prevention Program Guidelines for the diagnosis and management of asthma recommend that clinicians consider treatment of reflux to improve asthma control in patients with poorly controlled asthma [83]. Data from adults with GERD and asthma have shown a wide variety of outcomes, ranging from no improvement to significant improvement in clinical status and pulmonary functions [84].

The current asthma guidelines recommend that medical management of GERD be instituted for patients who have asthma and complain of frequent heartburn (pyrosis), particularly those who have frequent episodes of nocturnal asthma [85]. Three categories of medications are widely available for the treatment of reflux disease: proton pump inhibitors (PPIs), H2 antagonists, and antacids.

Proton Pump Inhibitors: The PPIs are the most potent inhibitors of gastric secretion available and the recommended therapy when treating GERD-induced asthma. PPIs should be administered 30 to 60 minutes before meals. In randomised controlled trials of treatment for oesophageal reflux in children with a diagnosis of both asthma and gastro-oesophageal reflux, Meier et al[86] studied 15 asthma patients with GER in a double-blind placebo-controlled cross-over trial with omeprazole 20 mg twice daily for 6 weeks, with use of a more than 20% change in FEV1. 4 of 14 patients (29%) had omeprazole-responsive asthma, on evaluation of the 11 non-responders, 6 (45%) had esophagitis, and the non-responders had 3 to 5 times more esophageal acid than did the responders. This points out the importance of prolonged acid suppression before determining outcome, especially in patients with significant esophageal acid exposure [86]. Furthermore, Stordal et al [87] did not find any difference in asthma outcome or pulmonary function in children with GERD and undifferentiated asthma after 3 months of treatment with omeprazole. It is likely that a brief 3-month treatment may not be optimal for observing a difference, especially when both atopic and non-atopic children are included. Moreover, Størdal et al [87] also stated that acid suppression could relieve the asthma symptoms of patients with the more severe forms of asthma and GERD.

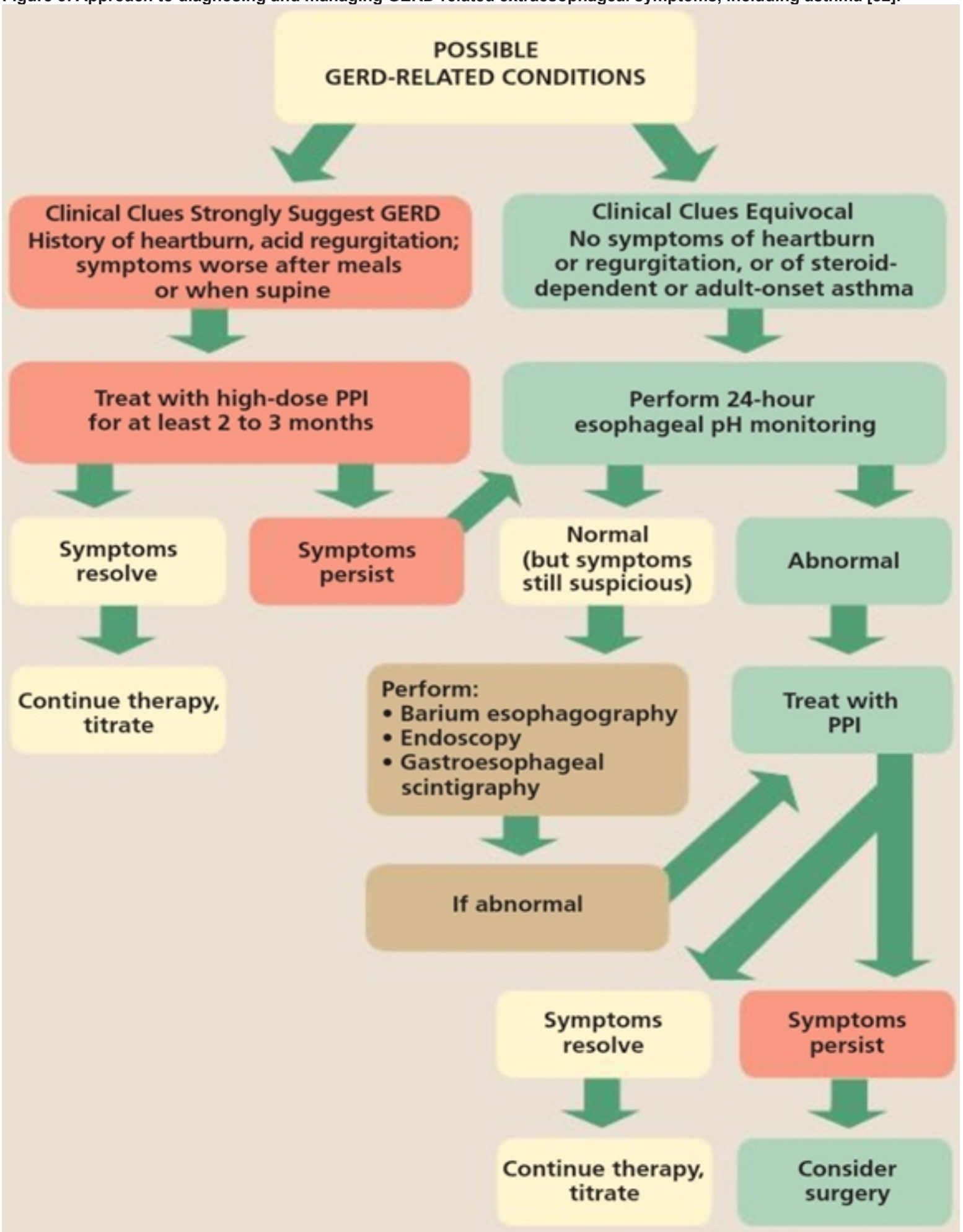
Yuksel et al [88] reported improvement in asthma symptoms in non-atopic children with GERD and asthma. Maev et al. 2003, showed that therapy of bronchial asthma associated with GERD using omeprazole in the dose equal to 40 mg per day or esomeprazole in the dose equal to 40 mg per day contributed to a reliable improvement of both pulmonary and esophageal symptoms. However, application of esomeprazole resulted in a faster reduction of bronchial obstruction and gastroesophageal reflux [89]. Although Levin et al. 1998, found improvement of peak expiratory flow rate and quality of life in asthmatics with gastroesophageal reflux after daily use of omeprazole 20 mg for 8 wk, the increase in FEV1 failed to reach statistical significance [90].

The guidelines drawn up by the British Thoracic Society (BTS) and the Scottish Intercollegiate Guidelines Network (SIGN) for asthma management [91] examine this topic. They report that the systematic review by Coughlan et al [92] selected 12 double-blind, randomized clinical trials with adults, and reported that GERD treatment did not improve asthma symptoms or lung function in concomitant asthma and GERD. A reduction in dry cough was reported, although this was probably not caused by asthma. The BTS-SIGN guidelines [91] conclude that any GERD must be treated, even if this generally has no impact on asthma. GERD may simply represent just an associated unrelated finding with asthma; it may worsen the severity of asthma, or could be a consequence of asthma itself [93].

Antacids: Antacids relieve heartburn and dyspepsia by neutralizing gastric acid. In addition to increasing the intragastric pH, they may also increase LES pressure. Generally, antacids have a short duration of action, requiring frequent daily administration.

Lifestyle Modifications: Asthma symptoms associated with GERD can be aggravated by high-fat meals that delay gastric emptying and foods that lower LES pressure. Eating or drinking acidic foods may also trigger symptoms[94].

Figure 3: Approach to diagnosing and managing GERD-related extraesophageal symptoms, including asthma [82].



Conclusion

The diagnosis and management of GER in asthmatic patients have remained challenges for years. Health care providers should be aware that GERD is a potential trigger of asthma, although not all asthma patients with GERD experience reflux symptoms. All patients with asthma should be questioned about reflux symptoms. If GER symptoms are present, then a 3-month therapeutic trial with high-dose proton pump inhibitors should be considered to see whether asthma improves. Further work is needed to evaluate the most cost-effective approach to providing therapy to these patients. Nevertheless, all patients with chronic cough or asthma should be aggressively investigated for the possibility of GERD propagating their disease.

Abbreviations: GERD= gastroesophageal reflux disease; LES=lower esophageal sphincter; PEF=peak expiratory flow, PPI: proton pump inhibitor, TENOR: The Epidemiology and Natural History of Asthma Outcomes and Treatment Regimens

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Burn Wound Infections: A Review Article

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Aminah Alturki et al. Burn Wound Infections; A Review Article. World Family Medicine. 2021; 19(5): 111-116
DOI: 10.5742/MEWFM.2021.94057

Abstract

Burn wounds induce metabolic alterations that predispose the patient to various complications. nfection is the most common cause of morbidity and mortality in this population. Bacterial profile of burn wound patients is diverse, depending on timing and location of injury. Early after burning, the predominant microorganisms are gram-positive bacteria such as Staphylococcus aureus. Subsequently, the burn wound colonizes with a variety of microorganisms comprising both susceptible and multi-drug resistant gram-negative bacteria such as Pseudomonas aeruginosa and Acinetobacter species. This review will help in understanding the epidemiology of burn wound infection and the prevalence of highly resistant bacteria in burn wound patients. In addition, it illustrates the role of strict infection control practices in preventing the nosocomial transmission of microorganisms among burn patients, and it provides guidance for empiric antibiotic therapy to avoid unnecessary broad antibiotic usage, which will reduce mortality and morbidity related to infections and decrease incidence of multi-drug resistant organisms in burn units.

Key words: Burn, Bacterial, Infections, Prevalence, multi-drug resistant organisms.

Introduction

Burn wound infection, is a very common problem all over the globe and is caused by pathogenic bacteria whether by gram-negative or gram-positive bacteria. In the last 50 years medicine has been witnessing great progress in the treatment of such complications. Burn wound infection is considered as a thermal injury (1). The treatment of such thermal injuries requires specials units. When they were treated between the 1950s through to mid-1980s as conservative therapy, sadly researchers did not fully comprehend at that time, when the scar, dead tissue on the skin, was removed, there would be a bed of microorganisms that could be mishandled by the caregivers and transmitted by their hands, by fomites i.e. clothing, soap, or any material capable of transmitting infectious diseases, and in some studies, even through the air (2). It is important to know what could be the most prevalent bacteria that is associated with a burn wound, so that it would help healthcare providers to start treating the patient as soon as they walk through the door (3). Such review is also important to know what bacteria is likely to be spreading, and stop it (3). The area where burn infections happen usually have a mix of bacteria, like normal flora, which are harmless to the body, but cannot be recognized in a burn-wounded patient (1). The review will help in a better understanding of what might be the predominant bacteria in burn wound patients; it will also help in identifying the highly resistant bacteria in those patients.

Skin as the major host defence mechanism

The skin is composed of three layers; the epidermis and the dermis layers are disunited by a basement membrane area and the final layer is the subcutaneous tissue (4). The intact human skin surface is considered as the first-line human defence mechanism which is vital for the body's homeostasis through the regulation of fluids, body temperature, and protection against infections(4). When trauma or thermal injury specifically disturbs the defence system many complications can occur(5). Burn wound infections are one of the most common forms of trauma that are likely to happen(1,6). Patients with serious injuries require immediate intervention to reduce the risk of both associated morbidities and mortality. The incidence of thermal injuries in the east Mediterranean region alone was estimated to be between 112 to 518 in every 100,000 per year in a systematic review study conducted in 2010, while hospital mortality reached 20% of the cases(5).

The etiology of burn wounds

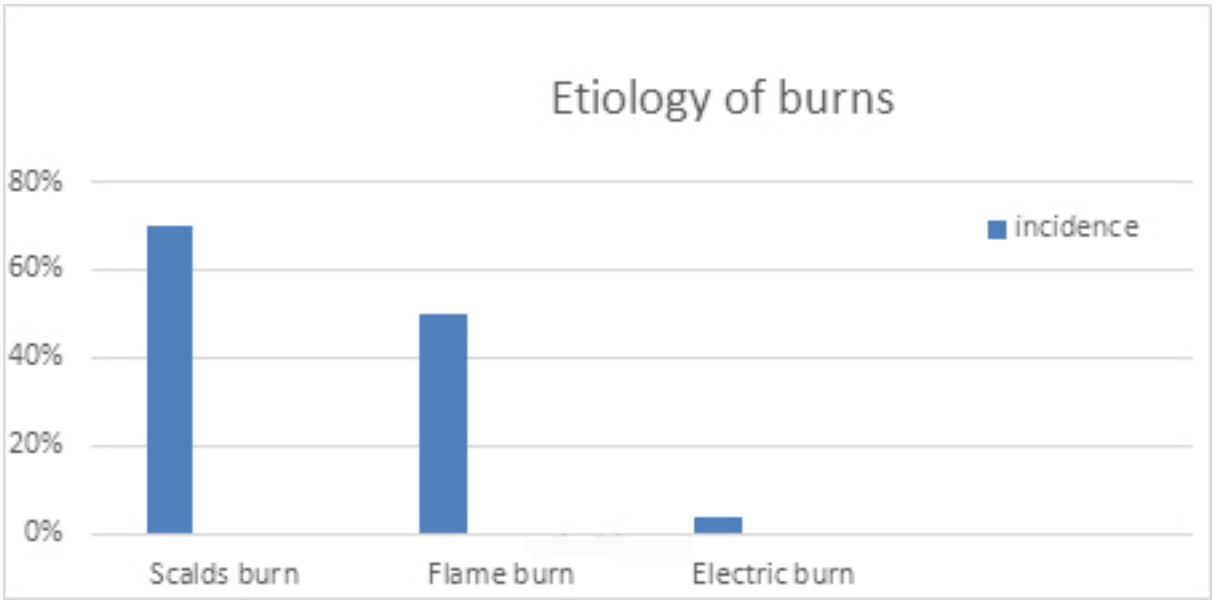
Burn injuries can be caused by a variety of environmental factors, which in addition, could be both minor and life-threatening. The majority of burns are called thermal burns since they are caused by scalds, flame, and contact with extremely hot objects. Other types of burns are electrical and chemical types of burns and they differ from thermal injury in that they tend to cause more drastic damage. Scalds are wounds that affect the skin and are caused by a hot liquid, and this type of incidence most often occurs in children amounting to 70% of burns, but they can also occur with the elderly population(7). Scalds tend to cause superficial dermal burns. On the other hand, flame burns are caused by fire, and amount to 50% of burns in adults, and the injuries tend to be deep dermal or full-thickness(7). Nevertheless, contact with a hot object is the most prevalent and tends to cause deep dermal or full-thickness burns. Electrical burns, on the other hand, are caused by the current of electricity that travels throughout the body creating entry and exit points in all layers of the tissue causing grievous damage; however, the voltage is the main determinant of the degree of tissue damage, and luckily only 3-4% of burns in admissions are caused by the electrical injury(7). Finally, chemical injuries, which are usually caused by industrial accidents, are a type of burn that tends to be deep, alkali, for example, and can penetrate the skin deeper than acid(7).

The pathophysiology of burns

A burn wound is a thermal injury caused by biological, chemical, electrical, and physical agents with local and systemic responses.1,7). Keeping that in mind, the pathophysiology of burn wounds can be characterized as an inflammatory reaction that leads to rapid edema formation (1,7). Nevertheless, understanding the pathophysiology of the burn wound in depth is vital to improving the overall management of patients; however, one must say that it is a complex process as burn wound etiologies lead to various types of injuries which in turn lead to different management processes (7).

Burn wounds result in both local and systemic responses(7). The local change was described by Jackson in 1947 and consists of the formation of three zones (8). The first zone is the coagulation zone in which it forms the maximum damage and is characterized by necrosis and irreversible tissue damage due to coagulation of the constituent Proteins (8). The second zone is the area of stasis which is considered to be peripheral to the zone of coagulation and is characterized by a decrease in tissue perfusion (8). Finally, the zone of hyperemia, which is the outermost zone where the tissue perfusion is increased (8). The systemic response, however, is mediated by the release of cytokines and other inflammatory mediators which have a systemic effect once the burn wound reaches 30% of the total body surface area (7).

Figure 1: Etiology of Burns



At the level of the cardiovascular system, there would be a loss of intravascular proteins due to the increase in capillary permeability which will lead to leakage of proteins into the interstitial compartment, and the myocardial contractility will be decreased due to the release of tumor necrosis factor α (7,8). These changes combined with fluid loss due to the burn wound, result in hypotension and hypo-perfusion at the level of organs (7,8). Also, there would be a respiratory response to the burn wound; due to inflammatory mediators which cause bronchoconstriction, and in severe burn wounds, the patient may develop respiratory distress (8). Additionally once the metabolic state is activated, the metabolic rate will increase up to three times its original rate (8). Lastly, the immune system changes which are characterized by down-regulation of the immune response affect both cell-mediated and humoral pathways (8). These changes generate a greater risk of developing infections, and in several studies, they found that sepsis is the leading cause of death among patients affected by burns.8,9). Burn Infection is defined as the presence of high concentrations (>105 organisms/g of tissue) of bacteria in the burn wound and scab (7).

The Etiology of burn Infections

The Etiology of infection in burn patients may arise due to a variety of factors. These factors can be sub-divided depending on the patient's physical and medical history. The clinical intervention must be provided in hospital settings or a living environment. In regard to the burned patient status, the relation between prevalence of burn infections and the patient immunity is well-established since the skin is considered as a first-line host defence mechanism of the body, therefore when this barrier is disturbed by a burn or any traumatic event, such as a disease or as a part of the natural aging process that will make the body vulnerable to infections (1). It is also clear that very young children, besides the elderly, have an increased risk of being burned and worse clinical outcomes than patients in other age groups(1). Moreover, medical history of underlying diseases such as diabetes mellitus, end-stage chronic kidney diseases, and liver failure might be a risk for weakened immunity and because of that developing infection factors include high body mass index (BMI), or usage of immunosuppressants like corticosteroids for certain medical conditions(1). It is also important to consider the site of the burn wound and percentage of total body surface area involved since this factor can be a major determinant of the type of infection that is possibly going to arise and its complications (1).
Hospital settings are also a core risk factor for patients with burns where different types of infection in association with each clinical intervention can develop. For example, burn wound infections of impetigo, open burn-related surgical wound infections, cellulitis, and invasive infections in unexcised burns in which patients become prone to develop more invasive infections(1). Furthermore, since colonization of the normal flora can be a source of infection, sometimes swabbing and hydrotherapy can lead to infections(1,10). Burn unit outbreaks of infection have been attributed mainly to contaminated Hubbard hydrotherapy tanks or water but in other cases to contaminated surfaces such as the patient's mattress (1). Despite the recognized infection risk of immersion hydrotherapy treatment in burn units, this was standard practice in many specialized burn centers until the 1990s(1). Lastly, health care providers are one of the most common sources of nosocomial infections as they are dealing every day with different medical cases which ease the transition of pathogens between patients unless very strict caution is taken into consideration (10).
Also, lifestyle, living, and work environment are all important risk factors. Those factors are concerned with the prevalence of pathogens in particular areas which could be various and increase the risk of easily being infected by them directly or through delaying the healing process (11,12).

The Prevalence of Bacteria in Burn wound and its importance

The reviewed articles were divided into two sections; the first part explored the prevalence of Bacteria and the second part the importance and reason for such prevalence. For the prevalence and the consideration of the environmental factors and the accuracy of articles the searched studies were conducted according to the closest regional area to Riyadh then to the furthest in a timeline of the last 5 years.

We started with Taif in Saudi Arabia since the capital Riyadh and the surrounding area lacked the required articles. The 2016 paper conducted the following predominance of bacteria in burn patients: Staphylococcus aureus, Klebsiella pneumoniae, and coagulase-negative Staphylococci were the most frequently isolated organisms, each demonstrating (20.2%), next to Pseudomonas aeruginosa (14.6%) and finally E. gram-negative(13). Comparing such results to a nearby geographical area but with a 26 year time difference, the book was titled Diseases and Agents of Klebsiella concerns to Veterans of the Gulf War. The book dates events that happened back to 1990-1991 and stated the following about soldiers who had burn blast bacterial isolates: of the 40 bacteria obtained, 30 were Gram-positive obtained from soldiers before they received antibiotics. Gram-positive commensal skin bacteria such as Staphylococcus spp. and Micrococcus spp. were found in 93% of isolates. Less common were gram-negative bacterial genera, such as Pseudomonas, Chryseobacterium, and Escherichia(14).

Moving to Iraq, Baghdad in particular, a 2016 paper informed that in a total of 182 burn patients the paper showed a prevalence of 14 (7.53%) as gram-positive Staphylococcus aureus. Gram-negative isolates were 172 (92.47%). From those 172 gram-negative bacteria the most frequently isolated bacteria were Pseudomonas aeruginosa 60 (32.26%) isolates followed by Acinetobacter baumannii 40(21.51) (15). According to the Canadian Institute of Health Research, gram-positive bacteria Staphylococcus aureus remains the leading cause of burn wound infection followed by Streptococcus and enterococcus. Gram-negative pseudomonas didn't only show prevalence, it also showed its predominance in burned-linked death by sepsis.(9).

Table 1: **The etiology of burn wound infection in different studies and their correlation with comorbidities.**

Taif	Iraq, Baghdad	Canadian	Comorbidities
Staphylococcus aureus 20.2%.	Staphylococcus aureus7.03%.	The most common organism is gram positive bacteria (Staphylococcus aureus followed by streptococcus and enterococcus).	- DIABETES MELLITUS. - End-stage chronic kidney disease - Liver failure - High BMI score - Immunosuppressed patients. - Impetigo. - Cellulitis.
Pseudomonas aeruginosa14.6%.	Pseudomonas aeruginosa32.26%.		
E. coli 10.1%.	Acinetobacter baumanii 21.51%.		

The overall reviewed articles state the high rates of mortality and morbidity are caused by burn injuries which represent a massive global health threat. Burn injuries are diverse but are unified in that they all involve necrosis of the largest organ of the body, the skin. The skin is one of the most important immune defence mechanisms(16). Such injuries do not only cause physical deformities but also cause immense psychosocial and emotional damage(17). Sepsis syndrome and bacteraemia are some of the most constant infectious complications in burn patients in the ICU; the two most common isolates from blood cultures are P. aeruginosa and K. Pneumonia (18).

The recent predominance of bacteria that build resistance against antibiotics

The search of the articles was done in consideration of the epigenetic factor according to the geographical area. The chosen reviewed papers population represented the Middle Eastern community starting from the closest region to the capital of Saudi Arabia, Riyadh to the furthest area in Africa, in a timeline of 6 years. Antibacterial resistance has been referred to as the silent tsunami facing modern medicine(3). The reviewed articles showed the shortcomings in the reports and surveillance, which may affect the regular updates regarding the constant developing resistance. Starting from Saudi Arabia the reviewed articles regarding the predominant bacteria that devolved resistance showed a lack in published papers according to Al-Ali who studied 220 admitted patients in the burn unit of AlHada Military Hospital, Taif back in 2015. The predominance of bacterial resistance was reported as the following; gram-negative bacteria resistance: E. coli found to be resistant in 89 out of 220 cases representing 40.4%. Pseudomonas aeruginosa 87 (39.5%). Klebsiella pneumoniae 62 (28.1%), while Proteus mirabilis 33 (12.7%). In contrast, Morganella morganii found to be resistant in 22 out of 220 cases representing 11.3%. Acinetobacter baumannii 43 (19.5%). Gram-positive bacterial resistance: Staphylococcus aureus was found to be resistant in 44 out of 220 cases representing 20%. However, coagulase-negative staphylococci were 50 out of 220 yields representing 22.7%, while Enterococcus facium were recovered from 10 out of 220 cases (4.5%). The result of this study revealed that resistance of Staphylococcus aureus to 15 antibiotics, and was fully susceptible to oxacillin, vancomycin, and apmecillin/sulbactam(13).

A nearby geographical study, which was done in Bahrain recently, showed that Gram-positive bacteria S.aureus was predominant in initial cultures. It was however, succeeded by Gram negative bacteria Pseudomonas(19). Research which dates to 2012 regarding the prevalence of antimicrobial resistance in clinical isolates from the whole Gulf Corporation Council countries stated that the most prevalent microorganism was Escherichia coli (10,073/44%), followed by Klebsiella pneumonia (4,709/20%), Pseudomonas aeruginosa (4,287/18.7%), MRSA (1,216/5.4%), Acinetobacter (1,061/5%), with C. difficile and Enterococcus representing less than 1% (2). A study which was done in a tertiary burn care hospital in Tehran with 3 wards (for men, women, and children separately) indicated that P. aeruginosa is the most prevalent Gram-negative bacterial species isolated from burn patients; A. baumannii and S. aureus were the second and third most prevalent species (20). A cross-sectional case-control study included 220 Iraqi patients who had burns (third-degree) with a total body surface area which ranged from 30-75% and admitted to the burn Department at Al-Kindy teaching Hospital between January – 2013 to June – 2013 indicated that burn is more common in females than males and females with infected burn (28.63%) were more common than males (11.36%). Klebsiella pneumonia is the most frequent bacteria isolated from the burn (44%) and in both sexes, females and males, 41% and 45.56% respectively from burn patients.

Klebsiella Prevalence of Bacterial Pathogens Infections in Patients with Burn Wounds (10)

Pneumonia is the most frequent bacterial isolated from the burn (80.9%). Pseudomonas aeruginosa is also resistant to these antibiotics (93.75%). Acinetobacter spp. and Bruckholderia spp. were also resistant to gentamycin, Ceftriaxone, and Cefotaxime (100%). In the case of Gram-positive bacteria, Staphylococcus aureus was resistant to imipenem (90.75%) (21). The most recent study was found in the burn and plastic surgery department, Aljalla Hospital Benghazi dated in October 2018 which stated the predominance as the following:

The most predominant bacterial isolate was Staph. Albus (33.6%), followed by Klebsiella (29.5%), N.L.F (14.7%), Pseudomonas(11.47%). E.coli (5%),N.H.S(4.1%), Staph. aureus (1.6%). Of the 11 nasal swabs obtained from nursing staff in the department,(81.8%) of them were pathogenic; predominant bacterial isolate was Staph. albus (30.7%), N.H.S (30.7%), N.L.F (23%), Klebsiella (15.3%), while11 hand swabs were obtained; (54.5%) were pathogenic, Staph.albus (50%), N.H.S (25%), N.L.F (15%), Klebsiella (10%). Of a total of 31 burned patients, 21 (67.7%) were females and 10 (32.2%) males. 120 burn swabs were collected from them, and the predominant bacterial isolate was Pseudomonas (50.8%), Staph. aureus (16.7), Klebsiella (13.3%) ,Acinetobacter (10%), Enterobacter (2.5%), E.coli (2.5%), N.H.S (2.5%), Proteus (0.8%), Staph. Albus(0.8%). Among these isolates P. aeruginosa was found, and was highly resistant for most of the antibiotics tested (22).

The therapeutic approaches and management of burn wounds

Burn wound patients have a massive psychological and physiological impact more than any other types of injuries. Therefore, if the healthcare provided to them is insufficiently prepared, patients will induce further injuries and won't be healed properly. The initial evaluation of the injured surface and the depth of the wound at the time of admission is essential. After examining the burn wound severity by different methods, fluid replacement during the first 24 hours after the injury is applied. Despite all the improvements in therapy, the infection will remain the major cause of morbidity and mortality in burn-injured patients. In addition, infections do not only slow the healing process within the burn wound but also can lead to systemic infection and block adequate skin grafting. Therefore, including a broad-spectrum antimicrobial activity in topical agents will decrease the wound infection. Even though wound injury is considered a special kind of injury, the healing of these injuries will not differ from other types. Recent studies showed that hydration is the ultimate factor responsible for best wound healing (23). Since the definitive decisions regarding dressings or surgery are made after 48 hours of the burn review, the initial dressing needs to have the ability to remain for 48 hours without any infection. One of the famous initial dressings is Acticoat (Nano-crystalline silver dressings); the silver in its content is toxic to pathogens. As silver dressing could inhibit fibroblasts and keratinocytes, which could prolong the healing process after 48 hours of use we change it to other dressings such as , Hydrocolloids, foams, alginates, and hydrogels. The healing process requires sun protection and moisturizers. Healing time depends on the patient's wound severity, depth, pigmented skin, and genetic history of scar healing. Therefore, further treatment will depend on the individual patient's case (24).

Conclusion

Burn wound is considered a rapid inflammatory reaction that leads to edema formation, hence lack of intact skin surface and skin integrity. Lack of skin surface compromises the first line of defence mechanism resulting in burn wound infection, which is considered as the most common form of trauma. The most common etiology of burn is caused by thermal injuries, and the thermal injures are divided into three sectors; scalds, flame and contact with extremely hot objects. Scalds are considered more severe to flame and to contact with extremely hot object.

Gram positive Staphylococcus aureus is considered the predominant leading cause of burn wound infection in Taif, Saudi Arabia and by the Canadian Institute of Health Research , whereas p. aeruginosa was predominant in Baghdad, Iraq. The predominant bacteria that developed resistance according to the Al Ali Study in Saudi Arabia was gram-negative bacteria E. coli while in the Bahrain study Gram-positive bacteria S. aureus was predominant. To reach the maximum therapeutic management of burn wound a thorough evaluation of burn wound should be reached. The depth of the wound at the time of admission is essential, as well as patients' comorbidities. Early fluid rehydration and broad spectrum antimicrobial topical agents are lifesaving to facilitate wound healing and skin grafting, if needed.

Acknowledgement First and foremost, We would like to express our sincere gratitude to Prof. Khalid bin Abdulrahman and Dr.Abdullah Bukhari for the continuous support, supervision and providing invaluable guidance throughout the research.

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Role of Vitamin D on Body Systems

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Received: March 2021; Accepted: April 2021; Published: May 1, 2021.
Citation: Ghaleb Mohd Faisal Abu Hwij, Samer Abdullatif Ali. Role of Vitamin D on Body Systems. World Family Medicine. 2021; 19(5): 117-123 DOI: 10.5742/MEWFM.2021.94058

Abstract

Severe vitamin D deficiency may cause rickets in infants or children and osteomalacia in adults, though it is now uncommon in developed countries. However, subclinical vitamin D deficiency is more prevalent, and it is associated with osteoporosis and higher incidence of falls or fractures. Since vitamin D receptors are present all over the body, insufficient vitamin D status may correlate with several extra-skeletal effects, such as immune dysfunction. This paper discusses the researches regarding system-based vitamin D effects, the possible risk factors leading to vitamin D deficiency, and the recommendations of vitamin D requirements. It is well-known that vitamin D can be obtained by sun exposure or limited natural dietary sources. The American Academy of Dermatology declared ultraviolet radiation to be a known skin carcinogen, so it may not be safe or efficient to obtain vitamin D via sun exposure or other artificial sources. Therefore, many pediatricians and physicians recommend appropriate vitamin D supplementation to achieve optimal plasma concentration. Trials assessing the effects of vitamin D repletion and establishing its optimum serum level are ongoing. Medical advice for vitamin D supplementation should be individualized accordingly.

Key words: Vitamin D, bone health, metabolism, immune system, Vitamin D deficiency,

Introduction

Vitamin D is essential for calcium and bone homeostasis, especially in children because childhood and adolescence are the most critical periods for bone development. The role of Vitamin D is not limited to bone health as it also has important roles in many extra-skeletal targets throughout the body, such as the muscles, immune system, and the cardiovascular system(1,2). Severe vitamin D deficiency (VDD) is a well-established cause of disease, including hypocalcemia and skeletal abnormalities (e.g., rickets)(3-5). Although severe deficiency causing classic bone manifestations is now rare, many adults and children endure a subclinical VDD state that may predispose them to neurologic, cardiovascular, respiratory, and immune pathology (6-8).

Vitamin D metabolism

Vitamin D is a fat-soluble vitamin. The major route to obtain vitamin D is dermal synthesis after ultraviolet-B (UVB) radiation, accounting for 90% of vitamin D replenishment and only a few foods naturally contain vitamin D (oily fish, cod liver oil, egg yolks, shiitake mushrooms, liver or organ meats)(9). Cholecalciferol (vitamin D3) is from animal sources and ergocalciferol (vitamin D2) is from plants(10) Cholesterol-like precursor (7-dehydrocholesterol) in skin epidermal cells can be converted after UVB radiation (wavelength 290-315 nm) into pre-vitamin D, which also isomerizes to vitamin D3. Both vitamin D3 and D2 are biologically inactive. They need further enzymatic conversion to their active forms. Firstly, it undergoes 25-hydroxylation in liver to 25(OH)D (calcidiol), the major circulating form of vitamin D, with a half-life of 2-3 weeks. Then it is converted in kidneys through 1-alpha-hydroxylation to its most active form, 1,25(OH)2D (calcitriol), with a half-life of 4-6 hours. This process is driven by parathyroid hormone (PTH) and other mediators, including hypophosphatemia and growth hormone(11,12). The 1-alpha-hydroxylation also takes place in non-renal sites, such as alveolar macrophages, osteoblasts, lymph nodes, placenta, colon, breasts and keratinocytes, suggesting possible autocrine-paracrine role of calcitriol(11,12). It functions through a vitamin D receptor (VDR) that is universally expressed in nucleated cells. Its most important biological role is promoting enterocyte differentiation and intestinal calcium absorption, facilitating calcium homeostasis. At the time of hypocalcemia, the plasma level of ionized calcium falls and this is detected by parathyroid gland calcium receptors. PTH is secreted by parathyroid gland, which stimulates 1-alpha-hydroxylation in kidneys to make more calcitriol from circulating calcidiol. The elevation of calcitriol increases calcium transport within intestines, bones, and kidneys, and further regulates the osteoblast and osteoclast activity. As plasma calcium rises back to normal, further secretion of PTH decreases. This physiologic loop of vitamin D and calcium homeostasis demonstrates that enough circulating calcidiol is essential to maintain adequate calcitriol synthesis and plasma calcium level(10). However, vitamin D deficiency may result in inadequate circulating calcidiol, which decreases calcitriol synthesis and calcium absorption, elevating PTH levels. It is reasonable to focus on plasma calcidiol and PTH level to assess vitamin D clinically. Additionally, because VDRs are found not only in small intestine, but also in colon, osteoblasts, activated T and B lymphocytes, mononuclear cells, beta islet cells and major organs, such as brain, heart, skin, gonads, prostate and breasts(12), coexisting extra-skeletal effects of vitamin D deficiency are to be expected.

Vitamin D and bone health

Severe vitamin D deficiency may cause rickets in infants or children and osteomalacia in adults, although these are uncommon diseases in most developed countries. However, subclinical vitamin D deficiency is more prevalent, and may be associated with osteoporosis and higher incidence of falls or fractures. A 2010 public health evaluation concluded that calcium supplementation of healthy children did not significantly decrease the incidence of fractures(14). A healthy balanced diet that fulfilled the recommended calcium intake was superior to routine calcium supplementations(13,14). However, due to limited natural dietary sources of vitamin D and insufficient sun exposure in most children and adolescents, vitamin D supplementation is necessary. Routine screening of calcidiol levels is not recommended, except for those with higher risk, or in children who present with poor growth, gross motor delay or unusual irritabilities; those who are hospitalized or institutionalized with limited sun exposure; or those with elevated serum alkaline phosphatase (ALP) levels (>500IU/L in neonates or >1000IU/L in children up to 9 years) (11,15,16).

Vitamin D and immune system

Functional VDR has been identified in almost all immune cells, including antigen-presenting cells (APCs) and T lymphocytes (17,18), thus providing an indirect evidence of vitamin D action on immune system. Vitamin D exerts its action on both innate and adaptive immune system through VDR (17,19,20). Overall, the immunomodulatory effects of vitamin D mostly depend upon the capacity of its biologically-active form calcitriol to regulate expression of several genes involved in cell proliferation, differentiation, and function (19,21,22). The relationships between vitamin D and these illnesses are discussed below.

Tuberculosis (TB)

There is an association between vitamin D deficiency and TB. It was reported in 2008 that UVB radiation had beneficial effects on TB therapy(23). However, Martineau et al. concluded that supplementation of vitamin D did not show significant improvement in clinical outcomes(24).

Respiratory tract infections

A prospective trial by Camargo found an inverse association between cord-blood calcidiol level and the risk of developing upper respiratory tract infection by 3 months and wheezing at 15 months of age(25). Newborns born with calcidiol < 20 ng/mL had six-fold higher risk of

respiratory syncytial virus-related bronchiolitis at 1 year old compared with those of calcidiol > 30 ng/ mL(26). A meta-analysis of 25 trials in 2017 showed reducing incidence of acute respiratory tract infection after vitamin D supplementation (OR 0.88, 95% CI 0.81e0.96), which is more significant in patients with severe vitamin D deficiency (< 10 ng/mL)(27).

Asthma

A cross-sectional study observed the calcidiol level between asthma and healthy groups(28). It showed that vitamin D concentration was directly correlated with forced expiratory volume/forced vital capacity (FEV1/FVC) ratio and predicted FEV1, meaning that lower calcidiol level was more significantly associated with asthmatic status. A Cochrane systematic review in 2016 documented that vitamin D supplementation had benefits on reducing risk of exacerbation requiring systemic glucocorticoids and risk of at least one exacerbation requiring emergency department visit or hospitalization or both (OR 0.39, 95% CI 0.19e0.78)(29). A recent review in 2019 that linked vitamin D and childhood asthma showed that there is evidence from clinical trials regarding the protective effects of vitamin D supplementation on the development of asthma and its beneficial effects in the management of asthma and recommended that because of its relatively low-cost and safety, supplementation with vitamin D to reverse deficiency and insufficiency in childhood asthmatics should be considered in the management of the disorder (30).

Coronavirus disease (COVID-19)

Caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), it has had a catastrophic impact worldwide(31). Recent observational studies have linked the population's relative vitamin D status to COVID-19 outcomes. Recently, a substantial body of evidence has clearly linked COVID-19 outcomes with low vitamin D status, but the results from those published to date are conflicting: two retrospective studies reported independent associations between low pre-pandemic calcidiol levels and the subsequent incidence and severity of COVID-19(32,33) while an analogous study in the UK did not support the potential link between calcidiol concentration and the risk of severe COVID19 infection and mortality (34).

A recent meta-analysis conducted by Liu et al., 2021 was based on studies that assessed the impact of vitamin D deficiency or insufficiency on COVID-19 outcomes. They found that low vitamin D levels are associated with an increased risk of COVID-19 infection. Their findings also suggest that COVID-19 infected individuals have lower vitamin D levels than those who are not infected; their results confirm the link between outcomes of COVID-19 with low vitamin D status. They concluded that low serum vitamin D status may be related to the increased risk of COVID-19 and that individuals with vitamin D deficiency should receive special attention, and future research should focus on the benefits of vitamin D supplementation (35).

Atopic dermatitis (AD) A meta-analysis demonstrated that serum calcidiol level was lower in patients with AD(36). A small randomized clinical trial also found beneficial effects of vitamin D supplementation in children with winter-related AD(37). On the contrary, another systematic review in 2012 did not show a significant benefit in clinical outcomes (including pruritus, sleep loss, number of flares, or need of further therapies) after vitamin D intervention(38).

Calcitriol also functions as an inhibitor of dendritic cell maturation, which reduces the activation of acquired immunity and may increase the risk of autoimmune disease(39) such as type I diabetes, multiple sclerosis, and inflammatory bowel disease(9) However, because reports conflict on the association between vitamin D status and these diseases, supplementation is not recommended at present (40).

Vitamin D and other systemic effects

Observational studies demonstrated the association between vitamin D deficiency and the risk of hypertension or cardiovascular events, higher incidence of cancers, more musculoskeletal pain or migraine, and neuropsychiatric disorders such as schizophrenia, dementia or depression(16). However, current evidence for vitamin D intervention in treating or preventing these diseases is lacking.

Vitamin D deficiency

The best indicator of the human body's vitamin D status is the concentration of serum calcidiol(41). The optimal calcidiol level for either skeletal or extra-skeletal health varies for different populations. In adults, the essential level of vitamin D is determined through studies of calcium homeostasis, bone mineralization and PTH levels. Adult PTH has negative correlation with serum calcidiol level, though this relationship is weak in children. The Institute of Medicine (IOM) concluded a serum level of 20 ng/mL was optimal for skeletal health(41), whereas other experts, including the Endocrine Society (ENDO), the International Osteoporosis Foundation (IOF), the National Osteoporosis Foundation (NOF) and the American Geriatrics Society (AGS) stated that at least 30 ng/mL was needed for disease prevention(15,16,42-44). In children, optimal vitamin D status is based upon clinical evidence for rickets or bone turnover, such as elevation of serum ALP. The consensus for adequate calcidiol concentration in children has not yet been established because of inconsistent evidence. In 2008, the American Academy of Pediatrics (AAP) classified calcidiol > 20 ng/mL as sufficiency(11), whereas the Pediatric Endocrine Society used a higher threshold in 2011, regarding calcidiol < 30 ng/mL as insufficiency(45). In 2016, the Global Consensus also defined calcidiol > 20 ng/ mL as sufficiency but adjusted other criteria (46).

Risk factors of Vitamin D deficiency

UVB is more prevalent during the hours of 10am to 3pm. During spring, summer and autumn, 10-15 minutes of sun exposure (over arms and face, or arms and legs/hands) from 10am to 3pm can produce adequate vitamin D in light-skinned populations(11). However, epidermal melanin of darker skinned individuals means more exposure is needed for cutaneous vitamin D synthesis. It is estimated that Asians from the Indian subcontinent require 3 times as much sun exposure as Caucasians, whereas Africans may need 6-10 times more(47). Infants and adolescents are populations at risk because of rapid skeletal growth after birth and during puberty(10). Weisberg showed that 96% of cases of rickets occurred in breastfed children(48). Because breast milk is known to contain very little vitamin D even in vitamin D-replete mothers(11,49) exclusively breastfed infants, especially those born to vitamin D-deficient mothers, are more at risk for rickets. Preterm infants are even more prone to vitamin D deficiency due to lack of transplacental transfer of vitamin D during the third trimester(50) and negligible sun exposure in postpartum hospital(50). Age-related declines in dermal synthesis of vitamin D, diminishing rate of hydroxylation, and poorer response of target tissues further explain the elevated risk for vitamin D deficiency in the elderly(10,52). Studies showed that children, particularly infants, may require less sun exposure than adults to produce adequate quantities of vitamin D because of their greater surface area to volume ratio and better capacity to produce vitamin D(53). However, obese people still have higher risk due to sequestration of vitamin D in adipose tissue(11,54). Cutaneous vitamin D synthesis depends on surface of skin exposed and duration of sun exposure. Extent of clothing due to cultural or religious factors and using topical sunscreen may block effective dermal synthesis. A sunblock of SPF 30 can reduce vitamin D production by 95%(55). Residents, beyond latitude of 33 degrees can receive little UVB due to the oblique angle and longer path of sunlight through the atmosphere. Air pollution and cloud-shading may further limit sun exposure. The amount of UVB is higher at greater altitudes and sunny areas. Individuals such as vegetarians or those with eating disorders are more likely to be vitamin D deficient due to an unbalanced diet. Chronic diseases involving intestinal malabsorption, or liver and renal insufficiencies may also reduce vitamin D production. Some anticonvulsants or antiretroviral agents can precipitate vitamin D deficiency by enhancing catabolism of calcidiol and calcitriol, while Ketoconazole may further block 1-hydroxylation(56). Patients with chronic high-dose glucocorticoids require more vitamin D due to inhibition of intestinal vitamin D-dependent calcium absorption.

Recommended Vitamin D requirement

In 2010, the IOM committee assumed only minimal sun exposure when establishing daily dietary intake requirements for calcium and vitamin D(57). Upper limits of intake indicate the level above which vitamin D may be risky for toxic or adverse events. The Recommended Dietary Allowance (RDA) of vitamin D for infants up to 12 months is 400IU daily, and 600IU for children of 1-18 years. Transplacental maternal vitamin D can build up the fetal store(50). However, even infants born to vitamin D-replete mothers may become vitamin D deficient after 8 weeks of life if unsupplemented during early infancy(58). It is reported that infants can get adequate quantities of vitamin D by sunlight exposure of 30 minutes per week wearing only a diaper or 2 hours per week when fully-clothed without a hat(48). Due to concern for possible risk of skin cancer later in life, the AAP suggest that infants younger than 6 months should be kept away from direct sunlight exposure(59), with natural food or vitamin D supplementation being preferable. Therefore, AAP and Lawson Wilkins Pediatric Endocrine Society recommend infants who are exclusively or partially breastfed require 400IU vitamin D daily beginning within first few days of life(11,15,45). This supplementation should be continued until infants are feeding on more than 1000 ml per day of vitamin D-fortified formula. Since most infant formulas contain at least 400IU/ L of vitamin D, formula-fed infants may also need vitamin D supplementation unless they consume beyond 1000 mL daily(11). As for obese children or those on chronic medications, requirements may be 2-4 times more(13). In 2010, the European Society of Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) Committee on Nutrition updated a guideline for preterm infants, suggesting 800-1000IU of vitamin D, 110-130 mg of calcium and 55-80 mg of phosphorus per day, as essential for preterm bone health(60). Later in 2013, an expert report from the AAP recommended 200-400IU vitamin D daily in very-low-birth-weight preterms (<1500 g) and 400IU in babies weighing >1500g(61). This lower dosage is adjusted according to smaller size of preterm babies and relatively lower need of vitamin D to achieve adequate calcidiol levels(61). This advice is supported by a 1992 study revealing calcium absorption in low-birth-weight infants, especially during the first few months of life, was in proportion to their daily calcium intake, but independent of vitamin D(62). However, in certain instances, the requirement may increase to 1000IU per day in infants >1500 g to achieve the goal of serum calcidiol > 20 ng/mL, since this is the intake upper limit for full-term babies. The RDA of vitamin D for adults through to 70 years is 600IU daily, and 800IU if they are older than 71 years(57). Since vitamin D intake is usually low in the elderly, coupled with lower sun exposure, it is reasonable to advise older people to supplement at least 600-800IU daily. The AGS and NOF suggest an even higher dosage (800-1000IU per day) for adults >65 years to prevent falls and fractures (42).

Vitamin D supplementation

The guideline for vitamin D supplementation in children with nutritional rickets is available from ENDO and the Global Consensus (table 1)(15,46). Although radiologic bone healing is evident 2-4 weeks after treatment, this high dose strategy should be continued for a further 2-3 months(11). After achieving the optimal calcidiol level, a maintenance dosage is suggested. To combat poor daily compliance, an alternative single high dose regimen “stoss

therapy" was introduced in patients over 1 month old. It is administered as oral vitamin D 100000-600000IU once, then followed with maintenance dosage(11). Stoss therapy should not be administered for young infants, since they are much more likely to develop hypercalcemia. Recently, there has been increasing evidence to support the combination use of calcium (500 mg daily) with vitamin D(46). Vitamin D3 is preferable to vitamin D2 as a supplement because of its longer half-life and stronger potency, leading to 2-3 times greater storage after administration(63). Serum calcium, phosphorus, ALP, 25(OH)D, PTH levels, and urine calcium to creatinine ratios with radiography should be monitored after treatment(11). Adult vitamin D repletion depends on baseline serum calcidiol concentration and effective absorptive capacity. In patients with normal absorptive ability, serum calcidiol may increase by 0.7-1.0 ng/mL for every 100IU of vitamin D3. The increment seems to be larger in patients with lower baseline calcidiol levels and declines above 40 ng/mL(64). The treatment strategies for vitamin D supplementation in adults are summarized in Table 2. Serum calcidiol should be followed 3 months after treatment, and higher dosage may be required if goal serum level is not achieved. However, the safety of supplementation in vitamin D-depleted pregnant women (50000IU per week for 6-8 weeks) has not been established. Some experts prefer slow replenishment of vitamin D of 600-800IU daily. ENDO stated that it is safe to give pregnant women 1000-2000IU per day (15).

Vitamin D intoxication and complications

Vitamin D intoxication generally occurs after inappropriate supplementation of vitamin D, especially with serum calcidiol above 100-150 ng/mL(16). Prolonged sunlight exposure does not produce excessive vitamin D3 due to photo-conversion of previtamin D3 and vitamin D3 to its inactive metabolites(65). Acute vitamin D intoxication is mostly due to hypercalciuria and hypercalcemia, with symptoms of confusion, polydipsia, polyuria, anorexia, vomiting and muscle weakness. Chronic vitamin D intoxication may lead to nephrocalcinosis, bony demineralization and even pain.

Conclusion

Vitamin D is an essential nutrient not only important in bone health but also beneficial to many other systems. The American Academy of Dermatology declared UV radiation from sun or artificial sources to be a known carcinogen(66), so it may not be safe or efficient to obtain vitamin D via sun exposure. Therefore, physicians should provide information to patients who are at higher risk for vitamin D deficiency on how to get sufficient dietary or supplemental vitamin D. Trials assessing the effects of vitamin D supplementation and establishing the optimal serum level of calcidiol are ongoing. Further recommendations for vitamin D supplementation should be individualized accordingly.

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Table 1: Strategies of Vitamin D supplementation in nutritional rickets

Age or underlying condition	Vitamin D supplementation
0-12 months	2000IU per day for 6-12 weeks, then maintain with 400IU daily
>12 months	2000IU per day for 612 weeks, then maintain with 600-1000IU daily
Selected high-risk groups	6000IU per day, then maintain with a higher dosage

Table 2: Strategies of Vitamin D supplementation in adults

Baseline 25(OH)D level or underlying condition	Vitamin D supplementation
<10 ng/mL	50000IU once per week for 6-8 weeks, then maintain with 800IU daily.
10-20 ng/mL	800-1000IU per day*
20-30 ng/mL	600-800IU per day*
Underlying malabsorption syndrome	10000e50000IU per day*
*Serum 25(OH)D level should be followed 3 months after treatment, and higher dosage may be required if goal serum level is not achieved.	

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