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Awareness and attitude regarding diabetic retinopathy among physicians in Riyadh, Saudi Arabia

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ABSTRACT

Background: Diabetic Retinopathy (DR) is the leading cause of working age population blindness in western society, and it has a prevalence of 36.8% in Saudi Arabia based on a recent study. The aim of this study is to identify the awareness and attitude among physicians who work in different specialties regarding Diabetic Retinopathy in Riyadh, Saudi Arabia. *Methods:* A cross-sectional study utilizing an online-based questionnaire targeted 370 non-ophthalmologist physicians of different specialties in Riyadh city, Saudi Arabia. The questionnaire is composed of three sections, first section covers demographic data of the participants, the second section assesses knowledge about diabetic retinopathy, and the last section is about attitude and practice of the participated physicians regarding diabetic retinopathy. *Results:* Total of 371 participants was included in this study. 124 (33.4%) had low level of knowledge, 176 (47.4%) had moderate knowledge level, and 71 (19.1%) had a high knowledge level. Age, gender, speciality, and years of experience had a significant relationship with knowledge toward diabetic retinopathy. *Conclusion:* Knowledge of DR should be improved in physicians regardless of their specialties. A knowledge level regarding DR is varying among specialties. The study determines that level and highlights the specific level for each specialty.

Keywords: Diabetic retinopathy; diabetes mellitus; blindness; screening; Saudi Arabia

1. INTRODUCTION

Diabetes Mellitus (DM) is a disease related to metabolic processes due to impairment either in insulin production or in insulin sensitivity causing hyperglycemia in the patient. DM has multiple etiologies, pathogenesis, and different types. The most prominent types of DM are type 1 DM and type 2 DM according to study done by Sapra and Bhandari, (2021). Type 1 DM is an

insulin deficiency disease caused by an autoimmune process destroying the pancreatic beta cell that affects insulin secretion. On the other hand type 2 DM, is an insulin function disease due to insulin resistance which is multifactorial. Obesity and aging are examples of factors causing insulin resistance (Sapra and Bhandari, 2021).

DM has acute complications such as diabetic ketoacidosis (DKA) as well as hyperosmolar hyperglycemic syndrome (HSS) (Sapra and Bhandari, 2021). The chronic complications of diabetes can be categorized as microvascular (peripheral neuropathy, nephropathy, and retinopathy) and macro vascular (cardiovascular disease, ischemic heart disease, peripheral vascular occlusive disease) (Papatheodorou et al., 2018; 2015). The estimated prevalence of diabetes in 2019 is 9.3% (463 million) patients worldwide, with an expected increase to 10.9% (700 million) patients in 2045 (Saeedi et al., 2019). Diabetic Retinopathy (DR) it is a chronic microvascular complication of DM that affects the retina and can develop into blindness. DR is the leading cause of working age population blindness in western society (Shukla et al., 2019). However, a study held in Taif Saudi Arabia show a prevalence of 36.8% (Al Ghamdi et al., 2012). In the other hand, the prevalence in Al Hasa region is 30% (Khan et al., 2010), and 36.1% is the prevalence in a study done in Al Madinah Al Munawarah (El-Bab et al., 2012).

In a study done in Riyadh, Saudi Arabia by Raghad and her colleagues which included 216 primary care Physicians, they found that Physicians with more than 15years of practice were having a higher level of knowledge regarding diabetes and DR than physicians with less than 5 years of practice. Only 24% of the primary care physicians were correctly referring type1 DM patients to screen for diabetic retinopathy while 71% were correctly referring type2 DM patients (Al Rasheed and Al Adel et al., 2017). DR is preventable cause of blindness by proper screening and early intervention hence we aim to assess awareness and attitude among physicians who work in different specialties (non-ophthalmologists) regarding Diabetic Retinopathy in Riyadh, Saudi Arabia.

2. METHODS

A cross sectional study conducted using an online-based questionnaire to evaluate the knowledge and attitude of non-ophthalmologist physicians toward diabetic retinopathy in Riyadh city, Saudi Arabia. Three hundred seventy physicians of different specialties other than (ophthalmologist) from different primary, secondary and tertiary hospitals across Riyadh city, Saudi Arabia have been participated in our study. The participants included in our study recruited between the periods of July 2021 up to September 2021. Data has been collected using an online-based questionnaire taken from other study done by Al Rasheed et al., (2017).

Physicians who participated in the study were provided with an online-based consent and those who agreed to complete the questionnaire were included in our study whereas, those who did not agree were excluded from our study. All Physicians who work in tertiary and secondary hospitals, as well as primary centers in Riyadh, Saudi Arabia are included in the study. Our exclusion criteria include 1- ophthalmologists, 2- physicians who did not give consent, 3- physicians who did not complete the survey, 4- physicians who work outside Riyadh city. The survey that has been utilized inthe study was composed of three main sections; the first section was concentrated upon the demographic data of the participated physicians including age, gender, nationality, specialty and years in practice. The second section of the questionnaire was composed of 14 multiple choice questions that used to assess the knowledge of the participants regarding diabetes screening, symptoms of DR and different treatment modalities. Participants who answered each question correctly getone score, while those who answered incorrectly or did not know the answer get zero score with a total score of 100%. The third section was composed of nine questions that used to assess the attitude and practice of the participated individuals regarding DR, including how frequently they screen diabetic patients, ophthalmology referral, educating diabetic patients and if they routinely use ophthalmoscope or perform eye examination.

Awareness was assessed regarding guidelines from (American Academy of Ophthalmology. Preferred practice pattern: diabetic retinopathy and awareness) (Flaxel et al., 2010). Assessment method of awareness were analyzed as who answered correctly of less than 50% is poor knowledge, who answered from 50% to 75% is moderate knowledge, and more than 75% is considered as high knowledge. However, under circumstances of COVID-19 pandemic, bias was considered as having less access to tertiary hospital physicians. Letters were written to hospitals administrations to facilitate the access to each physician in hospitals and clinics.

The sample size was determined by using the following formula: n = z2pq\d 2. Confidence level was set at 95%, estimated proportion of 50% was used, 5% level of precision was set, and an estimated population of 9903 was set (based on the last Saudi ministry of health report regarding the number of physicians in Riyadh on 2018) (MOH et al., 2018). The minimum sample size was calculated to be 370.

3. RESULTS

Total of 371 participants were included in this study. Table 1 shows the socio-demographic profile and the work profile of the participants. The mean age of participant was 36.87 ± 10.87. 245 (66%) were males and 126 (34%) were females. As for the nationality, 290 (78.2%) were Saudi, while 81 (21.8%) were non-Saudi. The mean years of experience were 10.46 ± 9.84. As for the specialties of the participants, more than 18 different specialty was included, the most commonly participating specialties were internal medicine 59 (15.9%), family medicine 56 (15.1%), and obstetrics and gynecology 54 (14.6%).

Table 1 Socio-Demographic Profile and Work Profile of the Participants (n = 371)

Demographical Characteristics	n	%
Age		
Mean	36.87	
Standard Deviation	10.87	
Gender		
Male	245	66.00
Female	126	34.00
Nationality		
Saudi	290	78.20
Non-Saudi	81	21.80
Years of Experience		
Mean	10.46	
Standard Deviation	9.84	
Specialty		
Internal medicine	59	15.90
Family medicine	56	15.10
Obstetrics and Gynecology	54	14.60
Emergency medicine	25	6.70
ENT	20	5.40
Pediatric	19	5.10
General surgery	18	4.90
Urology	15	4.00
Anesthesia	15	4.00
Radiology	14	3.80
Orthopedic surgery	12	3.20
Dermatology	12	3.20
General Practitioner	11	3.00
Cardiac surgery	10	2.70
Neurology	9	2.40
Community medicine	8	2.20
Physical medicine	6	1.60
Other specialties†	8	2.20

† Other specialties= Neurosurgery, Plastic surgery, Vascular surgery and Thoracic Surgery

Table 2A and 2B displays the participant's knowledge assessment toward diabetic retinopathy. The minimum knowledge score was 0, the maximum was 21, and the mean was 11.8 ± 4.2. Figure 1 illustrates the knowledge level of participants. 124 (33.4%) had low level of knowledge, 176 (47.4%) had moderate knowledge level, and 71 (19.1%) had a high knowledge level. Table 3

demonstrates the participant's attitude assessment toward diabetic retinopathy. 221 (59.6%) reported knowing how to use the ophthalmoscope. 162 (43.7%) reported having done eye examination before. 231 (62.3%) reported following up with patient they refer to specialist for diabetes. 112 (30.2%) reported participating in diabetic public awareness campaigns to educate the public I the past year. As for the source of learning toward diabetes retinopathy in the past year, the most common sources were books 181 (48.8%), internet 174 (46.9%), and 172 (46.4%) seminars, meetings, and symposiums.

Table 2A Participants Knowledge Assessment toward Diabetic Retinopathy (Diabetes 1 and 2 Comparison), (n = 371)

Question	Diabetes Type 1		Diabetes Type 2	
Q1/ Diabetic patient should visit an ophthalmologist following diagnosis				
Yes	270	72.8	305	82.2
No (correct answer)	80	21.6	37	10
I don't know	21	5.7	29	7.8
Q2/ How soon after diagnosis should a patient visit an ophthalmologist				
Immediately after diagnosis	126	34	211	56.9
One years after diagnosis	68	18.3	61	16.4
Two years after diagnosis	26	7	27	7.3
Five years after diagnosis (correct answer)	105	28.3	31	8.4
I don't know	46	12.4	41	11.1
Q3/ Diabetic patients should visit an ophthalmologist on a regular basis				
Yes (correct answer)	293	79	267	72
No	25	6.7	29	7.8
A type 1 diabetic patient should visit an ophthalmologist on a regular basis	38	10.2	50	13.5
I don't know	15	4	25	6.7
Q4/ How regular should a diabetic patient visit an ophthalmologist				
Every 5 years	41	11.1	-	-
Every 2 years	49	13.2	-	-
Every year (correct answer)	145	39.1	-	-
Based on ophthalmologist screening assessment	104	28	-	-
I don't know	32	8.6	-	-

Table 2B Participants Knowledge Assessment toward Diabetic Retinopathy (n = 371)

Question	**n**	**%**
Q1/ Which of the following eye diseases are seen with increased frequency in Diabetes (Check all that apply)		
Pterygium	68	18.3
Glaucoma (correct answer)	226	60.9
Retinal vascular disease	303	81.7
Cataract (correct answer)	251	67.7
Macular Degeneration (correct answer)	223	60.1
Trachoma	64	17.3
Vitreous hemorrhage	186	50.1
Conjunctivitis	108	29.1
Retinal detachment	236	63.6
Macular edema	213	57.4

Q2/ Which Diabetic patients are at greatest risk for Diabetic Retinopathy (Check all that apply)		
Pregnancy	147	39.6
Uncontrolled diabetes (correct answer)	326	87.9
Long duration diabetes (correct answer)	313	84.4
Hyperthyroidism	122	32.9
Diabetes with hypertension (correct answer)	301	81.1
Q3/ Early symptom of Diabetic Retinopathy (Check all that apply)		
Pain	100	27
Photosensitivity	160	43.1
Decreased visual acuity	268	72.2
Blindness	112	30.2
No symptoms (correct answer)	190	51.2
Q4/ The ideal method for evaluating Diabetic Retinopathy		
Direct (hand-held) ophthalmoscope	62	16.7
Fluorescein angiography	42	11.3
A dilated fundus exam (correct answer)	178	48
Visual field testing	26	7
Ultrasonography of the eye	3	0.8
I don't know	60	16.2
Q5/ Early signs of Diabetic Retinopathy (Check all that apply)		
Neovascularization	246	66.3
Retinal swelling	188	50.7
Vitreous hemorrhage	128	34.5
Fatty exudates (correct answer)	157	42.3
Micro-aneurysms (correct answer)	194	52.3
Papilledema	144	38.8
Q6/ What are the treatment options for patients with Diabetic Retinopathy (Check all that apply)		
LASIK	112	30.2
Vitrectomy (correct answer)	112	30.2
Laser photocoagulation (correct answer)	249	67.1
Intravitreous anti-VEGF (correct answer)	161	43.4
Intravitreous corticosteroids (correct answer)	92	24.8
Knowledge Score (Total score = 21)		
Mean	11.80	
Standard Deviation	4.20	
Minimum	0	
Maximum	21	

Table 3 Participants Attitude Assessment toward Diabetic Retinopathy (n = 371)

Question	n	%
Q1/ Do you know how to use the ophthalmoscope		
Yes	221	59.6
No	150	40.4
Q2/ Have you done eye examination to a diabetic patient before		
Yes	162	43.7
No	209	56.3

Q3/ What type of diabetic patients do you refer to an ophthalmologist		
Type 1	32	8.6
Type 2	50	13.5
Long duration antibiotics	49	13.2
All diabetics	193	52
If they develop any eye problem	47	12.7
Q4/ How much time does it take for you to explain how to manage diabetes		
= or < 15 minutes	89	24
15 to 30 minutes	84	22.6
30 minutes	28	7.5
Depends upon the patient	170	45.8
Q5/ Do you follow-up the patients you have referred to the specialists		
Yes	231	62.3
No	140	37.7
Q6/ Have you been involved in DM public awareness programs to educate the public in the past one-year		
Yes	112	30.2
No	259	69.8
Q7/ From which sources have you learned about Diabetic Retinopathy in the past year (Check all that apply)		
Seminars, meetings, symposiums	172	46.4
Journals	120	32.3
Newspaper	52	14
Books	181	48.8
Internet	174	46.9
Radio / TV	32	8.6
Senior medical personal	123	33.15

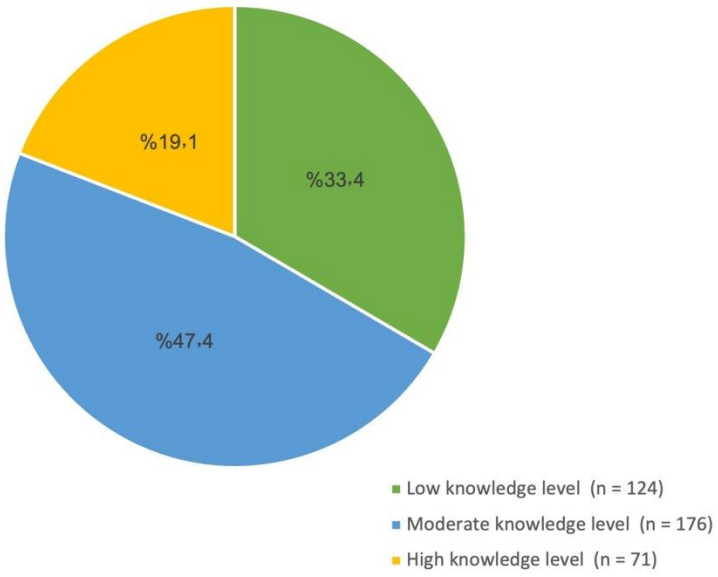

Figure 1 Participants' Knowledge Level toward Diabetic Retinopathy

Figure 2 shows the advice the participants would give to patients diagnosed with diabetes. 324 (87.3%) reported advising diet, 307 (82.7%) reported advising exercise, and 291 (78.4%) reported advising loss of weight. Table 4 present factors associated with knowledge score toward diabetes retinopathy. Gender was significantly associated with knowledge score ($p < 0.001$), whereas males had significantly higher scores than females (12.42 ± 3.80). Specialty was also significantly associated with knowledge score ($p < 0.001$), whereas a high variation of knowledge score was seen. Specialties with the highest score were urology, pediatrics, and emergency medicine, while the specialties with the lowest scores were dermatology, internal medicine, and family medicine. Age had a significant weak positive correlation with knowledge score ($p = 0.004$, Pearson's correlation = 0.15). Experience years also had a significant weak positive correlation with knowledge score ($p = 0.007$, Pearson's correlation = 0.14).

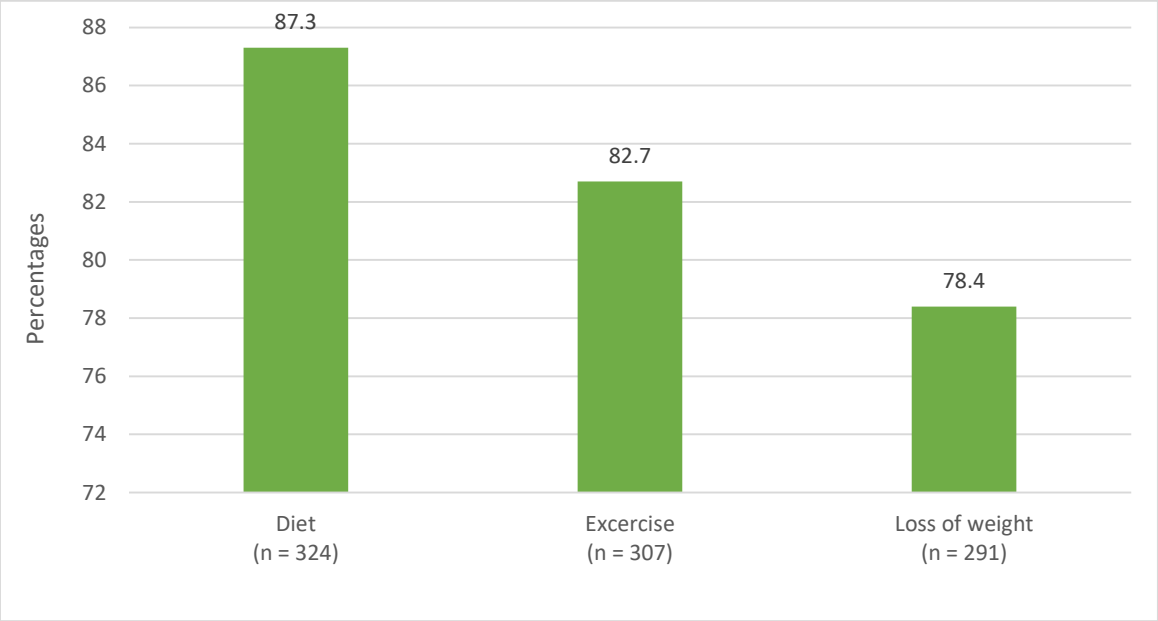

Figure 2 What Advice Do you Give to the Patient with Diabetes

Table 4 Factors Associated with Knowledge Score toward Diabetic Retinopathy

Factor	Knowledge Score		P-Value
	Mean	Standard deviation	
Gender			
Male	12.42	3.808	< 0.001*
Female	10.60	4.65	
Nationality			
Saudi	11.76	4.40	0.721
Non-Saudi	11.95	3.38	
Specialty			
Internal medicine	7.60	4.42	
Family medicine	8.10	5.24	
Obstetrics and Gynecology	8.88	4.61	
Emergency medicine	13.00	5.21	< 0.001*
ENT	10.96	3.77	
Pediatric	13.13	4.18	
General surgery	11.44	4.15	
Urology	13.97	4.02	
Anesthesia	11.67	4.06	

Radiology	11.80	2.94	
Orthopedic surgery	11.42	1.93	
Dermatology	5.50	5.75	
General Practitioner	11.14	4.42	
Cardiac surgery	12.07	3.45	
Neurology	10.80	3.21	
Community medicine	12.00	2.57	
Physical medicine	12.68	3.06	
Other specialties†	10.00	5.07	
Age Correlation with Knowledge Score			
Pearson's Correlation			0.15
P-value			0.004*
Experience Years Correlation with Knowledge Score			
Pearson's Correlation			0.14
P-value			0.007*
*Significant at level 0.05 † Other specialties= Neurosurgery, Plastic surgery, Vascular surgery, and Thoracic Surgery			

4. DISCUSSION

Diabetes mellitus (DM) is amongst the most common public health issues in today's world. Because of urbanisation, population growth, and increasing physical inertia and weight, the number of people suffering from diabetes is rising. Due to a lack of understanding about their disease, people with DM face a slew of catastrophic consequences (Naeem, 2015). Patient education and training are the most effective ways to prevent DM complications, according to the research. The goal of our study was to analyze the current knowledge, awareness, and practices regarding diabetic retinopathy among physicians work in different specialties. The findings identified a number of flaws in screening standards, risk factors, screening technologies, and treatment modalities. Total of 371 participants were included in this study. The participants were above 36 years age. Among those males were in the highest level 66% and the females were lesser 34%. 78.2% Saudi people, 21.8% were non-Saudi persons. There were more than 18 different specialty peoples who were included in the study, on average they were having more than 10 years of experience. Most commonly participating specialties were internal medicine 15.9%, family medicine 15.1%, and obstetrics and gynecology 14.6%. Most participants believed that diabetic patients should meet the ophthalmologist immediately after getting diagnosed for DM. The average knowledge score of DM among our participant's was11.8 $\pm$ 4.2. Out of 21, a same figure was found in the study done by Zibran et al., in Fiji (2019).

In India, Dandona et al., (2001) found that 58 percent of their sample had inadequate expertise. Although 47.4% of our participants had a moderated knowledge of DM, their understanding of DR was lacking. 33.4% of our participants in our study were aware that they needed to be screened for DR, but they were unsure how often they should do so. In our investigation, socioeconomic status was another factor leading to poor knowledge; a significant link was discovered between low monthly income and poor knowledge of DM and DR (P0.0001) and (P0.015). This was supported by a study conducted in South Korea, which found low socioeconomic level to be associated with inadequate awareness and large reductions in DR screening (Lee, 2018).

In Participants knowledge assessment toward Diabetic retinopathy, the retinal vascular disease was answered by most of the participants, but Glaucoma, Cataract, Macular Degeneration were the correct answers, which indicates that the participants having lack of knowledge regarding eye diseases associated with diabetes. Uncontrolled diabetes, long duration diabetes and Diabetes with hypertension participants were at greatest risk for Diabetic Retinopathy were correctly answered by the participants. Only 51.2% participants learned about early symptom of Diabetic Retinopathy. Only 48 percentages of people knows the ideal method for evaluating Diabetic Retinopathy. On average only 50% of the participants were answered correctly for the early signs of Diabetic Retinopathy and treatment options for participants with Diabetic Retinopathy. The mean average score for knowledge is 11.80 out of 21. Which indicates that have more than 50% of the study population is having greater knowledge in DR. Among the 371 participants 124 were having the poor knowledge, 176 participants having the moderate knowledge level and 71 participants having the higher knowledge level (Figure 1).

In the participants attitude assessment toward diabetic retinopathy 59.6% participants know how to use the ophthalmoscope. 56.3% done eye examination to a diabetic patient before. 52% said that they will refer all diabetic participants to an ophthalmologist. 45.8% takes time take for explaining how to manage diabetes is depends upon the patient. The 62.3% follow-up the patients referred to the specialists. This outcome was comparable to those of Alrasheed et al., (2017), who reported that > 60% of physicians routinely referred their DM patients to the ophthalmologist, and these of Nepal (Pradhan et al., 2018), where virtually all the doctors are agreed that all DM patients should be sent to an ophthalmologist. Most general practitioners urged their patients to have eye examinations on the time of diagnosis, and almost all of them suggested their patients to have annual eye check-ups if no retinopathy was found during the initial examination, according to Al Ghamdi et al., (2017).

Different sources have helped the participants to learn about DR in the past year like Books, Internet, Seminars, meetings, symposiums etc. however, participants' knowledge could be explained by a gap between their level of awareness and practice among people with diabetes, which is why focusing on knowledge alone in health awareness is insufficient; it must be combined with behavioral practice to achieve significant improvements in patient compliance and self-care.

Our study's strength was that it was multicentered in design and only included physicians, which is challenging to do in our environment due to physicians' disproportionate distribution, which is influenced by varying remunerations and social services in the regions where they practice. Furthermore, our study was the first to conduct a preliminary survey on the critical topic of physician awareness, attitude, knowledge, and practice of DM screening, which is currently unavailable in our context. These results, on the other hand, should be evaluated in light of the fact that they were conducted in tertiary health-care facilities, and thus may not be generalizable to lower levels of health-care, where there are few or no physicians to care for people with diabetes. In addition, a greater number of responders from various geopolitical regions of the country may be required to support the creation of a national guideline for the provision of effective DR services.

5. CONCLUSION

In this study, the knowledge level towards DR was assessed across different medical and surgical specialists, along with their attitude towards DR screening, signs, and treatment modalities, as the majority of all participants have a moderate level of knowledge. Pediatric, urology, and emergency medicine had the highest score of knowledge, and dermatology, internal medicine, and family medicine had the lowest score. Most of the participants were advising lifestyle modification to be done first. The authors recommend further research studies to be conducted on the subject involving a larger physician's population across the nation.

Consent to participate

As per standards, written consent was taken from participants before data collection.

Contribution Details

Fahad M. Almotairy , Mohammed S. Almutairi ,Abdulrahman S. Bamhair , Ghassan A. Bagazi, Omar K. Alolayan , Tamim A. Alsuqayh, Reem R. Alhuthail, conceived and planned the research.Fahad M. Almotairy , Mohammed S. Almutairi ,Abdulrahman S. Bamhair , Ghassan A. Bagazi, Omar K. Alolayan , and Tamim A. Alsuqayh carried out the literature research, planned and carried out the data collection. Ahmed Z. Alkhars carried out the statical analysis. Fahad M. Almotairy, Mohammed S. Almutairi, Ahmed Z. Alkhars contributed to the interpretation of the results. Fahad M. Almotairy, Mohammed S. Almutairi, Abdulrahman S. Bamhair, Ghassan A. Bagazi, Omar K. Alolayan, Tamim A. Alsuqayh, and Ahmed Z. Alkhars took the lead in writing the manuscript. All authors provided critical feedback and helped shape the research, analysis and manuscript.

Ethics approval

The study was approved by the Institutional Review Board, Al-Imam Muhammed Ibn Saud Islamic University, Riyadh, Kingdom of Saudi Arabia via reference number (*24-2021) on 16th of February 2021.*

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Conflict of Interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are presented in the paper. Further inquiries can be directed to the corresponding author.

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