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Barriers influencing diabetic adults' demand for diabetic retinopathy screening during the covid-19 pandemic in Taif city; patients' perspectives

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ABSTRACT

Background: Diabetic Retinopathy (DR) is a complication of uncontrolled Diabetic mellitus (DM). It affects the vision-related quality of life significantly, and it is one of the leading causes of blindness. Various socio-cultural elements affect eye health-seeking behavior and barriers to access DR screening services (DRSS) by people with DM (PwDM). However, studies assessing barriers to DR screening among people with diabetes in Saudi Arabia are limited. The principal aim of this study was to evaluate the barriers to DR screening among Saudi diabetics during the COVID-19 pandemic. *Methods:* This was a cross-sectional, survey-based study conducted in Taif, Saudi Arabia, from October 2020 to September 2021. Data was collected using a predesigned self-administered online questionnaire. Then data were analyzed by the SPSS program, version 25 at a level of significance of 0.05. *Results:* A total of 1042 adults with diabetes were enrolled in the study. About 39% of them had diabetes duration of fewer than five years. Around 3.8% of the participants agreed that poor glycemic control enhances diabetic retinopathy progression, 18.9% agreed that diabetic individuals might have advanced diabetic retinopathy despite having good vision, 7.5% agreed that comorbidities enhance diabetic retinopathy progression and 3.9% agreed that DR can be detected early might save vision. *Conclusion:* Finally, the study found that patients had an appropriate degree of awareness on DR; however, several knowledge areas should be improved. Furthermore, our findings demonstrated that COVID-19 caused a delay in patient care, resulting in poorer outcomes in patients with DR.

Keywords: COVID-19, Diabetic Retinopathy, DR screening, barriers, outcomes, Saudi Arabia

1. INTRODUCTION

Diabetes mellitus (DM) is a chronic, devastating disease that creates a substantial problem in developing and developed countries. It is one of the significant challenges facing healthcare systems due to its tremendous financial burden related to its many comorbidities and high mortality rates (Alzahrani et al., 2018). The global prevalence of DM in 2019 reached 463 million, representing 9.3% of people worldwide. The percentage is projected to reach 25% in 2030 and about 51% in 2045 (Shaw et al., 2010). In 2013 Saudi Arabia was classified the 7th out of the top ten countries with the highest prevalence of diabetes mellitus among the population aged 20–79 years with a high prevalence of 24% (Guariguata et al., 2014). Eyes involvement is one of uncontrolled DM complications (Shani et al., 2018). The most frequent complication of the microvascular associated with DM is diabetic retinopathy (DR) (Bunce & Wormald, 2006). DR can lead to visual impairment and blindness in working-aged people and patients aged 55 years or older (Shani et al., 2018). DR significantly affects the vision-related quality of life and a high rate of emotional distress and depression is reported in people with DR (Mazhar et al., 2011). According to World Health Organization (WHO), about 4.8% (37 million) of blindness cases worldwide are caused by DR (Resnikoff et al., 2004). DR can develop with two types of diabetes, type 1 or type 2, but type 1 is more common, as it starts earlier and has a more extended time course.

The global prevalence of DR is about 93 million people (Yau et al., 2012). With the increasing number of diabetes mellitus patients, the number of affected people with DR and vision threatening diabetic retinopathy (VTDR) including severe non-proliferative DR, proliferative DR and diabetic macular edema will increase to 191.0 million and 56.3 million, respectively by 2030 (Cho et al., 2018). Studies conducted in different regions of Saudi Arabia reveal that the prevalence of DR among diabetic patients is 28%-36% (Ahmed et al., 2016; El-Asrar et al., n.d.; El-Bab et al., 2012; Hajar et al., 2015). Poor glycemic control, diabetes duration, high cholesterol, high blood pressure, pregnancy, raised glycated hemoglobin-A1c (HbA1c), and tobacco and use can raise your chances of getting DR (Yau et al., 2012).

Early detection and establishing the treatment up to 98 percent of diabetes-related vision deterioration can be avoided (Ferris, 1993). DR is still in its early stages.is the most treatable stage, the American Diabetes Association and the American Academy of Ophthalmology set a program for DR screening, which states that patients with type 1 DM should start annual screening five years after diagnosis. In contrast, patients with type 2 DM should start annual screening when the diagnosis was made (Singh et al., 2008; "Standards of Medical Care in Diabetes–2006," 2006). Successful screening programs depend on many factors, including easy access to the screening service by the community and trained health professionals in DR screening (Harding et al., 2003; Scanlon, 2008; Peter H Scanlon et al., 2015). Eye health-seeking behaviors and barriers to access to DR screening services (DRSS) by people with DM (PwDM) are affected by a range of socio-cultural elements, including economic status (Baumeister et al., 2015). poor knowledge, shorter duration of the disease, and cost (Alwazae et al., 2019). From a systemic review published in 2019 aimed to assess the barriers for access to diabetic retinopathy screening services, it was found that the barriers different in each income sitting, however; lack of knowledge about DR and low awareness about DRS, asymptomatic nature of DR, financial issues, lack of time and priority issues stand out as the most prevalent Regardless of the country's income level, there are barriers (Piyasena et al., 2019).

A study was done in 2018 to determine the level of adherence to DRS among people with diabetes in Riyadh, Saudi Arabia. The study found that Twenty percent of individuals reported having DR, 51% had limited awareness of DRS, and more than 20% had never been evaluated for DR, and about 30% of participants reported that cost was a significant contributing barrier (Alwazae et al., 2019). Another study was conducted between 2013-2014 on diabetic patients who attended employee health clinics found that the most reported barriers were distance to a screening clinic, no referral from family physicians for annual eye screening, and gender-specific eyecare professionals (Al-Alawi et al., 2016). Telemedicine and mobile units were effective alternatives for more accessible DR screening and improving access to eye health in developing countries during the COVID-19 pandemic (Ben et al., 2020). Studies assessing barriers to DR screening persons who have diabetes in Saudi Arabia are limited. Thus, this study aimed to evaluate the obstacles to the DR screening among Saudi diabetics during the COVID-19 pandemic.

2. SUBJECTS AND METHODS

Study design and time frame

A cross-sectional study was done from October 2020 to September 2021.

Study settings and participants

An online survey was done on DM patients from Taif, Saudi Arabia.

The inclusion criteria: were DM patients aged 20–79 years who accepted to participate in the study, and excluded patients who refused to share in the study, who could not read or understand the questionnaire, and those who did not complete all its items.

Tools and data collection

a predesigned questionnaire (Peter H Scanlon et al., 2015) was used to collect patients' sociodemographic data, diabetic and diabetic retinopathy status, patients'attitude and practice regarding eye screening, and barriers to ophthalmology clinic follow-up.

Ethical considerations

Ethical approval was obtained from Taif University's ethical community to carry out the study.

Statistical analysis

Data analyzed by the (SPSS) program version 25. The Chi-square test ($\chi 2$) was employed to analyze qualitative data, which were reported as numbers and percentages to assess the relationship between variables. A p-value of <0.05 was considered statistically significant.

3. RESULTS

Table 1 shows that, 56% of the participants were females, 52.1% had an age ranging from 40-59 years, and 44% had a university education. About 39% (39.4%) of them had diabetes duration of less than five years. Of the participants, 20.3% and 12.8% had previous eye laser photocoagulation and previous eye injection, respectively. About 38% (38.3%) had a missed eye screening and /or treatment, and 58.2% had a duration of screening gap (time without screening) during the pandemic for at least six months.

Table 1 Distribution of the studied participants according to their characters, diabetic and diabetic retinopathy status (No =1042)

Variable	No. (%)
Gender	
Male	459 (44)
Female	583(56)
Age	
20 – 39 years	368 (35.3)
40 – 59 years	543(52.1)
≥ 60 years	131 (12.6)
Education	
Illiterate	127 (12.2)
High school and less	395 (37.9)
University	458 (44)
Higher education	62 (6)
Duration of diabetes	
Less than five years	411 (39.4)
6 – 19 years	380 (36.5)
20 – 29 years	147(14.1)
≥30 years	104 (10)
Diabetes treatment	
Diet	165 (15.8)
Pills	214 (20.5)
Insulin	227 (21.8)
Pills + Insulin	103 (9.9)
Diet + insulin	47 (4.5)
Die + pills + insulin	112 (10.7)
Pills + diet	174 (16.7)
Previous eye laser photocoagulation	
Yes	212 (20.3)

No	830 (79.7)
Previous eye injection	
Yes	133 (12.8)
No	909 (87.2)
Missed eye screening and or treatment	
Yes	399 (38.3)
No	643 (61.7)
Duration of screening gap (time without screening) during the pandemic	
Less than three months	221 (21.2)
4 -6 months	215 (20.6)
≥6 months	606 (58.2)

Table 2 shows that 39.5% of the participants were not concerned about the delayed screening, 22% suffered loss or impaired vision during the pandemic, 12.2% visited the emergency room because of their diabetic eye complication during the pandemic, and 35.4% had a rebooked appointment with the ophthalmologist during the coming three months (Figure 1).

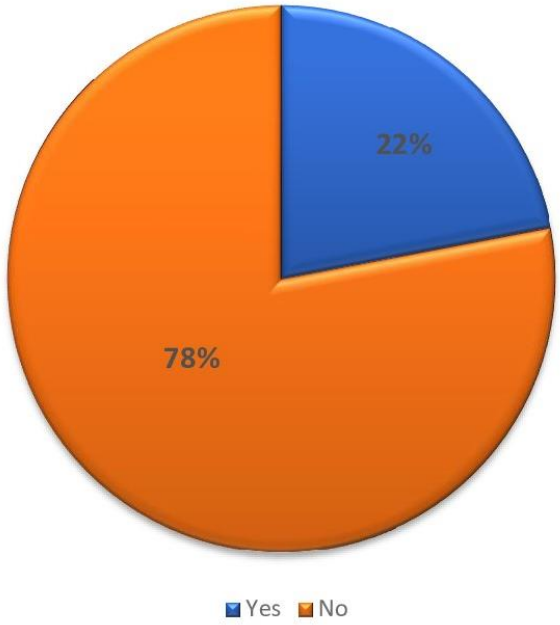

Figure 1 Prevalence of loss or impaired vision during the pandemic

Table 2 Distribution of the studied participants according to their attitude and practice regarding eye screening (No =1042)

Variable	No. (%)
How much are you concerned about the delayed screening?	
Not concerned	412 (39.5)
Little	341 (32.7)
Moderate	207 (19.9)
High	82 (7.9)
Did you suffer loss or impaired vision during the pandemic?	
Yes	229 (22)
No	813(78)

Did you visit the emergency room because of your diabetic eye complication during the pandemic? Yes No	 130 (12.5) 912(87.5)
Did you have a rebooked appointment with the ophthalmologist during the coming three months? Yes No	 369 (35.4) 673 (64.6)

Table 3 shows that 80.7% of the participants disagreed that poor glycemic control enhances diabetic retinopathy progression, 37.7% disagreed that diabetic individuals might have advanced diabetic retinopathy despite having good vision, 68.3% disagreed that hypertension and hyperlipidemia enhance diabetic retinopathy progression, and 83.3% disagreed that diabetic retinopathy can be detected early and saved.

Table 3 Distribution of the studied participants according to their knowledge regarding diabetic retinopathy (No =1042)

Variable	No. (%)
Poor glycemic control enhances diabetic retinopathy progression Agree Neutral Disagree	 40 (3.8) 161 (15.5) 841 (80.7)
A diabetic individual may have advanced diabetic retinopathy despite having good vision Agree Neutral Disagree	 197 (18.9) 452 (43.4) 393(37.7)
Comorbidity (Hypertension, Hyperlipidemia) enhance diabetic retinopathy progression. Agree Neutral Disagree	 78 (7.5) 252 (24.2) 712 (68.3)
Diabetic retinopathy can be detected early and saved. Agree Neutral Disagree	 41 (3.9) 133 (12.8) 868 (83.3)

Table 4 illustrated that 26.5% of studied participants agreed that the barrier towards regular screening was closed clinics, for 64.2% it was fear of screening result, for 32% it was the fear of Coronavirus infection, for 69% it was the transportation, and for 42.2% the barrier was the cost in the private sector. Table 5 shows that male participants had a significantly higher percentage of those whose barrier to regular eye screening was the fear of Coronavirus. In comparison, females had a significantly higher percentage of those whose barrier to regular eye screening was transportation (p=<0.05). On the other hand, a non-significant relationship was found between participants' gender and other barriers to regular eye screening (p=>0.05).

Table 4 Distribution of the studied participants according to barriers towards regular eye screening (No=1042)

Variable	No. (%)
I did not have the regular screening because of the closed clinics. Agree Neutral Disagree	 276 (26.5) 255(24.5) 511 (49)
I did not have regular screening because of the fear of screening results. Agree Neutral Disagree	 669 (64.2) 207 (19.9) 166 (15.9)
I did not have the regular screening because of the fear of Coronavirus infection. Agree Neutral Disagree	 333(32) 173 (16.6) 536 (51.4)
I did not have the regular screening because of the transportation. Agree Neutral Disagree	 719 (69) 169(16.2) 154 (14.8)
I did not have the regular screening because of the cost in the private sector. Agree Neutral Disagree	 440 (42.2) 204 (19.6) 398 (38.2)

Table 5 Relationship between participants' gender and barriers towards regular eye screening

Barrier	Gender		$\chi 2$	p-value
	Male No. (%)	Female No. (%)		
I did not have the regular screening because of the closed clinics. Agree Neutral Disagree	 133 (48.2) 115 (45.1) 211 (41.3)	 143 (51.8) 140 (54.9) 300 (58.7)	3.6	0.16
I did not have regular screening because of the fear of screening results. Agree Neutral Disagree	 298 (44.5) 81 (39.1) 80 (48.2)	 371 (55.5) 126 (60.9) 86 (51.8)	3.25	0.19
I did not have the regular screening because of the fear of Coronavirus infection.				

Agree	167 (50.2)	166 (49.8)	12.43	0.002
Neutral	84 (48.6)	89 (51.4)		
Disagree	208 (38.8)	328 (61.2)		
I did not have the regular screening because of the transportation.				
Agree	344 (47.8)	375 (52.2)		
Neutral	65 (38.5)	104 (61.5)	14.72	0.001
Disagree	50 (32.5)	104 (67.5)		
I did not have the regular screening because of the cost in the private sector.				
Agree	202 (45.9)	238 (54.1)		
Neutral	87 (42.6)	117 (57.4)	1.06	0.85
Disagree	170 (42.7)	228 (57.3)		

Table 6 shows that participants ranging from 40 – 59 years old had a significantly higher percentage of those whose barrier to regular eye screening was the closed clinics and the transportation (p=<0.05). On the other hand, a non-significant relationship was found between participants' age and other barriers to regular eye screening (p=>0.05). Table 7 shows that participants with a university education had a significantly higher percentage of those whose barrier to regular eye screening was transportation (p=<0.05). On the other hand, a non-significant relationship was found between participants' education and other barriers to regular eye screening (p=>0.05).

Table 6 Relationship between participants' age and barriers towards regular eye screening

	Age				
Barrier	20 – 39 years	40 – 59 years	≥ 60 years	$\chi 2$	p-value
I did not have the regular screening because of the closed clinics.					
Agree	108 (39.1)	139 (50.4)	29 (10.5)		
Neutral	108 (42.4)	112 (43.9)	35 (13.7)	16.45	0.002
Disagree	152 (29.7)	67 (13.1)	67 (13.1)		
I did not have regular screening because of the fear of screening results.					
Agree	226 (33.8)	353 (52.8)	90 (13.5)		
Neutral	82 (39.6)	99 (47.8)	26 (12.6)	4.64	0.32
Disagree	60 (36.1)	91 (54.8)	15 (9)		
I did not have the regular screening because of the fear of Coronavirus infection.					
Agree	113 (33.9)	183 (55)	37 (11.1)		
Neutral	74 (42.8)	78 (43.9)	23 (13.3)	6.91	0.14
Disagree	181 (33.8)	284 (53)	71 (13.2)		
I did not have the regular screening because of the transportation.					
Agree	227 (31.6)	393 (54.7)	99 (13.8)		
Neutral	77 (45.6)	79 (46.7)	13 (7.7)	15.5	0.002
Disagree	64 (41.6)	71 (46.1)	19 (12.3)		

I did not have the regular screening because of the cost in the private sector.					
Agree	153 (34.8)	230 (52.3)	57 (13)		
Neutral	89 (43.6)	94 (46.1)	21 (10.3)	8.67	0.07
Disagree	126 (31.7)	219 (55)	53 (13.3)		

Table 7 Relationship between participants' education and barriers towards regular eye screening

Barrier	Education				χ2	p-value
	Illiterate	≤High school	University	Higher education		
I did not have the regular screening because of the closed clinics.						
Agree	29 (10.5)	112 (40.6)	124 (44.9)	11 (4)		
Neutral	25 (9.9)	97 (38)	118 (46.3)	15 (5.9)	8.02	0.23
Disagree	73 (14.3)	186 (36.4)	216 (42.3)	36 (7)		
I did not have regular screening because of the fear of screening results.						
Agree	67 (10)	262 (39.2)	301 (45)	39 (5.8)		
Neutral	30 (14.5)	70 (33.8)	95 (45.9)	12 (5.8)	11.54	0.07
Disagree	30 (18.1)	63 (38)	62 (37.3)	11 (6.6)		
I did not have the regular screening because of the fear of Coronavirus infection.						
Agree	35 (10.5)	124 (37.2)	157 (47.1)	17 (5.1)		
Neutral	16 (9.2)	64 (37)	77 (44.5)	16 (9.2)	9.06	0.17
Disagree	76 (14.2)	207 (38.6)	224 (41.8)	29 (5.4)		
I did not have the regular screening because of the transportation.						
Agree	71 (9.9)	275 (38.2)	327 (45.5)	46 (6.4)		
Neutral	20 (11.8)	70 (41.4)	69 (40.8)	10 (5.9)	23.33	0.001
Disagree	36 (23.4)	50 (32.5)	62 (40.3)	6 (3.9)		
I did not have the regular screening because of the cost in the private sector.						
Agree	52 (11.8)	168 (38.2)	192 (43.6)	28 (6.4)		
Neutral	22 (10.8)	82 (40.2)	90 (44.1)	10 (4.9)	1.83	0.93
Disagree	53 (13.3)	145 (36.4)	176 (44.2)	24 (6)		

Table 8 shows that participants with diabetes duration less than five years had a significantly higher percentage of those whose barrier to regular eye screening was the closed clinics (p=<0.05). In contrast, participants with a diabetes duration of 6-19 years had had a significantly higher percentage of those whose barriers to regular eye screening were the fear of screening result, transportation and the cost in the private sector (p=<0.05).

Table 8 Relationship between diabetes duration and barriers towards regular eye screening

Barrier	Diabetes duration				χ2	p-value
	<5 y	6 – 19 y	20 – 29 y	≥30 years		
I did not have the regular screening because of the closed clinics.						
Agree	125 (45.3)	96 (34.8)	35 (12.7)	20 (7.2)		
Neutral	106 (41.6)	95 (37.3)	27 (10.6)	27 (10.6)	13.1	0.04
Disagree	180 (35.2)	189 (37)	85 (16.6)	57 (11.2)		
I did not have regular screening because of the fear of screening results.						
Agree	237 (35.4)	285 (42.6)	84 (12.6)	63 (9.4)		
Neutral	101 (48.8)	52 (25.1)	30 (14.5)	24 (11.6)	33.32	<0.001
Disagree	73 (44)	43 (25.9)	33 (19.9)	17 (10.2)		
I did not have the regular screening because of the fear of Coronavirus infection.						
Agree	129 (38.7)	146 (43.8)	39 (11.7)	19 (5.7)		
Neutral	73 (42.2)	58 (33.5)	22 (12.7)	20 (11.6)	19.74	0.003
Disagree	209 (39)	176 (32.8)	86 (16)	65 (12.1)		
I did not have the regular screening because of the transportation.						
Agree	265 (36.9)	291 (40.5)	85 (11.8)	78 (10.8)		
Neutral	75 (44.4)	52 (30.8)	28 (16.6)	14 (8.3)	27.29	<0.001
Disagree	71 (46.1)	37 (24)	34 (22.1)	12 (7.8)		
I did not have the regular screening because of the cost in the private sector.						
Agree	69 (38.4)	185 (42)	50 (11.4)	36 (8.2)		
Neutral	94 (46.1)	64 (31.4)	28 (13.7)	18 (8.8)	19.16	0.004
Disagree	148 (37.2)	131 (32.9)	69 (17.3)	50 (12.6)		

4. DISCUSSION

Studies to determine the impediments to DR screening among diabetics in Saudi Arabia are necessary since Saudi Arabia, as mentioned before, has a high prevalence (24%) of DM. Other reasons that increase the importance of the screening; DR is the most frequent microvascular complication, and DRS is a cost-effective manner to preserve eyesight (Baumeister et al., 2015). This is an observational study using a predesigned online survey to collect information about the sociodemographic, diabetic and diabetic retinopathy status, barriers of ophthalmology clinic follow-up, and the attitude and practice regarding eye screening of DM patients from Taif city, Saudi Arabia.

Our study results have shown that 3.8% of the participants agreed that poor glycemic control enhances diabetic retinopathy progression, 18.9% think that a diabetic individual may have advanced diabetic retinopathy despite having good vision, 7.5% believe that comorbidities enhance diabetic retinopathy progression and 3.9% are aware that diabetic retinopathy detected early may save their vision. Overall, the lack of awareness about DR seems to be a worldwide health problem, interfering with proper management and preventing possible visual impairment as shown from a systemic review of 77 studies, a lack of understanding and awareness are significant barriers to DRS ("Standards of Medical Care in Diabetes–2006," 2006). Therefore, more effort should be made to increase awareness through family physicians and to hold health education campaigns.

Our results revealed that around 38% of the respondents reported missing eye screening and /or treatment, and 58.2% experienced a gap in screening (time without screening) during the pandemic for six months or more. Furthermore, during the pandemic, 22% of the participants suffered vision loss or impairment, 12.2% visited the emergency room due to a complication of their diabetic eye, and 35.4% had a rebooked appointment with the ophthalmologist during the coming three months. Similarly, a study in Greece has reported that COVID-19-related lockdown caused postponement in patient care, resulting in significantly worse outcomes in patients with DR (Alwazae et al., 2019). Approximately 64% of our sample agreed that fear of screening results was their barrier from attending DRS unite, this barrier also was found among patients in other studies (Piyasena et al., 2019).

Health education about the seriousness of eye-related complications of diabetes may reduce this barrier and increase commitment to DRS. About 69% agreed that they have transportation issues, also participants with high education mentioned it was the main barrier to regular eye screening, this problem was reported in a systemic review as one of the significant barriers among high-income countries (Ben et al., 2020). Fear of Coronavirus infection as a barrier during the COVID-19 pandemic was significantly higher among males, contrary to what has been reported in other studies about the fear of COVID-19 (23-25). As seen in previous studies (Peter H Scanlon et al., 2015), advanced age participants are more likely to follow eye examinations at recommended intervals. Our findings were consistent with this finding.

The limitations of our study are similar to those of similar cross-sectional studies. For example, sampling a small portion of the population makes the study susceptible to biases as non-response bias and recall bias, makes it difficult to make a causal inference, and the identified associations are sometimes difficult to interpret.

5. CONCLUSION

In conclusion, our study found some barriers to annual DR screening among adult DM patients in Taif city, the study has shown a low level of knowledge among patients, and many knowledge points should be enhanced as it is considered a barrier since it affects compliance of DR screening. Additionally, our results have revealed that there are other barriers to DR annual screening. COVID-19 has caused postponement in patient care because of closed clinics and patients fear of getting an infection, which resulted in worse outcomes among patients with DR.

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Ethical consideration

Ethical approval was obtained from Research Ethics Committee at Taif University with the IRB approval number (HAO-02-T-105).

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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.

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