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Knowledge, Attitude, and Practices Regarding Diabetic Eye Disease among General Population in Medina City, Saudi Arabia

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Abstract

Background: Diabetic eye disease is known as a group of eye problems that diabetic patients may develop as a complication of diabetes and can lead to blindness. They may include Diabetic retinopathy (DR), Cataracts, and Glaucoma. **Objectives:** This study aims to assess the knowledge, attitude, and practices (KAP) around diabetic eye disease in the general population including patients with DM and non-diabetic people in Medina City, Saudi Arabia. **Methods:** This is a cross-sectional study involving 385 participants via a self-administered online Questionnaire started in January 2023 in Medina, Saudi Arabia. **Results:** In total, 339 participants with ages ranged from 18 to more than 60 years with a mean age of 26.8 ± 12.6 years old completed the questionnaire. The majority were females (74.6%), singles (67.8%), and had a university level of education (54.6%). Most of the study participants were found to have poor knowledge levels (67%) in comparison to 33% who had an overall good knowledge of diabetic eye diseases. Knowledge level was found to be higher among old-aged participants and those with a family history of DM (P = 0.001, P = 0.049) respectively. Regarding participants' attitudes and practices, the study showed good attitudes toward eye care practice for diabetics with half of the participants (50%) reporting self-awareness as a reason that made them undergo the first eye screening. **Conclusion:** Participants in the present study have poor knowledge and awareness level of diabetic eye disease. Furthermore, positive attitudes and perceptions have been revealed by the participants toward the practice of providing eye care for diabetics.

Keywords

Knowledge, Attitude, Practices, Diabetes Mellitus, Eye Disease

1. Introduction

Diabetes mellitus (DM) is a major public health problem defined by the World Health Organization (WHO) as a disorder that affects the metabolism of the body and is characterized by chronic high blood glucose levels associated with defects in carbohydrate, lipid, and protein metabolism, that results from disturbances in insulin secretion, insulin action, or both [1].

DM can be classified into three main classes; 1) Type 1 DM which is known as severe insulin deficiency in the body that makes insulin administration essential. 2) Type 2 DM which is characterized by the body's tissue resistance to insulin action combined with insulin secretion deficiency. 3) Type 3 DM is known as gestational diabetes and is defined as any abnormality in glucose levels that is detected for the first-time during pregnancy.

Through the past 30 years, DM is still one of the top drivers that is increasing the global burden. DM was found to be affecting more than 463 million people worldwide and it is estimated that the number of diabetic patients will double by 2025 [2] [3] [4] [5] [6].

According to International Diabetes Federation, the Middle East, and North African region has the world's highest diabetes adult age prevalence of 12.2%. In 2013, Saudi Arabia was the seventh out of the world's top ten diabetes-prevalence countries with a high prevalence of 24% specifically, in people aged 20 - 79 years [1] [3] [4].

DM can lead to different macrovascular and/or microvascular complications such as cardiovascular diseases, cerebrovascular diseases, diabetic eye disease, diabetic nephropathy, and diabetic neuropathy. Diabetic eye disease is known as a group of eye problems that diabetic patients may develop as a complication of diabetes and can lead to a severe decrease in vision or even blindness. They may include Diabetic retinopathy (DR), Cataracts, and Glaucoma. In diabetic patients, high blood glucose level damages the small blood vessels wall in the eye, changing their structure and function.

These blood vessels may enlarge, leak, form clots, close off, or develop tiny balloon-like flaws called micro-aneurysms because of this illness, known as diabetic retinopathy. Macular edema is the medical term for the fluid buildup that frequently occurs in the retina used for activities like reading. In severe situations, a process known as neovascularization causes the retina to lose its blood supply and sprout new, but damaged blood vessels. These delicate blood vessels are prone to bleeding, which can lead to scar tissue, hemorrhages that impair vision, or separation of the retina from the back of the eye (retinal detachment). Glaucoma can be caused by the new vessels' ability to obstruct the passage of

fluid inside the eye [2].

Among diabetic eye diseases, DR is considered the most harmful complication that can result in vision loss for the affected patients. Moreover, other eye diseases affecting vision such as cataracts and glaucoma were found to increase in prevalence among diabetic patients [7].

Several studies done around the world showed that diabetic eye diseases remain the leading cause of visual loss particularly among the adult working age group [5] [8] [9]. It is estimated that about 15,000 to 39,000 people around the world lose their vision because of diabetes and about 14.6% aged 40 years and above, developed diabetic retinopathy after a 5-year duration of diabetes. In Saudi Arabia, there is a study found that around 36% of diabetic patients experience stressful retinopathy. Moreover, many studies have proved that microvascular complications such as diabetic eye disease are linked to several risk factors such as disease duration, poor glycemic control, hypertension, dyslipidemia, nephropathy, pregnancy, and gender.

The American Diabetes Association and the American Academy of Ophthalmology published guidelines stating that type 1 DM patients should begin their annual eye examinations 5 years after their diagnosis, while patients with type 2 DM should have an annual eye examination starting at the time of the diagnosis. This helps medical practitioners and physicians to detect diabetic eye diseases in their earliest and treatable stages [4] [7].

Conclusively, control of the modifiable risk factors through periodic eye examinations and timely interventions has been shown to delay the progression of these complications. Furthermore, an undervalued important element in optimal management and delaying disease progression is the improvement of education and awareness regarding diabetes and its complications among both general and diabetic patients. Focusing on these parameters could enable actions targeting preventive strategies more effectively, improve patient's quality of life and consequently, improve the national healthcare systems with significant cost savings.

In that context, our study aims to assess the knowledge, attitude, and practices (KAP) around diabetic eye disease in the general population including patients with DM and non-diabetic people in Medina City, Saudi Arabia. To the best of our knowledge, this is the first study to evaluate KAP regarding diabetic eye diseases among general population in Medina. In addition, as most other studies focused on DR alone, we opted for a more comprehensive approach to diabetic eye diseases.

2. Objectives

1) To assess the knowledge, attitude, and practice level regarding diabetic complications, specifically diabetic eye disease in both diabetic and non-diabetic people in Medina.

2) To determine the barriers to eye care for diabetic eye disease among the general population in Medina.

3. Materials & Methods

3.1. Study Design and Duration

Our study is a cross-sectional study among the general population in Medina City, which was started in January 2023.

3.2. Study Population and Sampling

The study includes the general population of Medina, either diabetic or non-diabetic people from both genders. Participants less than 18 years old are excluded.

Our study sample includes 385 participants, they are selected randomly from Medina City by using a self-administered online Questionnaire (See Appendix). The survey was distributed using social media platforms. A non-probability (convenience) sampling method was used to select the sampling units. For sample size calculation, we used a (Sampsize) website.

3.3. Survey Instrument

English and Arabic self-administrative online questionnaires are used (See Appendix). The questionnaire was pretested in a pilot study on 30 participants to ensure the clarity of the questionnaire and identify any omissions; several additions and modifications were made.

The questionnaire is divided into four parts: the first includes questions regarding patients' demographic data, such as age, gender, level of education, marital status, place of residency, associated comorbidities, and smoking status. The second part includes eight questions to assess the knowledge regarding diabetes by asking the population about the complications, screening, and treatment options of diabetic eye disease. The third part contains seven questions to assess the knowledge, attitude/practice of diabetic eye complications. The last part involves only people who have diabetes to ask about the background of the disease which includes type, duration, type of treatment, and last HbA1C. The participants are asked to choose the most appropriate reason from a list based on their opinions and knowledge.

Participation of the general population in the study is based on an informed consent option chosen before the completion of the questionnaire. Participants are informed about the study's goal, length, and anonymity before being recruited. The participants are notified that their information will be used for research purposes, but the participants' identities remain anonymous.

3.4. Data Analysis

The data were collected, reviewed, and then fed to Statistical Package for Social Sciences version 21 (SPSS: An IBM Company). All statistical methods used were two-tailed with alpha level of 0.05 considering significance if P value less than or equal to 0.05. Regarding knowledge and awareness, each correct answer was

given 1-point score. Overall awareness level regarding diabetic eye diseases was assessed through summing up discrete scores for different correct awareness items. The overall knowledge score was categorized to poor level if participants' score was less than 60% of the overall score and good level of knowledge was considered if the participants score was 60% or more of the overall score. Descriptive analysis was done by prescribing frequency distribution and percentage for study variables including participants' personal data, education and medical data, and family history of DM. Also, knowledge and awareness items, attitude and self-reported practices for eye examination were tabulated while overall knowledge level was graphed. Cross tabulation for showing distribution of participants' overall knowledge level by their data was carried out with Pearson chi-square test for significance and exact probability test if there were small frequency distributions.

3.5. Ethical Approval

This study was ethically approved by The Institutional Review Board (IRB), General Directorate of Health Affairs in Madinah with IRB log No. 23-061.

4. Results

A total of 339 eligible participants completed the study questionnaire. Participants' ages ranged from 18 to more than 60 years with a mean age of 26.8 ± 12.6 years old. Exact of 253 (74.6%) were females, 230 (67.8%) were single, and 94 (27.7%) were married. As for education, 185 (54.6%) had a university level of education, 132 (38.9%) were in high school and 10 (2.9%) had a post-graduate degree. As for co-morbidities, 32 (9.6%) were diabetic, 21 (6.3%) were hypertensive, 16 (4.8%) had dyslipidemia, 11 (3.3%) had Ischemic Heart Disease (IHD) while most of the participants (79.1%; 265) had no chronic health problem. A total of 208 (61.4%) had a family history of DM, 270 (79.6%) were non-smokers, but 50 (14.7%) were current smokers (Table 1).

Table 2 shows the knowledge about diabetic eye diseases among general population, Medina City, Saudi Arabia. A total of 70 (20.6%) of the study participants said that they may have DM and not know about it. As for complications poorly controlled for DM, 90.4% reported for eye diseases, 79.1% know about Nephropathy, 76.2% for Neuropathy, 70.6% for coronary artery disease, and 70.2% know about Peripheral vascular disease. Only 57.4% know about strokes as a complication for poor DM control. Regarding the effect of DM on the eye, 56.3% know about the effect on the retina, 53.1% know about the vision affect, and 38.6% know that DM can affect the health of the eyes, 37.2% know about blindness. A total of 78.5% know that children with diabetes also have a risk of developing eye complications, 75.2% know that a diabetic patient needs to have an eye checkup when his/her blood sugar level is well-controlled, and 90.3% know that a diabetic patient needs to have an eye checkup when his/her blood sugar level is poorly controlled. As for check-up frequency, only 22.1% know it

Table 1. Bio-demographic data of study participants, Medina City, Saudi Arabia (n = 339).

Bio-demographic data	No.	%
Age in years		
18 - 29	237	69.9%
30 - 44	33	9.7%
45 - 59	54	15.9%
>59	15	4.4%
Gender		
Male	86	25.4%
Female	253	74.6%
Marital status		
Single	230	67.8%
Married	94	27.7%
Divorced/ widow	15	4.4%
Educational level		
Below high school	12	3.5%
High school	132	38.9%
Bachelor degree	185	54.6%
Post-graduate degree	10	2.9%
Do you have any comorbidities?		
No-comorbidities.	265	79.1%
Diabetes Meletus	32	9.6%
Hypertension	21	6.3%
Dyslipidemia	16	4.8%
Ischemic Heart Disease	11	3.3%
Others	23	6.9%
Are there any members in your family who have diabetes?		
Yes	208	61.4%
No	131	38.6%
Smoking		
Non-smoker	270	79.6%
Ex-smoker	19	5.6%
Current smoker	50	14.7%

Table 2. Knowledge about diabetic eye diseases among general population, Medina City, Saudi Arabia (n = 339).

Knowledge items	No.	%
Can you have diabetes and not know it?		
Yes	70	20.6%
No	159	46.9%
I don't know	110	32.4%
Complications poorly controlled for DM		
Coronary artery disease	199	70.6%
Strokes	162	57.4%
Peripheral vascular disease	198	70.2%
Neuropathy	215	76.2%
Eye disease	255	90.4%
Nephropathy	223	79.1%
How do you think diabetes can affect the eyes?		
No idea	38	11.2%
It doesn't affect the eyes at all	10	2.9%
Affects vision	180	53.1%
Affects your glasses prescription	53	15.6%
Can make you blind	126	37.2%
Affects the health of the eyes	131	38.6%
Retina is the main part of the eyes that is damaged due to diabetes	191	56.3%
Others	2	0.6%
Children with diabetes also have a risk of developing eye complications		
Yes	266	78.5%
No	21	6.2%
I don't know	52	15.3%
Diabetic patient needs to have an eye checkup when his/her blood sugar level is well-controlled?		
Yes	255	75.2%
No	51	15.0%
I don't know	33	9.7%

Continued

Diabetic patient needs to have an eye checkup when his/her blood sugar level is poorly controlled		
Yes	306	90.3%
No	11	3.2%
I don't know	22	6.5%
How often should persons with diabetes get their eyes tested, if their diabetes is stable?		
Only if their vision changes	48	14.2%
Every three months	65	19.2%
Every six months	92	27.1%
Every one year	75	22.1%
Every two years	5	1.5%
I don't know	54	15.9%
treatments available for diabetic retinopathy		
Good control of diabetes alone is adequate	161	47.5%
Laser treatments	110	32.4%
Surgery	67	19.8%
I don't know	128	37.8%

should be annually. Regarding available treatment for diabetic retinopathy, most of the participants reported good control of diabetes alone is adequate (47.5%), followed by laser treatment (32.4%), and surgery (19.8%).

As shown in Figure 1. A total of 112 (33%) of the study participants had an overall good knowledge of diabetic eye diseases while most of them (67%; 227) had a poor knowledge level.

Table 3 shows the attitude regarding diabetic eye diseases, among the general population in Medina City, Saudi Arabia. Exact of 74% disagreed that patients with diabetes often waste their time and money on eye checkups as most of the time eyes of diabetics are normal and 72.9% of the study participants disagreed that if the vision is good, it means that the eyes are not affected due to diabetes. Hence, no need to visit an eye doctor every year. 71.7% of the participants disagreed that if treatment was started for an eye problem, no need to worry about controlling sugar and lipid. Only 42.8% disagreed that if a diabetic patient was treated with laser once, no need for laser treatment again in that eye to treat complications of diabetes.

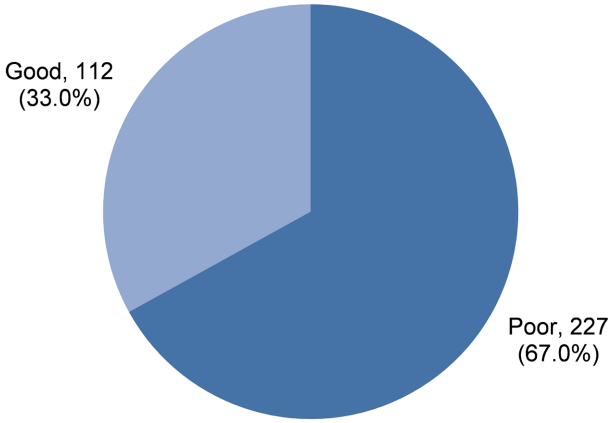

Figure 1. Overall public knowledge and awareness level about diabetic eye diseases among general population, Medina City, Saudi Arabia.

Table 3. Attitude regarding diabetic eye diseases among general population, Medina City, Saudi Arabia (n = 339).

Attitude items	Disagree		Neutral		Agree	
	No.	%	No.	%	No.	%
If the vision is good, it means that the eyes are not affected due to diabetes. Hence, no need to visit an eye doctor every year	247	72.9%	31	9.1%	61	18.0%
If treatment was started for an eye problem, no need to worry about controlling sugar & lipid	243	71.7%	50	14.7%	46	13.6%
Patients with diabetes often waste their time and money on eye checkups as most of the time eyes of diabetics are normal	251	74.0%	49	14.5%	39	11.5%
If a diabetic patient was treated with laser once, no need for laser treatment again in that eye to treat complications of diabetes	145	42.8%	0	0.0%	194	57.2%

Table 4 shows the public practice, reasons, and barriers regarding eye examination among diabetic patients. A total of 11 (34.4%) diabetic patients undergo annual eye examination while 4 (12.5%) never do. As for reasons that make diabetics undergo the first eye screening, the most reported included Self-awareness (50%), Doctor's referral (46.9%), and No previous eye screening was done (9.4%). Regarding the barriers that prevent diabetics from getting eye care, most of the participants reported No recommendation from the family physician or diabetologist (46.9%), No ocular symptoms (31.3%), Lack of access to eye care (15.6%), and Financial reasons (6.3%).

Table 4. Public practice, reasons and barriers regarding eye examination among diabetic patients (n = 32).

Practice	No.	%
How often do you get an eye exam due to your diabetes?		
Only if my vision changes	7	21.9%
Every three months	3	9.4%
Every six months	6	18.8%
Every one year	11	34.4%
Every two years	1	3.1%
Never	4	12.5%
Reasons that make you undergo the first eye screening		
Self-awareness	16	50.0%
Doctor's referral	15	46.9%
No previous eye screening was done	3	9.4%
Others	4	12.5%
Barriers that prevent you from getting eye care		
No recommendation from the family physician or diabetologist	15	46.9%
No ocular symptoms	10	31.3%
Lack of access to eye care	5	15.6%
Others	3	9.4%
Financial reasons	2	6.3%

As shown in Table 5, a total of 40% of participants aged more than 59 years had an overall good knowledge level compared to 12.1% of others aged 30 - 44 years with recorded statistical significance (P = 0.001). Also, 40% of single participants had good knowledge versus 6.7% of widows (P = 0.001). Good knowledge about diabetic eye diseases was detected among 37% of participants with a family history of DM in comparison to 26.7% of others (P = 0.049).

Table 6 shows distribution of public knowledge of diabetic eye diseases by diabetes data, Medina City, Saudi Arabia. A total of 56.3% of diabetic patients had type 2 DM. Diabetes was for 6 - 10 years among 28.1% of diabetics, for 11 - 20 among 28.1%, and for less than 5 years among 28.1%. Tablets were the most received treatment (50%) followed by insulin injection (40.6%), and other. HbA1c was less than 6.5% among 18.8% of the study diabetics, and > 7.5% among 53.1%. No relation between diabetic patients and their knowledge of diabetic eye diseases was detected (P > 0.05 for all).

Table 5. Factors associated with public knowledge of diabetic eye diseases, Medina City, Saudi Arabia (n = 339).

Factors	Overall knowledge level				P-value
	Poor		Good		
	No.	%	No.	%	
Age in years					
18 - 29	144	60.8%	93	39.2%	0.001*$
30 - 44	29	87.9%	4	12.1%	
45 - 59	45	83.3%	9	16.7%	
>59	9	60.0%	6	40.0%	
Gender					
Male	63	73.3%	23	26.7%	0.151
Female	164	64.8%	89	35.2%	
Marital status					
Single	138	60.0%	92	40.0%	0.001*
Married	75	79.8%	19	20.2%	
Divorced/ widow	14	93.3%	1	6.7%	
Educational level					
Below high school	11	91.7%	1	8.3%	0.217$
High school	88	66.7%	44	33.3%	
Bachelor degree	120	64.9%	65	35.1%	
Post-graduate degree	8	80.0%	2	20.0%	
Smoking					
Non-Smoker	176	65.2%	94	34.8%	0.388
Ex-smoker	14	73.7%	5	26.3%	
Current smoker	37	74.0%	13	26.0%	
Do you have any eye diseases or previous eye treatment?					
Yes	77	67.5%	37	32.5%	0.871
No	150	66.7%	75	33.3%	
Are there any members in your family who have diabetes?					
Yes	131	63.0%	77	37.0%	0.049*
No	96	73.3%	35	26.7%	

P: Pearson χ^2 test; $: Exact probability test; *P < 0.05 (significant).

Table 6. Distribution of public knowledge of diabetic eye diseases by diabetes data, Medina City, Saudi Arabia.

Diabetes data	Total		Overall knowledge level				P-value
			Poor		Good		
	No.	%	No.	%	No.	%	
Do you have diabetes?							
Yes	32	9.4%	19	8.4%	13	11.6%	0.338
No	307	90.6%	208	91.6%	99	88.4%	
Type of DM							
Type 1 *DM*	10	31.3%	6	31.6%	4	30.8%	0.183
Type 2 *DM*	18	56.3%	9	47.4%	9	69.2%	
I don't know	4	12.5%	4	21.1%	0	0.0%	
Duration of DM (years)							
<5	9	28.1%	6	31.6%	3	23.1%	
6 - 10	9	28.1%	3	15.8%	6	46.2%	0.283
11 - 20	9	28.1%	6	31.6%	3	23.1%	
>20	5	15.6%	4	21.1%	1	7.7%	
How is your diabetes treated?							
Diet control and or exercise	1	3.1%	1	5.3%	0	0.0%	
Tablets	16	50.0%	9	47.4%	7	53.8%	0.684
Insulin injections	13	40.6%	7	36.8%	6	46.2%	
None-monitoring	1	3.1%	1	5.3%	0	0.0%	
Others	1	3.1%	1	5.3%	0	0.0%	
Your last HbA1C level?							
<6.5%	6	18.8%	3	15.8%	3	23.1%	0.412
6.5% - 7.5%	9	28.1%	7	36.8%	2	15.4%	
>7.5%	17	53.1%	9	47.4%	8	61.5%	

P: Exact probability test.

5. Discussion

According to the WHO, the number of people with diabetes across the world is about 280 million, and it is expected to double by 2025 [5]. It's concerning that the Middle East and North Africa have a higher prevalence of diabetes compared to other parts of the world, which puts patients in those regions at a higher risk of developing complications [10]. The Kingdom of Saudi Arabia is one of the top 10 countries with the highest prevalence of diabetes globally, and this is mainly

due to lifestyle changes [11]. Physical inactivity and a sedentary lifestyle caused by economic improvement are the main reasons for reduced life expectancy in the KSA [12].

Diabetes affects the blood vessels in the eyes, leading to various disorders such as glaucoma, vitreous hemorrhage, cataracts, diabetic retinopathy, and ultimately blindness. Diabetic retinopathy is the most common eye disorder in people with diabetes [13].

The current study aimed to assess public awareness, and attitude regarding diabetic eye disease and to assess eye care practices among diabetics. Regarding knowledge level, the study showed that about one-third of the participants had good knowledge about diabetic eye diseases. In more detail, one-fifth of the study participants reported that they may have DM and not know about it. Regarding the complications of poorly controlled DM, eye diseases, nephropathy, neuropathy, coronary artery disease, and peripheral vascular disease were the most known. More than half of the participants knew about the effect of DM on the retina, also knew that DM can affect vision, and more than one-third talked about the effects on the health of the eyes, and about blindness. About three-fourths know that children with diabetes also have a risk of developing eye complications, diabetic patient needs to have an eye checkup when his/her blood sugar level is well-controlled but most of them know that diabetic patient needs to have an eye checkup when his/her blood sugar level is poorly controlled. In regard to check-up frequency, only one-fifth of the participants know it should be annually. Regarding available treatment for diabetic retinopathy, the most reported were good control of diabetes, laser treatment, and surgery.

Knowledge level was higher among old-aged participants and those with a family history of DM. Similar findings were reported by El-Bab *et al.* [14] in the city of Al-Madinah where 36.1% of participants were knowledgeable about diabetic eye diseases which is similar to our study findings. Relative to the current study findings, a higher awareness level was reported in Jeddah, [15] where 92.4% of the participants had a satisfactory level of awareness but only 10.5% of participants knew the recommended frequency for eye check-ups (similar to the current study finding). Also, Al-Hargan MH *et al.* [16] in Riyadh documented that 88% of study participants were aware that diabetes mellitus can affect the retina; whereas 76% knew that control of blood sugar decreases the hazard of DR, and 66% were aware that diabetic eye disease can lead to blindness. Another study in Riyadh by Al Rashed WA *et al.* [17] revealed that 88.6% of the participants had high awareness about eye problems in diabetes, ocular trauma (81.2%), and other general eye diseases (91.3%). This estimated poor awareness in our study sample may be explained by lack of health education awareness provided by health care authorities and indicates the high need for periodic health education campaigns. Globally, Konstantinidis L *et al.* [7] found that nearly all participants knew that diabetes could damage the eye; also, most of them were aware of the importance of glycemic control and regular eye examination in

preventing eye diseases. Schmid *et al.* [9] reported that 96% of Australian patients with diabetes were aware that diabetes could be sight-threatening, and more than 98% of Japanese patients with type 2 diabetes were aware that diabetes could be related to eye damage [18]. Improving public awareness about diabetic eye diseases among general population will help in early disease detection and also in avoiding risky behavior that may contribute to serious eye complications. This will reduce public burden including economic and daily life burden on disease cases who may have irreversible eye problems up to blindness which inversely affect their quality of life.

In regard to participants' attitudes and perceptions, the current study showed good attitudes regarding eye care practice for diabetics 74% disagreed that patients with diabetes often waste their time and money on eye checkups as most of the time eyes of diabetics are normal, almost the same percentage disagreed that if vision is good, it disagreed that if the vision is good, it means that the eyes are not affected due to diabetes. Hence, no need to visit an eye doctor every year, also, similar number of participants disagreed that if treatment was started for an eye disagreed that if treatment was started for an eye problem, no need to worry about controlling sugar and lipids. Less than half of the participants disagreed that if a diabetic patient was treated with laser once, there is no need for laser treatment again in that eye to treat complications of diabetes. These findings were supported by many other studies in Saudi Arabia, [19] [20] [21] and outside Saudi Arabia [16] [17] [18]. These similar findings regarding the good attitudes and perceptions about diabetic eye diseases could be attributed to the higher prevalence of DM in Saudi Arabia and the fear of getting or worsening of the diabetic eye disease in some patients. Also, high rates of having a family history with DM can increase the good attitude and perception regarding it.

6. Study Limitations and Suggestions

To the authors' knowledge, this is the first study in Medina region, Saudi Arabia to assess the knowledge, attitude, in addition to practices regarding diabetic eye disease among general population which had a large sample size (385) with a sufficient response rate. However, in interpreting the results of this study, some limitations should be considered. The research was carried out in Medina region; therefore, results may not be generalized to people worldwide. Study sampling method (Convenience sampling) which was performed through a cross-sectional survey. As such, the data were collected online through self-reported questionnaires on social media. As a result, there is a possibility of bias against underprivileged populations or those having problems in using electronic devices. Finally, our study didn't exclude people who are physicians or have medical backgrounds which will affect their choices. Therefore, studies from different regions in Saudi Arabia and studies that exclude physicians and people with medical backgrounds are suggested because having a medical background and the health awareness of different regions of Saudi Arabia may affect the results. Despite

these limitations, this study provides useful information regarding diabetic eye disease knowledge, awareness, and practices among Saudi population and may provide insights for future research in this field to learn more about this area and address the aforementioned issues.

7. Conclusion and Recommendations

A poor knowledge and awareness level about diabetic eye diseases has been reported among the general population. Furthermore, positive attitudes and perceptions have been revealed by the participants toward the practice of providing eye care for diabetics. Among diabetic patients, poor practice toward eye examination of the diabetic has been found. No family physician/diabetologist advice, no ocular symptoms, lack of access to eye care, and financial concerns were the most common barriers that hinder diabetics from receiving eye care. These findings ensured the need for understanding diabetic eye diseases in both diabetics and non-diabetics in Medina region, Saudi Arabia, through public health campaigns for improving the annual eye check-up by their regular ophthalmologists. All doctors (general practitioners, family physicians, and ophthalmologists) in addition to optometrists, health workers, educational authorities, and policy planners should make a concerted effort to raise awareness of diabetic eye disease and its negative health effects. This would give them the ability to monitor and control this issue at the primary level of prevention.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendices

English Questionnaire

Section 1: Demographic Part

Question 1: What is your age?

- <18 years
- 18 - 29 years
- 30 - 44 years
- 45 - 59 years
- ≥60 years

Question 2: What is your gender?

- Female
- Male

Question 3: Marital Status?

- Married
- Single
- Divorced
- Widow

Question 4: City?

- Medina
- Other (please specify)……

Question 5: What is the highest level of education you have completed?

- I did not receive a formal education.
- Elementary
- Intermediate
- High school
- Bachelor's degree
- Postgraduate

Question 6: Do you have any comorbidities? (Circle one or more of the following options)

- No, I do not have any comorbidities.
- DM
- HTN
- Dyslipidemia
- IHD
- Other (please specify)……

Question 7: Smoking status

- Current smoker
- Ex-smoker
- Non-smoker

Question 8: Do you have any eye diseases or previous eye treatment?

- Yes (mention it)……
- No

Question 9: Are there any members in your family who have diabetes?

- Yes
- No

Section 2: Assess the Knowledge

Question 1: Can you have diabetes and not know it?

- Yes
- No
- I do not know

Question 2: Which of the following complication/s may arise if diabetes is poorly controlled?

- ***Coronary artery disease***
  - Yes
  - No
  - I do not know
- ***Stroke***
  - Yes
  - No
  - I do not know
- ***Peripheral vascular disease***
  - Yes
  - No
  - I do not know
- ***Neuropathy***
  - Yes
  - No
  - I do not know
- ***Eye Disease***
  - Yes
  - No
  - I do not know
- ***Nephropathy***
  - Yes
  - No
  - I do not know

Question 3: How do you think diabetes can affect the eyes? (Circle one or more of the following options)

- No idea
- It doesn't affect the eyes at all.
- Affects vision.
- Affects your glasses prescription.
- Can make you blind.
- Affects the health of the eyes.
- Retina is the main part of the eyes that is damaged due to diabetes.
- Other (please specify)……

Question 4: Children with diabetes also have a risk of developing eye complications.

- Yes
- No
- I do not know

Question 5: Does a diabetic patient need to have an eye checkup when his/her blood sugar level is well-controlled?

- Yes
- No
- I do not know

Question 6: Does a diabetic patient need to have an eye checkup when his/her blood sugar level is poorly controlled?

- Yes
- No
- I do not know

Question 7: How often should persons with diabetes get their eyes tested, if their diabetes is stable?

- Do not know.
- Only if their vision changes
- Every three months
- Every six months
- Every one year
- Every two years

Question 8: Do you know what are the treatments available for diabetic retinopathy? (Circle one or more of the following options):

- Good control of diabetes alone is adequate.
- Laser treatments
- Surgery
- I do not know.

Section 3: Assess the Attitude/Practice of Diabetic Eye Diseases

Question 1: If the vision is good, it means that the eyes are not affected due to diabetes. Hence, no need to visit an eye doctor every year.

- I agree.
- I do not agree.
- I do not know.

Question 2: If treatment was started for an eye problem, no need to worry about controlling sugar & lipid.

- I agree.
- I do not agree.
- I do not know.

Question 3: Patients with diabetes often waste their time and money on eye checkups as most of the time eyes of diabetics are normal.

- I agree.

- I do not agree.
- I do not know.

Question 4: How often do you get an eye exam due to your diabetes?

- Never.
- Only if my vision changes.
- Every three months.
- Every six months.
- Every one year.
- Every two years.
- Other (please specify)……

Question 5: If a diabetic patient was treated with laser once, no need for laser treatment again in that eye to treat complications of diabetes.

- I agree.
- I do not agree.
- I do not know.

Question 6: What are the reasons that make you undergo the first eye screening? (Circle one or more of the following options):

- Doctor's referral.
- Self-awareness.
- No previous eye screening was done.
- Other (please specify)……

Question 7: What are the barriers that prevent you from getting eye care? (Circle one or more of the following options):

- No recommendation from the family physician or diabetologist.
- Financial reasons.
- Lack of access to eye care.
- No ocular symptoms.
- Other (please specify)……

If you do not have diabetes, this survey is finished.

Section 4: Background of Diabetic Patients

Question 1: Do you have diabetes?

- Yes
- No

Question 2: If yes, what type of diabetes do you have, or have you had?

- Type 1
- Type 2
- I do not know

Question 3: Duration of diabetes?

- Less than 5 years
- 6 - 10 years
- 11 - 20 years
- More than 20 years

Question 4: How is/was your diabetes treated?

- Insulin injections
- Tablets
- Diet control and/or exercise
- None-monitoring
- Other (please specify)……

Question 5: Your last HbA1C level?

- <6.5
- 6.5 - 7.5
- >7.5
- I do not know.

Thank you for completing the survey.

Arabic Questionnaire/الاستبيان باللغة العربية

القسم 1: المعلومات الشخصية.

السؤال 1: ما هو عمرك؟

- 18 سنه.>
- 29-18 سنه.
- 44-30 سنه.
- 59-45 سنه.
- 60 سنه.>

السؤال 2: ما هو جنسك؟

- انثى.
- ذكر.

السؤال 3: الحالة الاجتماعية؟

- متزوج/ه.
- أعزب/عزباء.
- مطلق/ه.
- أرمل/ه.

السؤال 4: مكان الإقامة؟

- المدينة المنورة.
- أخرى (اذكرها/اذكريها) .....

السؤال 5: المستوى التعليمي؟

- لم احصل على أي درجة علمية.
- الابتدائية.
- المتوسطة.
- الثانوية.
- البكالوريوس.
- دراسات عليا

السؤال 6: هل تعاني/ن من أي مشاكل صحية؟

(اختر واحد او أكثر من الخيارات التالية):

- أنا لا أعاني من أي مشاكل صحية.
- داء السكري.
- ارتفاع ضغط الدم.

- ارتفاع نسبة الأحماض الدهنية (الدهون) في الجسم.
- أمراض القلب.
- أخرى (اذكرها/اذكريها) .....

السؤال 7: فيما يتعلق بالتدخين، هل انت؟

- مدخن/ة.
- مدخن/ه سابقاً.
- غير مدخن/ة.

السؤال 8: هل تعاني/ن من أي أمراض بالعين أو سبق لك الحصول على علاج للعين؟

- نعم (اذكرها/اذكريها) .....
- لا

السؤال 9: هل يعاني أحد افراد عائلتك من داء السكري؟

- نعم
- لا

القسم 2: تقييم المعلومات.

السؤال 1: هل من الممكن أن تكون/ي مصابة بداء السكري دون أن تعلم/ي؟

- نعم
- لا
- لا اعلم

السؤال 2: أي من المضاعفات أو المشاكل الصحية التالية يمكن ان ينتج بسبب ضعف التحكم بالسكري؟

- ***أمراض شرايين القلب***
  - نعم
  - لا
  - لا اعلم
- ***الجلطات الدماغية***
  - نعم
  - لا
  - لا اعلم
- ***أمراض الأوعية الدموية***
  - نعم
  - لا
  - لا اعلم
- ***أمراض الاعصاب***
  - نعم
  - لا
  - لا اعلم
- ***أمراض العيون***
  - نعم
  - لا
  - لا اعلم
- ***أمراض الكلى***
  - نعم

- لا
- لا اعلم

السؤال 3: باعتقادك، كيف يمكن لداء السكري ان يؤثر على العين؟

(اختر واحد او أكثر من الخيارات التالية):

- لا اعلم.
- لا يؤثر على العين مطلقاً.
- يؤثر على الرؤية.
- يؤثر على قياسات النظارة.
- قد يؤدي الى العمى.
- يؤثر على صحة العين.
- الشبكية هي الجزء الأساسي من العين الذي يتأثر بسبب داء السكري.
- أخرى (اذكرها/اذكريها) .....

السؤال 4: هل تعتقد/ي ان الأطفال المصابين بداء السكري لديهم الخطورة للإصابة بمضاعفات ومشاكل العين أيضاً؟

- نعم
- لا
- لا اعلم

السؤال 5: هل تعتقد/ي ان مريض السكري يحتاج الى القيام بفحص العين بشكل دوري عندما يكون مستوى السكر لديه منتظم؟

- نعم
- لا
- لا اعلم

السؤال 6: هل تعتقد/ي ان مريض السكري يحتاج الى القيام بفحص العين بشكل دوري عندما يكون مستوى السكر لديه غير منتظم؟

- نعم
- لا
- لا اعلم

السؤال 7: باعتقادك، كم مره يجب على مريض السكري ان يقوم بفحص العين في حال كان مستوى السكر لديه منتظم؟

- لا اعلم.
- فقط في حال وجود تغييرات في الرؤية.
- مره واحدة كل ثلاثة أشهر.
- مره واحدة كل ستة أشهر.
- مره واحدة كل سنه.
- مره واحدة كل سنتين.

السؤال 8: هل تعلم/ي ما هي طرق العلاج المتوفرة لعلاج اعتلال الشبكية المرتبط بداء السكري؟

(اختر واحد او أكثر من الخيارات التالية):

- التحكم الجيد بمستوى السكر وحده يُعد كافياً.
- العلاج بالليزر.
- الجراحة.
- لا اعلم.

القسم 3. فيما يتعلق بالسلوك والممارسات لمضاعفات مرض السكري في العينين:

السؤال 1: إذا كانت الرؤية جيدة، فهذا يعني أن العينين لم تتأثر بالسكري ولذلك لا حاجه لزيارة طبيب

العيون سنوياً للقيام بفحص العين؟

- أوافق.
- لا أوافق.
- لا اعلم.

السؤال 2: في حال استخدام أي من الطرق العلاجية لمشاكل العين، فليس هناك داعٍ للقلق تجاه التحكم بمستوى السكر أو الدهون في الجسم؟

- أوافق.
- لا أوافق.
- لا اعلم.

السؤال 3: غالباً ما يقوم مرضى السكري بتضييع وقتهم وأموالهم لعمل فحوصات العين الدورية حيث إنه في معظم الأوقات تكون عيونهم طبيعية وبلا مشاكل؟

- أوافق.
- لا أوافق.
- لا اعلم.

السؤال 4: كم مره تقوم بزيارة طبيب العيون لفحص العين بسبب مرض السكري؟

- أبداً.
- فقط في حال كانت لدي تغييرات في الرؤية.
- مره واحده كل ثلاثة أشهر.
- مره واحده كل ستة أشهر.
- مره واحده سنوياً.
- مره واحده كل سنتين.
- أخرى (اذكرها/اذكريها) .....

السؤال 5: في حال تلقى مريض السكري العلاج بالليزر مره واحدة، فهذا يعني انه لا حاجه إلى العلاج بالليزر مره أخرى لعلاج مضاعفات ومشاكل العين المرتبطة بالسكري؟

- أوافق.
- لا أوافق.
- لا اعلم.

السؤال 6: ما هي الأسباب التي جعلتك تقوم/ي بأول فحص للعين؟

(اختر واحد او أكثر من الخيارات التالية):

- تحويل الطبيب.
- الوعي الذاتي.
- لم يتم عمل فحص للعينين
- أخرى (اذكرها/اذكريها) .....

السؤال 7: ما هي الحواجز أو الأسباب التي منعتك من الحصول على العناية بالعين والقيام بالفحوصات الدورية؟

(اختر واحد او أكثر من الخيارات التالية):

- لم يكن هناك توصيات موجهه من الطبيب الذي اتابع حالتي معه.
- أسباب مادية (مالية).
- عدم القدرة على الوصول لأماكن العناية وفحص العين.
- عدم وجود أي أعراض بصرية تستدعي القيام بالفحوصات.
- أخرى (اذكرها/اذكريها) .....

في حال لم تكن/تكوني مصاب/ه بداء السكري، فإن هذه الاستبانة قد انتهت.

شكراً لك على وقتك.

القسم4. فيما يتعلق بالمعرفة لدى مريض السكري

السؤال 1: هل انت مصاب/ه بداء السكري؟

- نعم
- لا

السؤال 2: في حال كانت اجابتك للسؤال السابق بـ(نعم)، فما هو نوع السكري الذي لديك؟

- النوع الأول.
- النوع الثاني.
- لا اعلم.

السؤال 3: ما هي المدة منذ أن تم تشخيصك بداء السكري؟

- أقل من 5 سنوات.
- 6-10 سنوات.
- 11-20 سنه.
- أكثر من 20 سنه.

السؤال 4: ما طريقة العلاج الحالية التي تستخدمها/تستخدميها لعلاج السكري؟

- إبر الإنسولين.
- أقراص دوائية (حبوب).
- النظام الغذائي والرياضة.
- لا استخدم أي طريقة علاجية.
- أخرى (اذكرها/اذكريها) .....

السؤال 5: كم كان معدل السكر التراكمي لديك في اخر تحليل؟

- 6.5 >
- 6.5 - 7.5
- 7.5 <
- لا اعلم

شكراً لك لتعبئة هذه الاستبانة.