Awareness and Compliance Behavior of Diabetic Patients for Eye care to Prevent Diabetic Retinopathy: The Status of Jazan Region, Saudi Arabia

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Abstract

Background: Diabetic retinopathy (DR) as a complication of diabetes mellitus (DM) and other diabetic complications are of great worldwide concern. In order to control both DM and DR, patients must be informed and comply with prevention and treatment recommendations.

Objectives: The study aimed to assess the knowledge, attitudes, and patient compliance behavior regarding DR among diabetic patients from Jazan Region of Saudi Arabia and identify factors related to patient awareness and compliance.

Patients and Methods: This cross-sectional study was done on 385 diabetic patients from six primary healthcare centers in Jazan region. A self-administered questionnaire was used to solicit responses regarding knowledge, attitudes, and compliance with regular ophthalmic eye examinations. The questionnaire also comprised questions related to the sociodemographic data and other questions related to the diabetic status. The collected responses were presented as frequencies and percentages, and the associations between the variables were accomplished using Chi-squared test. P-value < 0.05 was considered significant.

Results: About half of the participants (50.6%) were females, and 51.4% were within the age group 45-64 years. Less than half of the participants (40.8%) had low monthly income, and 45.5% were illiterate or had primary education. About 33.6% of the participants had the disease for more than 10 years, and 90.1% were controlled. There was a high awareness level of diabetes-related eye complications (96.4%) and the need for regular eye exams (93.5%). About 54.0% had never seen an ophthalmologist. Participants in the low to medium economic levels and those with primary education had a significant positive attitude. No significant associations were found between the diabetic variables and most of the knowledge and attitude questions (P> 0.05).

Conclusion: There is a need to increase patient awareness about the complications of diabetes and the need for policy guidance for primary healthcare providers to follow best practices when treating diabetic patients to guard against and/or control its complications.

Keywords: Diabetes, Knowledge, Attitudes, Ophthalmic eye examination, Compliance, Behavior, Diabetic retinopathy, Jazan.

Introduction

Type 2 Diabetes (DM2) is a chronic disease of worldwide concern that is characterized by the body's inability to metabolize glucose due to either insufficient insulin production by the pancreas or to cell inability to respond to the available insulin (insulin resistance) (1). DM2 is increasing globally due to several factors such as obesity, sedentary lifestyles, and urbanization. The present population of diabetics is expected to swell from 463 million to 700 million, including both diagnosed and undiagnosed (2,3). Poorly managed DM2 has many adverse macro-/micro-vascular health consequences such as cardiovascular, renal, and eye diseases and neuropathy. One of the most common causes of blindness among adults aged 20-74 years is diabetic retinopathy (DR), resulting from long-term DM2. It occurs within two decades of diagnosis among both insulin-dependent and -independent diabetes (4).

A systematic review of 35 international studies showed a global DR frequency of 35.4%(5). Saudi Arabia is ranked 2nd highest in the prevalence of DM2 in the Middle East and 7th highest globally. Saudi population studies have shown DR rates ranging from 27.8% to 36% from region to region (6-9). Such a high rate of DR is due to several reasons, for example, poor control of DM2 and guarding against its complications. Many patients do not have regular eye examinations. They may not seek eye exams because they do not understand the silent nature of the progression of DR or that it can result in irreversible blindness. Studies from Saudi Arabia have also shown a strong correlation between advanced age, duration of DM2, and insulin dependence (2,11,19). Deficiencies regarding patient education on DR seriousness and the need to control their DM2 to prevent it are evidenced in these studies. The true extent of DR may be hard to measure as patients who do not get regular eye exams will not be part of the data set (12).

International studies revealed variations in awareness of the risk of diabetic eye diseases such as DR and compliance with regular eye examinations worldwide. Studies in Australia, Hong Kong, and Switzerland report that most diabetic patients are aware of the significance of regular eye exams but compliance ranges from 69 to 75.7%(5,12,13). By contrast, studies of India, Bangladesh, and Ghana developing nations show lower awareness of ocular diseases; 17.01%, 24%, and 34.6%, respectively, correlated with a corresponding lack of compliance with regular eye exams (14-16). Studies conducted in Jordan and Syria found relatively high levels of awareness of diabetes-related eye diseases, including DR and blindness. However, patients were referred to ophthalmologists in both countries at low rates; 59.5% and 25%, respectively (17,18).

Studies in three cities of Saudi Arabia have shown compliance with ophthalmologic exams to parallel international studies (19-22). A study from King Abdulaziz University Hospital in Jeddah reported that 61% of diabetic patients were aware of DR; however, 38% of them were aware that an annual retinal examination is necessary, and a majority were not aware of the risk factors and prevention measures for DR (19). A population-based study in Jeddah showed that 82.6% of patients with DM2 who were mindful of diabetic risks for DR, only 65% went for regular ophthalmologic exams (20). A study conducted in Al-Hasa, showed a lower awareness of diabetes-related eye diseases (46.8%), with a corresponding lower rate of regular eye examinations (45.1%) among diabetic patients (21). A cross-sectional study conducted at two primary healthcare centers in Riyadh reported that 88% of patients with DM2 had knowledge about DR. Nevertheless, 45% of them passed more than two years since their last eye examination (22).

To the best of our knowledge, there have been no comprehensive studies on the awareness, attitudes, and management of DR among patients with DM2 in Jazan region of Saudi Arabia. The seriousness of DR and the need to assess levels of knowledge, attitudes, and management among patients with DM2 in Jazan is critical for addressing this condition to improve patients' health and life quality. We aimed to assess the knowledge, attitudes, and patient behavior regarding DR among diabetic patients in Jazan Region of Saudi Arabia and identify socioeconomic, educational, and treatment accessibility factors; which would guide policymakers planning to improve the quality of diabetes healthcare.

Subjects and methods

Study design and participants:
This was a cross-sectional study in Jazan Region, Kingdom of Saudi Arabia. A total of six centers, three urban and three rural primary healthcare centers (PHCs) with outpatient departments that treat chronic diseases, were randomly selected. The sample size for this study was calculated using sample size formula for cross-sectional study design; $n=z^2pq/d^2$, where n = sample size, and z = standard normal distribution at P = 50% with 95% confidence interval and d = marginal error (5%). The anticipated population proportion (p) of the sample was selected to be 50% although it brings the largest sample size. For 95% confidence level, z = 1.96, then the formula becomes: n = $(1.96^2 \times 50/100 \times 50/100) /0.05^2$ = 384 participants. Diabetic patients were randomly enrolled by sequential inclusion at PHCs weekly from Sunday to Thursday until reaching our target sample size of 385 patients. The questionnaire sheets were distributed to patients and collected on the same day. Nondiabetic patients, diabetic patients who received their care at diabetes centers that are not primary care, and diabetic patients who refused to participate were excluded. An official approval was obtained from Jazan Hospital IRB (#2002). Approval was secured also from each of the target six PHCs. Signed informed consent for participation was obtained from each outpatient.

Data collection:

The questionnaire used in this study was adapted from some previous studies (10-21). The collected data included anonymous personal characteristics (gender, age, monthly income, and education level). In addition, there were questions related to the DM, including duration of diabetes, diabetes control status, last fasting blood glucose (FBS) reading, and HbA1c (value in percentage). Furthermore, the questionnaire included questions of patients' knowledge and attitude about eye complications from diabetes, patients' knowledge of recommended treatment and prevention of DR, and patients' compliance behavior with recommended treatment and prevention of DR. The questionnaire was distributed and collected within the visit time from the primary healthcare clinics. A pre-test was conducted using 40 subjects to determine the clarity of the questionnaire and analyzed for any ambiguities within the questions and responses, which were eliminated in the final study. The final responses were categorized for better presentation and reporting of the results. The demographic variables were categorized as follows: gender (male and female), age (18 - 44 yrs, 45 - 64 yrs, and ≥ 65 yrs), monthly income (< 5k, 5k - 10k, and > 10k), and education level (illiterate or primary, secondary, and university or above). The DM variables were categorized as follows: duration of the disease (< 5 yrs, 5 - 10 yrs, and > 10 yrs), current status of the disease (uncontrolled, and controlled), fasting blood glucose (< 150 mg/dL, ≥ 150 - < 250 mg/dL, and ≥ 250 mg/dL), and Hb1Ac (< 7 %, 7 - <10 %, ≥ 10 %).

Data analysis:

Data were entered into a personal computer from the collected questionnaire sheets. The Statistical Package for the Social Sciences (SPSS version 25) was used for the analysis. Descriptive statistics were calculated for all quantitative and qualitative variables. The results were presented as frequencies and percentages with charts as appropriate. The Chi-Squared test was applied for the association between the knowledge and attitude questions and demographic variables and DM parameters. The statistical significance level was established at P< 0.05.

Results

A total of 385 questionnaires were available for analysis (response rate of 91%). About half of the participants (50.6%) were females, and 51.4% were within the age group 45-64 years. Less than half of the participants (40.8%) had monthly income < 5000 SR, and 45.5% were illiterate or had primary education. Regarding the diabetic-related variables, about a third (33.6%) of the participants had the disease for more than 10 years, and 90.1% were controlled. Only 295 participants responded to the question of fasting blood sugar (FBS); 46.4% reported FBS values ≥ 150 to < 250 mg/dL. Only 160 participants responded to the Hb1Ac question; of them, 75.6% reported 7 - <10 % values. More details are presented in Table 1.

Concerning the question of knowledge about RD, most participants (96.4%) knew that diabetes could cause eye disease. There was no significant association with gender (P= 0.053), income (P= 0.297), and education level (P= 0.088). However, a significant association was found with age (P= 0.007), where a lesser percentage of participants with age ≥ 65 years knew about RD (Table 2&3). There were also no significant associations with DM parameters (Table 4&5); duration of DM (P= 0.70), current status (P= 0.151), FBS (P= 0.726), and Hb1Ac (P= 0.722).

Regarding the knowledge of DM complications, the responses varied among the participants (Figure 1). Diabetic retinopathy was selected by most of the participants (n= 225, 58.4%) followed by blindness (n= 207, 53.8%), while glaucoma was the least selected choice (n= 75, 19.5%).

Knowledge of the participants regarding the available treatment for diabetic retinopathy is presented in Figure 2. More than half of the participants (n= 224, 58.2%) agreed that "control of diabetes" is the best available treatment for DR, while 46.2% (n= 178) of the participants chose "medications only" as the available treatment. However, few participants (n= 51, 13.2%) chose "alternative medical therapies" as the available treatment.

The majority of participants (93.5%) responded positively "Yes" that persons with diabetes should go for regular eye examinations. There were significant associations with the demographic variables (P< 0.05). More females responded with "No" than males (P= 0.001); a lesser number of participants with age ≥ 65 years responded with "Yes" (P= 0.011), and more participants with < 5000 SR income responded with "No" (P= 0.003), and more participants with illiterate or primary education responded with "No" (P< 0.001) (Tables 2 & 3).

However, there were no significant associations between this question and the DM parameters (P> 0.05) (Tables 4 & 5). Regarding the participants' attitude toward visiting an ophthalmologist if DM is under control, more than half of the participants (58.4%) reported "no need" for a visit as the DM is under control. There were no significant associations between this question and the demographic variables (P> 0.05), except with monthly income, where more participants with monthly income > 10000 SR reported "no need" (Tables 2 & 3).

The associations between this question and the DM variables were also not significant (P> 0.05) (Tables 4 & 5). Responses of the participants to the question of whether timely treatment can prevent/delay damage due to diabetes revealed that most participants (92.5%) agreed to that. No significant associations were observed between this question with gender (P= 0.122), age (P= 0.990), and education (P=0.674). However, there was a significant association with monthly income where a lesser number of participants with age ≥ 65 years responded with "Yes" (P= 0.011) (Tables 2 & 3). Moreover, there were significant associations with DM duration (P= 0.005), and DM status (P= 0.016), whereas no significant associations were found with FBS (P= 0.756), and Hb1Ac (P= 0.623) (Tables 4 & 5).

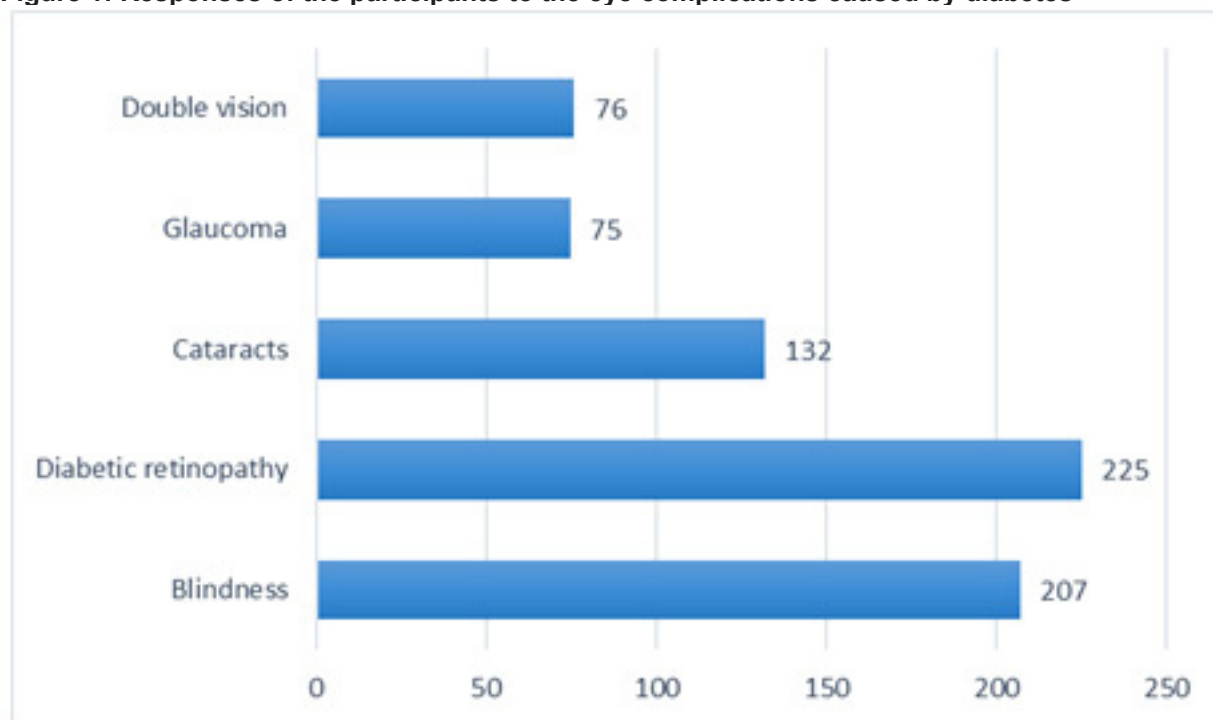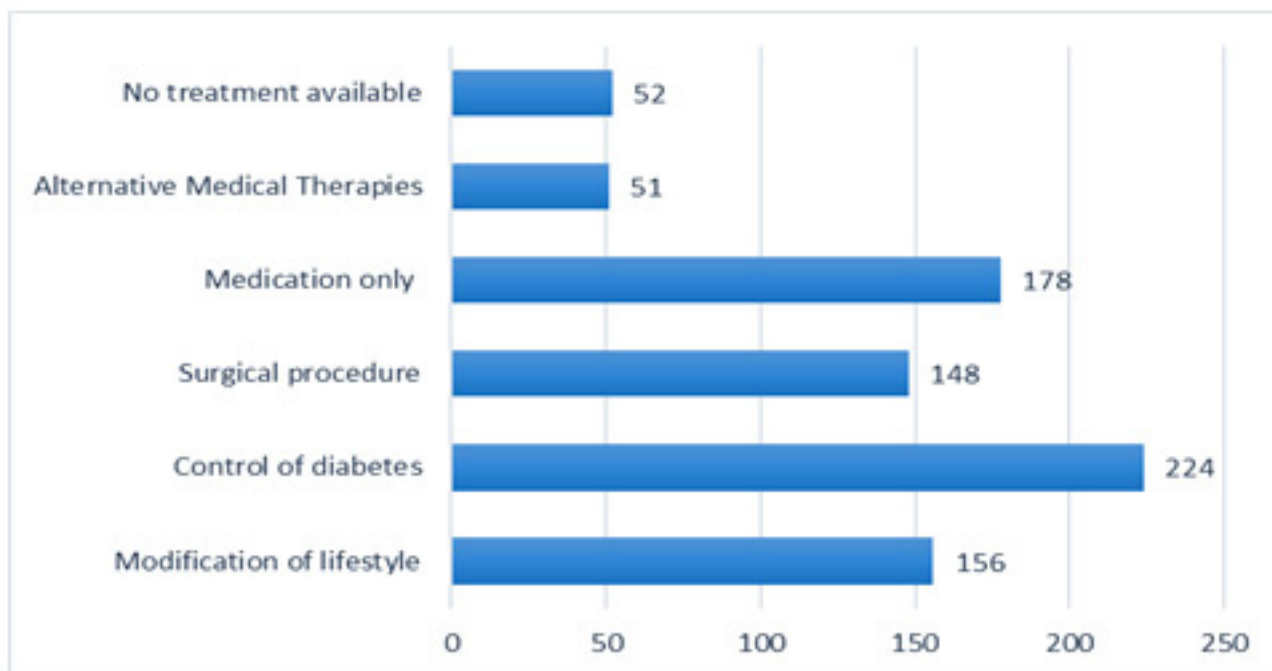| Table 1: Characteristics of the study sample		
	Frequency	Percent
Gender (N= 385)		
Male	190	49.4
Female	195	50.6
Age (N= 385)		
18 - 44 yrs	117	30.4
45 - 64 yrs	198	51.4
≥65 yrs	70	18.2
Monthly income (N= 385)		
< 5k	157	40.8
5k - 10k	143	37.1
> 10k	85	22.1
Educational level (N= 385)		
Illiterate or primary	175	45.5
Secondary	90	23.4
Univ. or above	120	31.2
Years since being diabetic (N= 385)		
< 5 yrs	123	31.9
5 - 10 yrs	132	34.3
> 10 yrs	130	33.8
Diabetes status (N= 385)		
Uncontrolled	38	9.9
Controlled	347	90.1
FBS (N= 295)		
< 150 mg/dL	85	28.8
≥ 150 - < 250 mg/dL	137	46.4
≥ 250 mg/dL	73	24.7
Hb1Ac (N= 160)		
< 7 %	14	8.8
7 - <10 %	121	75.6
≥ 10 %	25	15.6

Figure 1: Responses of the participants to the eye complications caused by diabetes

Figure 2: Knowledge of the participants towards the available treatment for diabetic retinopathy.

Table 2: Numbers, frequencies, and associations of the participants' responses in relation to gender and age

		Total	Gender			Age			
			Male	Female	P	18-44 yrs	45-64 yrs	≥65 yrs	P
Do you know that diabetes can cause eye disease?	No	14 (3.6)	3 (21.4)	11 (78.6)	0.053	3 (21.4)	4 (28.6)	7 (50.0)	0.007
	Yes	371 (96.4)	187 (50.4)	184 (49.6)		114 (30.7)	194 (52.3)	63 (17.0)	
Should persons with diabetes go for regular eye examinations?	No	25 (6.5)	4 (16.0)	21 (84.0)	0.001	4 (16.0)	11 (44.0)	10 (40.0)	0.011
	Yes	360 (93.5)	186 (51.7)	174 (48.3)		113 (31.4)	187 (51.9)	60 (16.7)	
There is no need to visit an ophthalmologist if a person has diabetes under control	No	160 (41.6)	79 (49.4)	81 (50.6)	1.000	55 (34.4)	81 (50.6)	24 (15.0)	0.224
	Yes	225 (58.4)	111 (49.3)	114 (50.7)		62 (27.6)	117 (52.0)	46 (20.4)	
Timely treatment can prevent/delay damage due to diabetes in eyes	No	29 (7.5)	10 (34.5)	19 (65.5)	0.122	9 (31.0)	15 (51.7)	5 (17.2)	0.990
	Yes	356 (92.5)	180 (50.6)	176 (49.4)		108 (30.3)	183 (51.4)	65 (18.3)	

Table 3: Numbers, frequencies, and associations of the participants' responses in relation to monthly income and education

		Income				Education			
		< 5k	5k-10k	> 10k	P	Illiterate or primary	Secondary	Univ. or above	P
Do you know that diabetes can cause eye disease?	No	8 (57.1)	5 (35.7)	1 (7.1)	0.297	10 (71.4)	3 (21.4)	1 (7.1)	0.088
	Yes	149 (40.2)	138 (37.2)	84 (22.6)		165 (44.5)	87 (23.5)	119 (32.1)	
Should persons with diabetes go for regular eye examinations?	No	18 (72.0)	6 (24.0)	1 (4.0)	0.003	21 (84.0)	2 (8.0)	2 (8.0)	0.000
	Yes	139 (38.6)	137 (38.1)	84 (23.3)		154 (42.8)	88 (24.4)	118 (32.8)	
There is no need to visit an ophthalmologist if a person has diabetes under control	No	63 (39.4)	49 (30.6)	48 (30.0)	0.004	61 (38.1)	42 (26.3)	57 (35.6)	0.051
	Yes	94 (41.8)	94 (41.8)	37 (16.4)		114 (50.7)	48 (21.3)	63 (28.0)	
Timely treatment can prevent/delay damage due to diabetes in eyes	No	8 (27.6)	17 (58.6)	4 (13.8)	0.045	14 (48.3)	8 (27.6)	7 (24.1)	0.674
	Yes	149 (41.9)	126 (35.4)	81 (22.8)		161 (45.2)	82 (23.0)	113 (31.7)	

Table 4: Numbers, frequencies, and associations of the participants' responses in relation to DM duration and status

		Duration				Status		
		< 5 yrs	5-10 yrs	> 10 yrs	P	Uncontrolled	Controlled	P
Do you know that diabetes can cause eye disease?	No	5 (35.7)	8 (57.1)	1 (7.1)	0.070	3 (21.4)	11 (78.6)	0.151
	Yes	118 (31.8)	124 (33.4)	129 (34.8)		35 (9.4)	336 (90.6)	
Should persons with diabetes go for regular eye examinations?	No	6 (24.0)	13 (52.0)	6 (24.0)	0.155	4 (16.0)	21 (84.0)	0.293
	Yes	117 (32.5)	119 (33.1)	124 (34.4)		34 (9.4)	326 (90.6)	
There is no need to visit an ophthalmologist if a person has diabetes under control	No	60 (37.5)	50 (31.3)	50 (31.3)	0.143	18 (11.3)	142 (88.8)	0.490
	Yes	63 (28.0)	82 (36.4)	80 (35.6)		20 (8.9)	205 (91.1)	
Timely treatment can prevent/delay damage due to diabetes in eyes	No	5 (17.2)	18 (62.1)	6 (20.7)	0.005	7 (24.1)	22 (75.9)	0.016
	Yes	118 (33.1)	114 (32.0)	124 (34.8)		31 (8.7)	325 (91.3)	

Table 5: Numbers, frequencies, and associations of the participants' responses in relation to FBS and Hb1Ac

		FBS					Hb1Ac				
		Total	< 150 mg/dL	≥ 150-250 mg/dL	≥ 250 mg/dL	P	Total	< 7 %	7-<10 %	≥ 10 %	P
Do you know that diabetes can cause eye disease?	No	13 (4.4)	5 (38.5)	5 (38.5)	3 (23.1)	0.726	2 (1.3)	0 (0.0)	2 (100.0)	0 (0.0)	0.722
	Yes	282 (95.6)	80 (28.4)	132 (46.8)	70 (24.8)		158 (98.7)	14 (8.9)	119 (75.3)	25 (15.8)	
Should persons with diabetes go for regular eye examinations?	No	21 (7.1)	6 (28.6)	9 (42.9)	6 (28.6)	0.906	2 (1.3)	1 (50.0)	1 (50.0)	0 (0.0)	0.109
	Yes	274 (92.9)	79 (28.8)	128 (46.7)	67 (24.5)		158 (98.7)	13 (8.2)	120 (75.9)	25 (15.8)	
There is no need to visit an ophthalmologist if a person has diabetes under control	No	116 (39.3)	38 (32.8)	47 (40.5)	31 (26.7)	0.249	53 (33.1)	7 (13.2)	37 (69.8)	9 (17.0)	0.325
	Yes	179 (60.7)	47 (26.3)	90 (50.3)	42 (23.5)		107 (66.9)	7 (6.5)	84 (78.5)	16 (15.0)	
Timely treatment can prevent/delay damage due to diabetes in eyes	No	26 (8.8)	7 (26.9)	11 (42.3)	8 (30.8)	0.756	8 (5.0)	0 (0.0)	7 (87.5)	1 (12.5)	0.623
	Yes	269 (91.2)	78 (29.0)	126 (46.8)	65 (24.2)		152 (95.0)	14 (9.2)	114 (75.0)	24 (15.8)	

For the consultation question in case of eye problems, most participants (n= 375, 97.4%) claimed that they consulted an ophthalmologist. 54 (14%) participants consulted a specialist other than an ophthalmologist, and 34 (8.8%) participants searched for an Internet solution. More details are shown in Figure 3.

When the participants were asked "how often they go for regular eye examination", more than half of them (54.0%) answered that they never went for an examination; and that it was their first time for an ophthalmic examination. About 112 (29.1%) participants reported that they went for an examination every year, while only 10 (2.6%) participants reported that they visited an ophthalmologist every month (Figure 4).

Figure 3: Responses of the participants to the question related to consultation in the event of eye problem
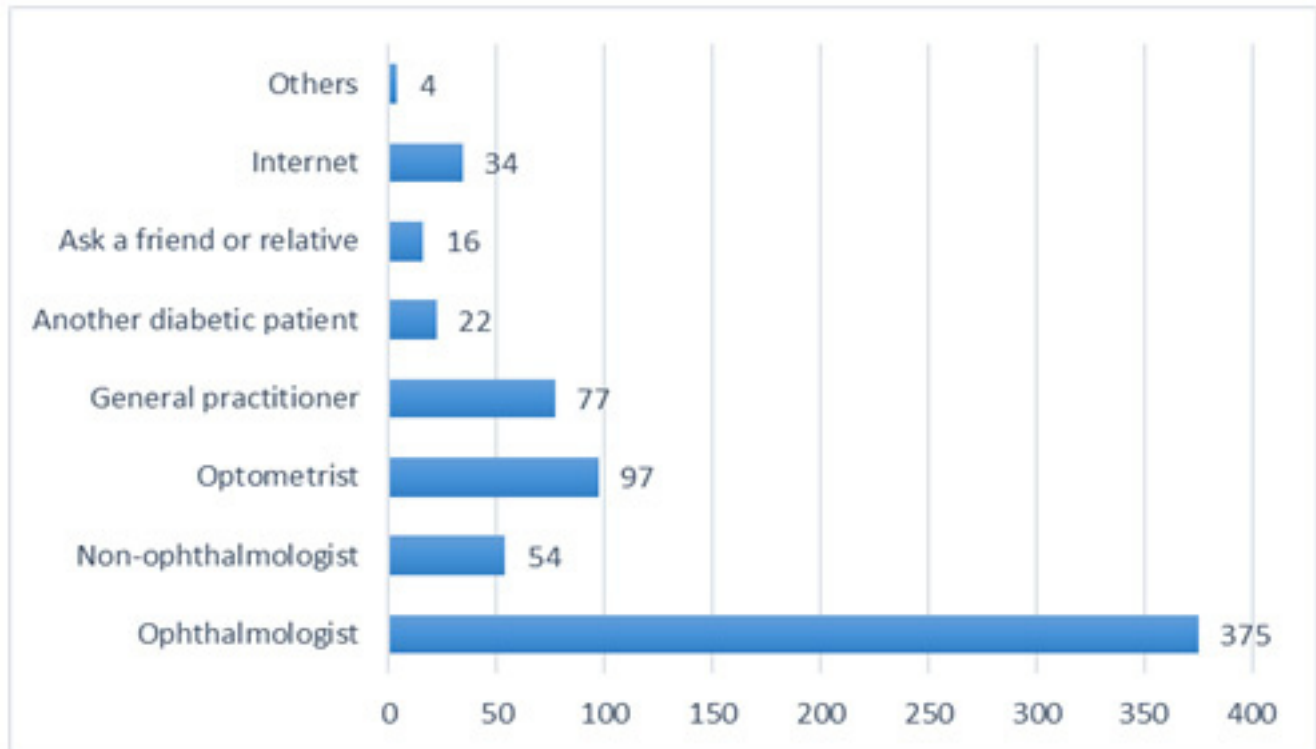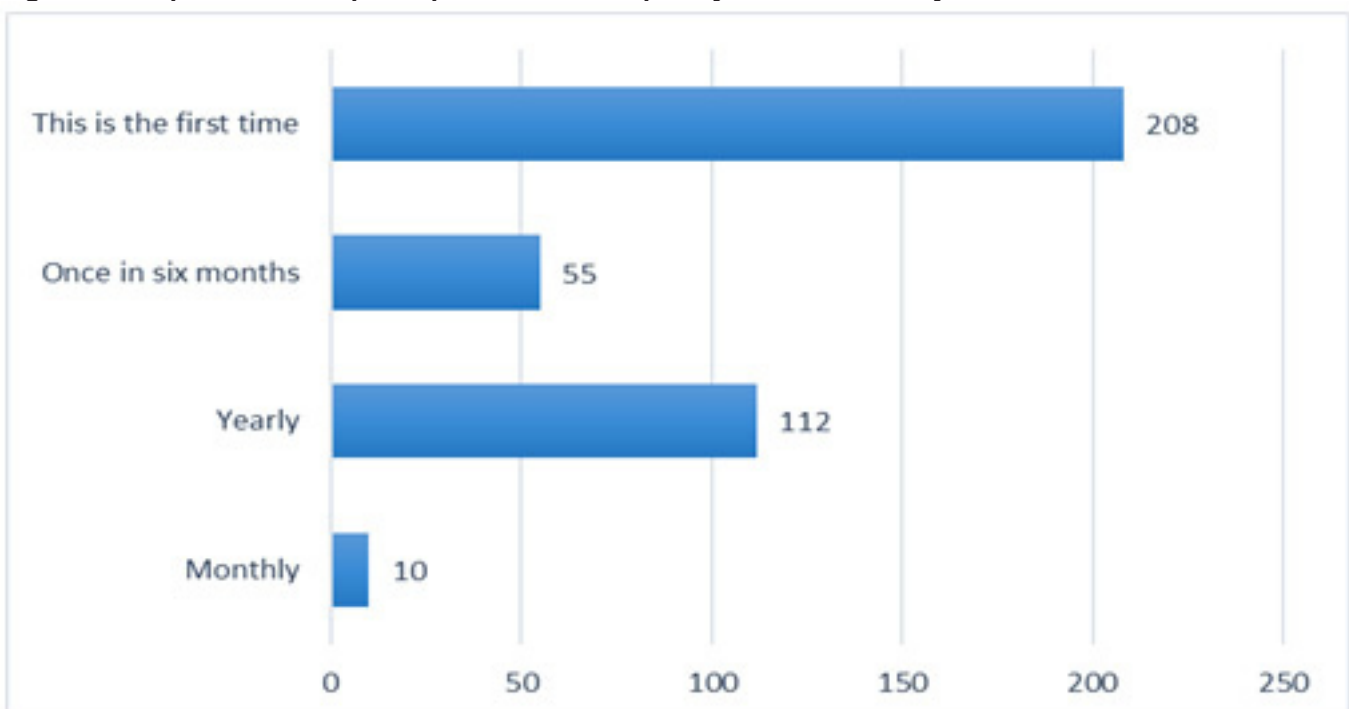

Figure 4: Responses of the participants for the frequency of the visit for eye examination

Discussion

Diabetes mellitus is a primary global health concern (1). When it is poorly controlled, it is the cause of many complications, including organ damage and retinopathy (3). International studies have been conducted to measure both the knowledge of diabetes and compliance with recommended eye examinations by diabetic patients. This study was conducted in Jazan, Saudi Arabia to assess the level of knowledge and attitudes of diabetic patients in the region as well as their keenness to receive regular eye examinations for the prevention and treatment of DR. This study found that the level of knowledge about DR among people with diabetes was high (96.4%) mirroring other studies in Middle Eastern countries such as Jordan and Syria, 88% and 90%, respectively and Saudi Arabia (17,20,22). In addition, 93.6% of our participants were aware that regular retinal examinations were advisable, and 92.6% had a favourable attitude toward DR prevention measures, unlike a previous study in Jeddah in which only 38% were aware of the necessity of annual retinal examinations.

We next examined the influence of knowledge of DR on patients' behavior and compliance for required eye exams. The behavior of diabetic patients does not reflect the high percentages of knowledge and favorable attitudes with resultant regular eye examinations. 45.9% of the study participants were never seen by an ophthalmologist. It is considered malpractice if diabetic patients are not referred to ophthalmologists, as reported in Middle Eastern and Saudi literature (17,21). One common misconception voiced by 58.2% of participants is that when diabetes is well-controlled, it is unnecessary to have eyes examined by an ophthalmologist. Another misconception revealed by a Turkish study is that DR develops with noticeable initial symptoms; hence if there are no symptoms, there is no DR (11).

The goal of our study was to evaluate the knowledge, attitudes, and behavior concerning DR among diabetic patients in the Jazan region and see if there are correlations between these characteristics with socioeconomic and demographic factors. Our study indicates that DR increases up to 70% with advancing age and disease duration, which agrees with a previous study in Abha showing that 36.4% of diabetic patients with DR have a strong association with extreme age and durations of diabetes and insulin dependence (10). Our findings that most participants knew that regular eye examinations are necessary are consistent with studies conducted in Australia and Hong Kong (6,13). Among our participants, almost half (45.9%) of study participants never visited an ophthalmologist or annually consulted a specialist compared to a limited number of patients who sought consultation more frequently. This contrasts with a Swiss study that revealed that 70.5% of patients had regular annual eye examinations (12).

Gender was significantly associated with knowledge in our study. The opposite has been observed in Saudi, Nigerian, and Iranian studies (23-25). Educational status was a contributing factor to the attitude in our study; when we asked "There is no need to visit an ophthalmologist if a person has well-controlled diabetes "a significant association was found (P = 0.02). This was consistent with another study done in India, where they found a significant association between higher education and a high level of KAP (26). Socioeconomic status was also associated significantly with the attitude of our participants, while this significance was not noted in other Saudi studies done in Riyadh (23,27). A limitation of the present study is using a self-reporting questionnaire that might have a recall bias. This study provides clear evidence of the need for increased patient education about the complications of diabetes and the need for policy guidance for primary healthcare providers to follow best practices when treating diabetes, including referrals to ophthalmologists. We recommend creating a targeted campaign, including health camps, to raise awareness among the public about DR.

Conclusion

This study revealed that among diabetic outpatients, there is a high level of awareness of both diabetes-related eye complications (96.4%) and the need for regular eye exams (93.5%). However, there is an inconsistency in the attitude and behavior of this group in follow-up care with 54.0% of study participants never being seen by an ophthalmologist. One contributory factor to this disconnection is the widely held misunderstanding among diabetic patients that if diabetes is well-controlled, complications will not occur, eliminating the need for regular ophthalmic eye examinations. The additional belief held by 90% of participants is that their diabetes is well-controlled, although 82% of them had poorly controlled diabetes.

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