Original Article

Knowledge, Attitudes, and Practices Regarding Diabetic Retinopathy among Diabetic Patients in Saudi Arabia

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Abstract

Diabetes mellitus (DM) is a common metabolic disorder that is characterized by increased circulating blood glucose levels. Long-standing continuous hyperglycemia (high blood glucose) leads to complications affecting many organ systems. The most common microvascular complication of diabetes mellitus is Diabetic Retinopathy (DR) which affects the blood vessels of the retina leading to permanent visual loss. This paper aims to assess the knowledge level, attitudes, and practices toward diabetic retinopathy among diabetic patients in Saudi Arabia. This descriptive cross-sectional study was conducted in Saudi Arabia from February 2022 to November 2022. All Saudi diabetic patients of either gender, aged from 18 to 65 were recruited to participate in this study through an E-questionnaire after securing ethical approval and informed consent from the participant. Data was collected and then transferred to the statistical package of social science software (SPSS) to be statistically analyzed. The study included 770 participants, 61.2% of them were females and 38.8% were males. 29.4% of participants were 20-30 years old. 74.9% of participants had good knowledge about diabetic retinopathy while 25.1% had poor knowledge. 30.9% had a positive attitude toward diabetic retinopathy. 84% of participants had good practice towards diabetic retinopathy while 16% had poor practice. Knowledge, attitude, and practice scores were found to be among the reported figures worldwide. Knowledge and attitude of diabetic retinopathy were significantly associated with age, gender, and residence region. However, none of the sociodemographic characters was associated with practice scores.

Keywords: Diabetic retinopathy, Saudi Arabia, Knowledge, Attitudes, Practice

Introduction

Diabetes mellitus is a chronic metabolic disease characterized by an imbalanced blood glucose level [1]. DM affects various body structures, including the ocular structures causing considerable complications such as Diabetic Macular Edema (DME) and Diabetic Retinopathy DR [2]. The latter is defined as a progressive microvascular ocular complication of DM characterized by the inability of the retinal circulation to meet the metabolic demands of the retina [3]. DR is the most common disorder affecting the eyes of patients with DM [4]. Additionally, in developed countries, DR is considered the foremost cause of newly diagnosed cases of blindness among the working-age population [5]. There are two main classes of diabetic retinopathy: non-proliferative and proliferative [6]. In the early stage of the disease, the patient may not notice any visual symptoms. However, in its advanced form of complications, the disease progresses to severe, irreversible vision loss [7]. DR affects nearly one-third of diabetic patients and appears in both type 1 and type 2 DM. According to previous epidemiological studies, the majority of people with type 1 DM and 75% of people with type 2 DM develop DR after 15 years of diabetes [8]. DR is responsible for most of the microvascular complications of diabetes and vision loss, accounting for 1.8 million out of 37 million cases (4.5%) of blindness globally [9].

Different studies were done regarding DR among diabetic patients in various nations worldwide. For instance, 65% of participants with diabetes in the United States were aware that diabetes can cause eye disorders [10], compared to 37% in Australia [11]. and 27% in India [12]. In a study done in Jordan, 88% of the participants knew that DM might have an impact on the eyes, and 81% knew that DR could cause blindness [13]. Locally, in Jeddah, 82.6% of the participants knew that diabetes mellitus had a negative effect on their eyes [14]. Another two studies conducted in Saudi Arabia's west and north indicated that two-thirds and three-quarters of the

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participants, respectively, had a good understanding of DR. [15, 16]. A future program that improves patient knowledge of diagnosis, complications, and management can be planned by educators by taking into account the degree of public awareness of a disease condition. A key factor in the early diagnosis, treatment, and prevention of potential visual impairment is the degree of awareness and knowledge about DR. Therefore, this study aims to assess the knowledge, attitudes, and practices regarding diabetic retinopathy among diabetic patients in Saudi Arabia.

Materials and Methods

Study Design

This study was a descriptive cross-sectional study that is based on a questionnaire that assessed the knowledge, attitudes, and practices regarding diabetic retinopathy among diabetic patients in Saudi Arabia from February 2022 to November 2022.

Study Setting

Participants, recruitment, and sampling procedure:
Since the study targets all Saudi diabetic patients of either gender, aged from 18 to 65 from all of Saudi Arabia regions, we were assigned data collectors from each region to facilitate the data collection process. The questionnaire was distributed across Saudi Arabia's six geographical regions, which are the astern, Central, Northern, Northwest, Midwest, and Southwest regions. These regions are 13 provinces which include: Riyadh, Makkah, Eastern, Madinah, Albaha, Aljawf, Northern borders, Qassim, Hail, Tabuk, 'Aseer, Jazan, and Najran provinces. We were collecting the responses from all of these provinces using the e-questionnaire after securing ethical approval and informed consent from the participants.

Inclusion and Exclusion Criteria

We were including all Saudi diabetic patients of either gender, aged from 18 to 65 years. While the exclusion criteria were non-diabetic patients, non-Saudi nationality, who refused to participate in the study, and patients below 18 years old and above 65 years old.

Sample Size

By using the Raosoft sample size calculator (http://www.raosoft.com/samplesize.html), the required sample size was determined. The bare minimum sample size that can accurately reflect the population is 666, taking into consideration the 1% margin of error and a 99% confidence level.

The Sample size was estimated using the formula: n= P (1-P) * Zα 2 / d 2 with a confidence level of 99%;

n: Calculated sample size
Z: The z-value for the selected level of confidence (1- a) = 1.96.
P: An estimated prevalence of knowledge
Q: (1 – 0.50) = 50%, i.e., 0.50
D: The maximum acceptable error = 0.01.
So, the calculated minimum sample size was:
n = (1.96)2 X 0.50 X 0.50/ (0.01) 2 = 666.

Method for Data Collection and Instrument (Data Collection Technique and Tools)

A 34 -item questionnaire was used as a study tool. This tool was designed after a detailed literature review of relevant studies; the main source [17]. Which was prepared in English and translated into Arabic. The Questions were almost exclusively multiple-choice. To minimize bias due to 'leading' questions, most of the questions in the knowledge and practice parts of the questionnaire were formed as open-ended questions. The questions in the attitude part were formulated as statements, and the participant was asked whether he or she agreed or disagreed, or was undecided. The questionnaire was divided into five sections. Section one sociodemographic characteristics: participants were asked to provide information regarding age, gender, nationality, marital status, occupation, and education level. The second section contained questions about diabetes Background: Characteristics related to diabetes like DM duration, type of DM, most recent HbA1C level, and any other medical condition including Hypertension, Hypercholesterolemia, and ischemic heart disease. The third and fourth sections include questions on DR's knowledge and attitude like whether he/she knew that diabetes affects the eye and can cause blindness. In the last section, participants were asked questions to find out what they do regarding the treatment and control of DR such as eye screening and eye care-seeking behavior.

The Scoring System

The answers to the questions were scored. If a person answered all questions correctly, KAP-33 scoring points were awarded. The total KAP-33 points were divided into three sections. The total score achieved by the patient in each section was calculated. In the knowledge section of the questionnaire, 20 points (60%) were attributed. The patients were categorized as having 'good' knowledge: score of 9 and above, or 'poor' knowledge: score of less than 9. In the attitude section of the questionnaire, 8 points (24%) were attributed. The patients were categorized as having a 'positive' attitude: score of 6 and above, or a 'negative' attitude: score of less than 3. In the practice section of the questionnaire, 5 points (16%) were attributed. The patients were categorized as having a 'good' practice pattern: score of 4 and above, or a 'poor' practice pattern: score of less than 4. those participants who obtained KAP scores of 19 and above were considered high-level, while the score below 19 was considered as low level.

Pilot Test

The questionnaire was distributed to 20 individuals and asked to fill it out. This was done to test the simplicity of the

questionnaire and the feasibility of the study. Data from the pilot study were excluded from the final data of the study.

Analyzes and Entry Method

Data was entered on SPSS version 22.0. For descriptive analysis, the mean and standard deviation was estimated for quantitative variables like the age of the participant, diabetes duration, etc. Frequency/ percentage was computed for categorical variables like gender, educational status, socioeconomic stand the existence of diabetic retinopathy, etc. Frequency/percentage was shown in bar charts, mean and standard deviations were displayed using tab boxplots plot. The chi-square test was used for the comparison of qualitative variables while the t-test and ANOVA were used for the comparison of quantitative variables with qualitative variables. A P-value less than 0.05was is taken as significant.

Results and Discussion

Table 1 shows that the study included 770 participants, 61.2% of them were females and 38.8% were males. 29.4% of participants were 20- 30 years old, 24.2% were 51- 60 years old and 20.3% were 41- 50 years old. 93% were Saudi. 56.4% of participants were married and 33.6% were single. 47.3% had a university degree or higher. 90.6% live in a city. 36.4% were employees.

Table 1. Sociodemographic characteristics of participants (n=770)

Parameter		No.	%
Age	Less than 20	71	9.2
	20 - 30	226	29.4
	31- 40	83	10.8
	41- 50	156	20.3
	51- 60	186	24.2
	More than 60	48	6.2
Gender	Male	299	38.8
	Female	471	61.2
Nationality	Saudi	716	93.0
	Non-Saudi	54	7.0
Marital status	Married	434	56.4
	Single/Single	259	33.6
	Widow	27	3.5
	Divorced	50	6.5
Educational level	Read and Write	43	5.6
	Primary stage	29	3.8
	Intermediate stage	46	6.0
	High school	188	24.4
	University or higher	364	47.3
	Diploma	100	13.0
Place of residence	City/Province	698	90.6
	Village	72	9.4
Region	Southern area	67	8.7
	Eastern Province	145	18.8
	The northern area	104	13.5
	Western Region	192	24.9
	Central Region	262	34.0
Functional status	Employee	280	36.4
	Student	138	17.9
	Unemployed	95	12.3
	Housewife	119	15.5
	Retired	138	17.9

Table 2 shows that 99.7% of participants have been diagnosed with diabetes by a doctor. 47.5% of participants have T2DM, 37.1% had T1DM and 15.3% don't know diabetes type. 39.5% of participants have had diabetes for 15 years, 33.1% have had it for 6 to 10 years and 12.7% have had it for 11 to 15 years.

Table 2. Knowledge of participants of diabetic retinopathy (n=770).

Parameter		No.	%
Diagnosed with diabetes	Yes	768	99.7
	No	2	.3
Type of diabetes have you been diagnosed with	Type 1	286	37.1
	Type 2	366	47.5
	I don't know	118	15.3
Duration of diabetes (Indicate the number of years)	15	304	39.5
	6 - 10	255	33.1
	11 -15	98	12.7
	16-20	63	8.2
	21 -30	40	5.2
	More than 30	10	1.3
Cumulative blood glucose level at the last HbA1C visit	Less than 6.5%	192	24.9
	More than 6.5%	433	56.2
	I don't know	145	18.8
Comorbidities	Hypertension	225	29.2
	Excessive cholesterol/triglycerides in the blood	179	23.2
	Kidney disease	53	6.9
	Heart failure/ischemic heart disease	54	7.0
	Autoimmune diseases	46	6.0
	Diseases of the digestive system and liver	40	5.2
	Respiratory diseases	46	6.0
	Other	83	10.8
	None	339	44.0
Parts of the body affected by diabetes (bias may occur)	The heart	250	32.5
	Kidneys	489	63.5
	Nerves	425	55.2
	Foot	479	62.2
	The eyes	574	74.5
	I don't know	68	8.8

Table 3 shows that 62.3% of the participants chose damage to the retina as one of the problems that can be caused by diabetes.36.6% discovered that diabetes can cause retinopathy by a general practitioner in the hospital. 38.8% learned at the time of diagnosis that diabetes can cause retinopathy. 77.7% agreed that diabetic retinopathy can cause blindness.

Table 3. Knowledge of participants of diabetic retinopathy (n=770)

Parameter		No.	%
What are the eye problems that diabetics can suffer from? You can choose more than one answer	Vision defect	351	45.6
	Cataracts or cataracts	359	46.6
	Damage to the retina/nerve at the back of the eye due to diabetes	480	62.3
	Infections in the eye	147	19.1
	I don't know	109	14.2
How did you first discover that diabetes can cause retinopathy (damage to the retina/nerve at the back of the eye due to diabetes)? You can choose more than one answer	Informed by a general practitioner in the hospital	282	36.6
	Informed by the ophthalmologist in the hospital	180	23.4
	I got information from family/friends	161	20.9
	Informed by the ophthalmologist at the health center	81	10.5

	I got information from the media and books	214	27.8
	I didn't know that diabetes could cause retinopathy (damage to the retina)	121	15.7
How many years have passed since you were diagnosed with diabetes until you learned that diabetes can cause retinopathy?	Learned at the time of diagnosis	299	38.8
	Learned at another time	297	38.6
	I did not know	174	22.6
If your answer to the previous question was (at another time), please specify the period in years since you were diagnosed with diabetes	15	186	
	11-20	34	
	6 - 10	77	
Can diabetic retinopathy cause blindness?	Yes	598	77.7
	No	172	22.3
What are the factors that cause the development/exacerbation of diabetic retinopathy? You can choose more than one answer	Poor control of diabetes	528	68.6
	Hypertension	261	33.9
	Kidney disease	135	17.5
	Anemia	68	8.8
	I don't know	133	17.3
What are the treatment options available for diabetic retinopathy? You can choose more than one answer	The laser	241	31.3
	Surgery	115	14.9
	The glasses	184	23.9
	Injection into the eye	158	20.5
	Surgery	84	10.9
	I don't know	308	40.0
Should people with diabetes have regular eye exams to look for diabetic retinopathy (examination of the back of the eye after the instillation of dilated eye drops to look for changes in the retina due to diabetes)?	Yes	545	70.8
	No	50	6.5
	I don't know	175	22.7
How often should diabetic patients without diabetic retinopathy have an eye exam?	Once a year	177	23.0
	Once every two years	53	6.9
	Once every 5 years	35	4.5
	Once every 6 months	325	42.2
	I don't know	180	23.4

Table 4 shows that 65.5% of participants agreed that eating sweets from time to time is okay.73.2% agreed that they have to go for regular check-ups as their doctor says even their blood sugar level is under control. 53.4% agreed that they are getting enough exercise while doing their daily activities. 67.8% agreed that they should have regular eye exams even if they don't have any eye problems.

Table 4. Attitude of participants towards diabetic retinopathy (n=770)

	I agree	Hesitant	Disagree
Eating sweets from time to time is okay.	504 65.5%	170 22.1%	96 12.5%
If I forget to take my medication on some days, that is okay.	185 24.0%	181 23.5%	404 52.5%
I have to go for regular check-ups as my doctor says, even if my blood sugar level is under control	564 73.2%	156 20.3%	50 6.5%
If I am not able to exercise as much as my doctor told me, it is okay because I am getting enough exercise while doing my daily activities.	411 53.4%	268 34.8%	91 11.8%
Although ophthalmologists say that people with diabetes should have a regular eye exam, if my diabetes is under good control, there is no real need for the exam.	226 29.4%	232 30.1%	312 40.5%

I have to go for an eye exam regularly as the ophthalmologist tells me, even if I don't have any problem with my eyes.	522 67.8%	184 23.9%	64 8.3%
Ophthalmologists say that good control of diabetes prevents problems caused by diabetic retinopathy, but it is not possible to keep blood sugar under complete control, as they say.	422 54.8%	227 29.5%	121 15.7%
No matter what I do, my vision may become poor or it may not improve. Therefore, I do not see the benefit of treating or following up **on** diabetic retinopathy in the eye clinic	175 22.7%	216 28.1%	379 49.2%

Figures 1 and 2 showe that 74.9% of participants had good knowledge about diabetic retinopathy while 25.1% had poor knowledge. 30.9% had a positive attitude toward diabetic retinopathy.

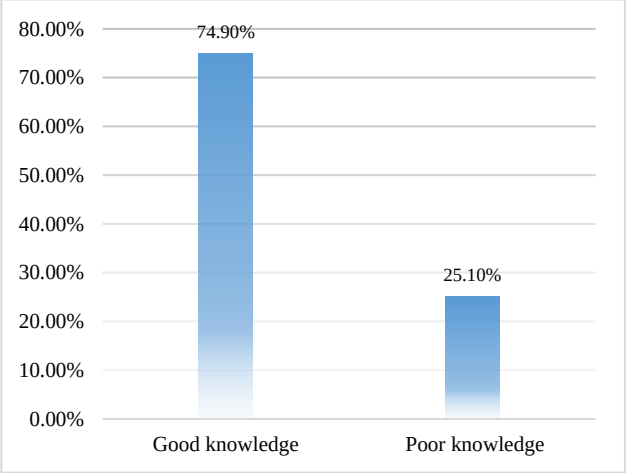

Figure 1. Knowledge Scores among Participants (n=770)

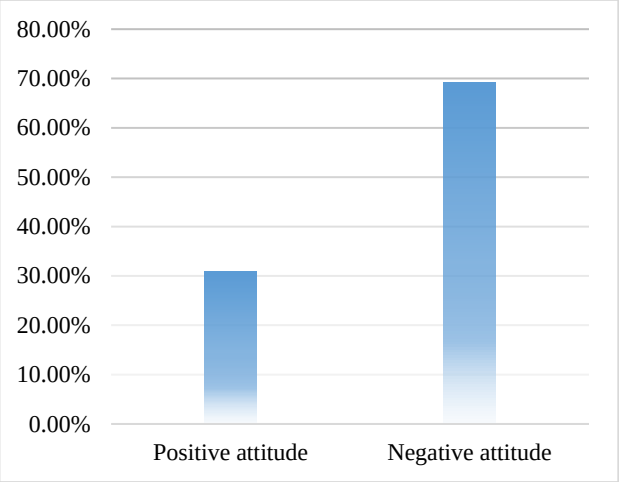

Figure 2. Attitude Scores among Participants (n=770)

Table 5 shows an association between KAP scores and the sociodemographic characters of participants. Knowledge score was significantly associated with gender, age, and residence region but not with educational level.

Table 5. Association between knowledge score with sociodemographic characters of participants (n=770)

		Knowledge score		Total (N=770)	P value
		Poor	Good		
Age	Less than 20	15 7.8%	56 9.7%	71 9.2%	**0.005**
	20-30	47 24.4%	179 31.0%	226 29.4%	
	31-40	31 16.1%	52 9.0%	83 10.8%	
	41-50	42 21.8%	114 19.8%	156 20.3%	
	51-60	39 20.2%	147 25.5%	186 24.2%	
	More than 60	19 9.8%	29 5.0%	48 6.2%	
Gender	Male	78 40.4%	221 38.3%	299 38.8%	**0.602**
	Female	115 59.6%	356 61.7%	471 61.2%	
Nationality	Saudi	180 93.3%	536 92.9%	716 93.0%	**0.862**

Region	0n-Saudi	13	41	54	**0.001**
		6.7%	7.1%	7.0%	
	Southern area	32	35	67	
		16.6%	6.1%	8.7%	
	Eastern Province	26	119	145	
		13.5%	20.6%	18.8%	
	The northern area	17	87	104	
		8.8%	15.1%	13.5%	
	Western Region	53	139	192	
		27.5%	24.1%	24.9%	
	Central Region	65	197	262	
		33.7%	34.1%	34.0%	
Place of residence	City/Province	171	527	698	**0.259**
		88.6%	91.3%	90.6%	
	Village	22	50	72	
		11.4%	8.7%	9.4%	
Marital status	Married	110	324	434	**0.231**
		57.0%	56.2%	56.4%	
	Single/single	59	200	259	
		30.6%	34.7%	33.6%	
	Widow	11	16	27	
		5.7%	2.8%	3.5%	
	Divorced	13	37	50	
		6.7%	6.4%	6.5%	
Education level	I can read and write	13	30	43	**0.099**
		6.7%	5.2%	5.6%	
	Primary stage	6	23	29	
		3.1%	4.0%	3.8%	
	Intermediate stage	17	29	46	
		8.8%	5.0%	6.0%	
	High school	52	136	188	
		26.9%	23.6%	24.4%	
	Undergraduate or higher	76	288	364	
		39.4%	49.9%	47.3%	
Functional status	Diploma	29	71	100	**0.081**
		15.0%	12.3%	13.0%	
	Employee	66	214	280	
		34.2%	37.1%	36.4%	
	Student	36	102	138	
		18.7%	17.7%	17.9%	
	Unemployed	27	68	95	
		14.0%	11.8%	12.3%	
	Housewife	39	80	119	
		20.2%	13.9%	15.5%	
	Retired	25	113	138	
		13.0%	19.6%	17.9%	

The burden of diabetes is increasing globally. As a result, it is also anticipated that the incidence of diabetic retinopathy will rise. Effective screenings and stringent blood sugar control can lower this risk. The delivery of care is significantly impacted by the lack of knowledge about diabetes and diabetic retinopathy in the community [9]. The current study aimed to assess the knowledge, attitudes, and practices regarding diabetic retinopathy among diabetic patients in Saudi Arabia.

According to our study results, 74.9% of participants had good knowledge about diabetic retinopathy while 25.1% had poor knowledge. The results of another Saudi study showed a high level of self-reported knowledge regarding DM affecting the eye [18], which is similar to other studies that have been done locally in Saudi Arabia in the areas of Hail and Al Jouf (76%) and Jeddah (83%) [14, 15]. Studies from Oman (93%), [19] Jordan (88%), [13], and Turkey (88%) [20] also showed a similarly high level of knowledge regarding knowledge about DM affecting the eyes as in our study results of 88%. Globally, Switzerland (96%), [21] and Malaysia (86%) [10] also had high knowledge, whereas one study from the rural Tamil Nadu area of India showed the lowest knowledge (74%) [22] with regards to eye disorder and DM. Alanazi *et al*. used a systematic random sample of Saudi patients with DM to evaluate the awareness of DM complications in the Arar region and reported that only 24.5% had adequate awareness of DR [23]. The knowledge of DR was good among 39.5% of the diabetic population in the general hospital in Ethiopia which was consistent with that of Goa, India (34.1%), [24] and higher than Peshawar, India (24.5) [25] yet lower than Tamilnadu, India (87%) [26]. Differences in the study set-up and the nature of the study populations involved might be responsible for the observed discrepancy in the knowledge figures. For instance, a study in Tamil Nadu India was on patients who were presented to the ophthalmology department and teaching center where the patient's knowledge of DR could be improved through better health education.

In our study, 30.9% had a positive attitude toward diabetic retinopathy. 84% of participants had good practice towards diabetic retinopathy while 16% had poor practice. This was higher than reported in a previous Saudi study as 75% of the general population felt that the patients with DM should undergo frequent eye checkups, only 9.6% of the patients with DM had been checked for diabetic retinopathy and only 9.8% were on follow-up, which reflects insufficient motivation among patients with DM [24]. Rani *et al*. [25] also observed poor practice patterns in a high percentage of the population despite good attitude levels. Namperumalsamy *et al*. [26] observed that only 6.8% of the patients with DM had undergone dilated fundus evaluation before their screening project and only one-fourth of the screened population with retinopathy returned for examination at the hospital. Padmaja *et al*. [27] also observed that 67% of the people in rural areas and 25% in urban areas had never been screened for diabetic retinopathy. This highlights the fact that despite good knowledge and attitude, insufficient motivation of the patients with DM for evaluation and follow-ups is a potential barrier to improving their practice patterns.

Contrary to previous studies findings, there was no association between knowledge scores and the educational level of participants. A previous study showed a significant association between having some formal education and knowledge about all three questions regarding knowledge about DM and retinopathy. This was similar to the studies from Jordan [13] and Malaysia, [10] both of which showed that diabetic patients having a primary level or above education had better knowledge than those patients who had no formal education. Similar studies from eastern China [12], Saudi Arabia [28], and India [29, 30] found that those with a lower level of education were less likely to be aware of DR. Since educational attainment is an important measurement of socioeconomic parameters, these people are more likely to be of a lower socioeconomic status and may not be able to afford the expenses for attending eye clinics when their vision is impaired.

In our study, age was associated with knowledge scores. A Saudi study showed that age was a strong independent factor in predicting the level of knowledge of eye disease in DM [31]. Consistent with this, previous research in India found that patients aged 30 years or above were more aware than younger patients of all eye diseases except night blindness [32]. Older diabetic patients are more likely to have longer durations of DM, which has been correlated with better knowledge about DM complications including DR.

It is important to develop methods for educating diabetic people about this condition, which could lead to blindness. Every time a patient interacted with the healthcare system; this would have to be done. General practitioners, doctors, endocrinologists, ophthalmologists, and optometrists should all be involved in the development and execution of hospital-based and community-based patient education programs due to the unfortunate ignorance about diabetic retinopathy among diabetic patients.

Conclusion

Knowledge, attitude, and practice scores were found to be among the reported figures worldwide. Knowledge and attitude of diabetic retinopathy were significantly associated with age, gender, and residence region. However, none of the sociodemographic characters was associated with practice scores. At the basic, secondary, and tertiary levels of healthcare, health education initiatives should be put into place. In order to raise awareness of diabetic retinopathy, particularly among those in lower socioeconomic and educational status groups, health education through mass media, pamphlets, posters, and diabetic retinopathy screening clinics on holidays like World Diabetes Day and World Sight Day would be helpful.

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