Awareness of diabetic retinopathy among patients with type 2 diabetes mellitus in primary health care in security forces hospital Riyadh, Saudi Arabia

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ABSTRACT

Background: Diabetes mellitus (DM) is a metabolic disease that is characterized by distortion in the metabolism of carbohydrates, lipids, and proteins and involves hyperglycemia. DM has different types. Several complications are associated with diabetes including diabetic retinopathy (DR). DR can further results in bad outcomes that can be avoided by early diagnosis and management. **Aim:** The aim of this paper is to assess the awareness and knowledge level about DR among type 2 DM patients in primary health care in security forces hospital. **Methods:** This is a cross-sectional study that was conducted on Saudi patients with type 2 DM who visited primary health care in security forces hospital. **Results:** This study included 174 participants, with equal male to female ratio was 1:1, there were 64.9% participants who reported controlled blood glucose level, and 47.1% reported that eye was affected by diabetes. There were 82.8% participants who had awareness about DR; the level of awareness differs significantly with sex (*P* value = 0.04) and the level of DM control (*P* value = 0.02). **Conclusion:** There was high level of knowledge regarding DR; however, there were few percent of participants who had no awareness and still at risk.

Keywords: Diabetic complications, diabetes mellitus, diabetic retinopathy, diabetic retinopathy awareness, T2DM

Introduction

Diabetes mellitus (DM) is a metabolic disease that is characterized by a defect in insulin action or secretion leading to an increase in the glucose level in blood which is known as hyperglycemia.[1] DM is of three main types: type 1 (T1DM), type 2, (T2DM) and gestational diabetes.[1] The global prevalence of DM was reported to be as low as 8% in 2011; however, it is expected to increase to 10% by 2030.[2] KSA and other Middle Eastern countries have a high prevalence of DM.[3] KSA was in the second rank having the highest prevalence of DM among the Middle East and the 7th rank among the world according to a WHO report. In KSA, the prevalence of DM reached an epidemic proportion,[4,5] according to the Saudi Ministry of Health, there were 0.9 million individuals who were diagnosed with diabetes in 1992, this number increased by 2.7 times to 2.5 million in 2010.[6] DM can result in several complications such as diabetic retinopathy (DR) which is considered the most common microvascular complication of DM,[7] neuropathy, neurologic, and cardiovascular complications.[8] DR is a retinal disease that involves the compromising of the oxygen and nutrients delivery to the retina.[9] DR may lead to vision impairment and loss.[8,10,11] DR develops among 34.6% of diabetic patients.[12] Among DM patients, there are several risk factors for DR have been reported including long duration of DM, uncontrolled DM, older age, presence of additive systematic diseases such as hypertension, dyslipidemia, and obesity.[13-15] The prevalence of DR varies among various regions in the world.[16] Awareness about DR among DM patients is an important factor for early diagnosis and the treatment of the disease to avoid further complications such as visual impairment.[17] Several studies

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reported low to average screening pattern where 31–53% of patients performed an annual eye examination.[18-22] The present study was conducted to assess the awareness, compliance, and barriers of DR among T2DM patients in Saudi Arabia.

Review of literature

The prevalence of T2DM in Saudi Arabia is high and it is increasing; one cross-sectional study in 2009 from KSA in Jeddah to assess the prevalence of diabetes in Saudi community showed that the prevalence rate was 30%,[23] and in 2011 another cross-sectional study reported that the prevalence was 31.6% among 9149 individuals.[24] Saudi Arabia had the highest prevalence of DM in 2015 among the Middle East and North Africa region as the prevalence was 17.6%.[25] It was reported in a global review that 34.6% of all diabetic patients have some forms of DR.[26] The prevalence of DR was reported to be 28.5%, 30.3%, 32.2%, 39.6%, and 39.3% in USA, UK, Australia, Japan, and Malaysia, respectively.[16] The prevalence of DR in KSA was found to be 31.3% in the capital Riyadh; the prevalence was estimated in other Saudi regions including AlTaif, Al-Hasa which was found 33% in the both region, but the highest prevalence was found in Al-Madinah 36%.[25-29] A study from Saudi Arabia reported that 36.4% of T2DM patients suffered DR.[30] The level of awareness about DR varies among different countries and different regions; a study from Australia[31] reported there were 37% only of DM patients who knew about ocular complications of DM. A lower level of awareness was reported from India (27%),[32] and the highest level of awareness was reported from the USA, where 65% of DM patients were aware of DR.[9] A study from Jordan demonstrated that there was a high level of awareness among diabetic patients regarding DR.[16] A study from KSA among physicians in Riyadh showed that the mean score of their awareness regarding DR was 57 out of 100.[33] A study from AlJouf and Hail province, KSA reported that 75.62% of diabetic patients were aware that diabetes can result in eye diseases.[34] A study from Taif, KSA showed that two-thirds of screened T2DM patients had good knowledge about DR.[35] A study from Jeddah, KSA demonstrated that DM patients had a good awareness about DM and its effects on eye; however, they showed the lack of awareness regarding DR.[36] Another study from Jeddah, King Abdul Aziz University found that 61% of diabetic patients had awareness about DR.[37]

Subjects and Methods

Subjects and study design

This study is cross sectional which was conducted from 1st October 2018 to 1st January 2019 in security forces hospital. The study was performed on Saudi patients with type 2 DM who visited PCC and their age ranged from 35–75 years old. The patients excluded from this study were either type 1 diabetic patients, non-Saudi, their ages less than 35 or older than 75 years, having congenital eye disease, suffering previous eye trauma, patient who known case or treat for other eye diseases like cataract or glaucoma and patient having a previously known cognitive impairment that would affect their ability to complete the survey or follow directions (e.g., mental retardation, dementia, psychosis).

Sample size and technique

Using expected awareness was reported 88% as given in the literature for calculating our sample size. Under the simple random sampling with a margin of error at 5% and the confidence level at 95%, we will need a sample of size 174.

We use the following formula:

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where n = sample size, z = z statistic for the level of confidence, p = expected prevalence, and d = allowable error. This formula assumes that "p" and "d" are decimal values. The study used a validated self-administered questionnaire. There was neither laboratory nor investigational techniques that were applied in this study. Medical records were used to be reviewed to check all participants who treated for other eye diseases like cataract or glaucoma.

Statistical analysis

SPSS program version 20 was used for statistical analysis, number and percent were used for qualitative variables, whereas mean and standard deviation were used for quantitative variables. Chi-square test was used for univariate analysis; significance was at $P < 0.05$.

Results

The present study included 174 individuals, the range of participants' age was 35–75 years old with mean ± SD of 45.8 ± 11 years, and the most dominant age group was those with age range of 51–60 years 83 (47.7%). The ratio of male to female was1:1, regarding education, the most dominant group was those who had a high school education 64 (36.8%). Most of the participants 129 (74.1%) reported that they had some relatives diagnosed with DM, there were 68 (39.1%) reported having diabetes for ≥11 years and the mean ± SD of their age at diagnosis was 39.88 ± 15.6. Most of the individuals [113 (64.9%)] reported that their blood glucose was controlled, and more than half [92 (52.9%)] stated that the eye was not affected, the most common source of referral to the eye doctor was GP 96 (55.1%) [Table 1].

The knowledge of participants is shown in details in Table 2. There were 114 (82.8%) participants who were aware that DM can affect the retina of the eye, 127 (73%) were aware that DR can lead to blindness, and 135 (77.6%) thought that blood sugar control may reduce the risk of DR. There were 144 (82.8%) participants eho thought that routine eye check-up is necessary during DM and less than half of participants 81 (46.6%) reported that check-up should be performed every 6 months.

Table 1: Sociodemographic characteristics	
Characteristics	***n* (%)**
Age in years	
≤40	21 (12.1)
41-50	37 (21.3)
51-60	83 (47.7)
≥61	33 (19.0)
Mean±SD	45.8±11
range	35-75
Sex	
male	87 (50.0)
female	87 (50.0)
Education	
illiterate	45 (25.9)
Elementary	51 (29.3)
High School	64 (36.8)
Higher education	14 (8.0)
Do you have any of your relatives diagnosed with DM	
yes	129 (74.1)
no	45 (25.9)
Duration of diabetes	
Less than 5	57 (32.8)
6-10	49 (28.2)
≥11 years	68 (39.1)
Age at diagnosis	
Mean	39.88±15.6
Median (IQR)	42 (36-50)
How is your blood glucose levels	
controlled	113 (64.9)
uncontrolled	61 (35.6)
Is eye affected	
yes	82 (47.1)
no	92 (52.9)
Source of referral to an eye doctor	
GP	96 (55.1)
patient himself	29 (16.7)
have no referral yet	49 (28.2)

Table 2: Knowledge of participants	
Knowledge questions	***n* (%)**
Are you aware that DM can affect the retina of the eye	
yes	144 (82.8)
no	30 (17.2)
Are you aware that DR can lead to blindness	
yes	127 (73.0)
no	47 (27.0)
Do you think that blood sugar control may reduce the risk of DR	
yes	135 (77.6)
no	39 (22.4)
Do you think that routine eye checkups are necessary during DM	
yes	144 (82.8)
no	30 (17.2)
How frequently do you think you should undergo an eye check-up?	
6months	81 (46.6)
1 year	58 (33.3)
2 years	4 (2.2)
Don't know	31 (17.8)
Do you know that laser treatment for DR does not improve vision but reduce further deterioration in vision?	
yes	98 (56.3)
no	84 (43.7)
Main source of information about DM and DR?	
internet	26 (14.9)
physician	90 (51.7)
friends	31 (17.8)
books	9 (5.2)
None	18 (10.3)

More than half of the individuals 98 (56.3%) stated that laser treatment for DR does not improve the vision, and more than half of participants 90 (51.7%) reported that the main source of knowledge about DM and DR was physicians.

The compliance of participants is shown in Table 3. There were 136 (78.2%) and 128 (73.6%) participants who reported that they fully adhere to DM treatment and measure their blood sugar at home, respectively. There were 45 (25.9%) participants who reported that they measure their blood sugar every day. There were 61 (35.1%) participants who reported that they never had vision examination, and 73 (42%) participants reported that the most common reason to get early retinal assessment was living in a remote area.

The overall awareness was among 144 (82.8%) participants, and only 30 (17.2%) were had unawareness [Figure 1].

The univariate analysis showed that sex and controlling of DM have a significant effect on awareness of participants (*P* value = 0.045, 0.021, respectively) [Table 4]. There were two factors that affected the awareness of participants who have diabetes
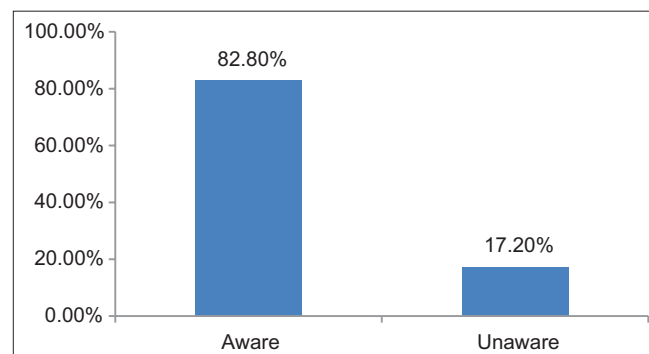

Figure 1: Awareness among participants

for less than 5 years and those who have diabetes for more than 5 years, these factors included adherence to DM treatment (*P* value < 0.001), measuring blood glucose at home (*P* value = 0.001), and the number of times measuring blood glucose (*P* value = 0.001) [Table 5].

Discussion

In the present study, there was a high level of awareness where 82.8% of the participants had awareness toward DR, only 17.2% had no awareness. Also, there were 82.8% of participants who knew that DM affects the retina of the eye, 77.6% knew that controlling blood sugar reduces the risk of DR, and 82.8%

Table 3: Compliance of participants

Compliance questions	Answers	n	Percentage
Are you fully adherent to your current DM treatment?	yes	136	78.2
	no	38	21.8
Do you measure your blood sugar at home?	yes	128	73.6
	no	46	26.4
How frequently do you measure your blood sugar at home?	Every month	36	20.7
	Every week	38	21.8
	Everyday	45	25.9
	Once I feel unwell	37	21.3
	Never	18	10.3
When you did last time had your vision exam	During the last 6 months	58	33.3
	Last year	55	31.6
	never	61	35.1
Whatare possible reasons that you think may prevent you to get an early retinal assessment	Lack of information about DR	52	29.9
	Lack of time	16	9.2
	Cost of the test	19	10.9
	Fearing of discovering something bad	14	8.0
	Living in a remote area	73	42.0

Table 4: Univariate analysis for the association between awareness of DR and selected variables

Variables	Aware (144) n (%)	OR	P
Sex		2.3 (1.1-5.3)	0.045
Male	77 (88.5%)		
Female	67 (77%)		
Education			
Illiterate	37 (82.2%)	-----	0.689
Elementary	43 (84.3%)		
High school	54 (84.4%)		
Higher education	10 (71.4%)		
Family history of DM			
Yes	103 (79.8%)	0.39 (0.127-1.18)	0.085
NO	41 (91.1%)		
DM			
Controlled	99 (87.6%)	5.3 (1.13-5.59)	0.021
uncontrolled	45 (73.8%)		
Duration of DM		2.4 (1.1-5.4)*	0.081
Less than 5 years	42 (73.7%)		
6-10 years	42 (85.7%)		
≥11 years	60 (88.2%)		

thought that a routine eye check-up is necessary during DM. The main source of information reported was GP (55.1%). Similar findings were reported in Jordanian study,[16] where 88.2% were aware that diabetes can affect the eyes, and the main source of information was GP 47.3%. A study from Hail province, Saudi Arabia, showed that 75.62% of diabetic patients were aware that eye disorders can be caused by diabetes.[34] A study from Taif, Saudi Arabia, reported that 64% of patients screened T2DM had awareness about DR.[35] A study from Jeddah reported that 82.6% of patients were aware that DM can affect the eye and 37%

were aware that the main source of information was physicians.[36] Another study from Jeddah, King Abdul Aziz University hospital reported awareness of DR among 61% of the patients.[37] Studies from different countries reported different level of knowledge about the eye disease caused by diabetes; in India, USA, and Oman there were 50%, 52% and 75% patients, respectively, who had awareness.[38-40] The rates of awareness were higher in Myanmar and Nigeria, where the awareness rates were 86% and 84.3%, respectively.[41,42] The variation in the level of awareness between different studies and our study can be attributed to the variation in the level of education of each population, the resources of each community, the physicians advice, and information they provide. In this study, there were 64.9% patients who reported controlled blood glucose; several studies[43,44] reported poor diabetic control among T2DM patients which resulted in a high rate of complications. Similar results were reported from Jeddah, where 64% of the patients stated that their DM was controlled.[36] In our study, we investigated variables that may affect the level of awareness; it was found that sex affected awareness significantly (P value = 0.04), where more males had awareness than female (88.5% vs. 77% respectively); also, awareness differed significantly regarding controlling DM (P value = 0.02), where there were 87.6% of those who controlled DM had awareness, whereas 73.8% of uncontrolled DM patients had awareness. In contrast to our findings, it was reported that education affected the level of awareness and higher awareness was significantly associated with a higher education level.[16] In Saudi study,[35] such correlation between awareness and education was reported, where patients with lower education showed lower awareness. A study from Turkey[45] revealed that T2DM patients with diabetes duration more than 10 years tended to be more aware about DR. Similar findings were reported by Saudi study from Taif.[35] In the current study, awareness of patients differed among those with DM duration less than and more than 5 years; regarding adherence to DM, a significant higher percentage of patients who adhere to treatment had awareness toward DR (P value < 0.001). Those who measure glucose at home and perform it every week tended to have awareness than the other (P value = 0.001).

Conclusion

The level of awareness about DR among T2DM in this study was good, controlling DM was associated with a higher level of awareness; hence, physicians should assure patients to control their diabetes.

Strength points, limitations, and recommendations

The strength points of the study are that the study investigated awareness of patients in details, then the overall knowledge was assessed, the weakness point includes the small sample size of the study. It is recommended to increase the awareness of patients who had low awareness by performing educational programs. Also, follow up and continuous screening for those patients are necessary. Further studies are recommended to investigate more factors that may associate with the level of awareness.

Table 5: Factors affecting awareness among those with more than and less than 5 years of diabetes

Variables	Are you aware that DM can affect the retina of the eye n (%)		P
	Aware	Unaware	
Are you fully adherent to your current DM treatment?			<0.001
Yes	120 (88.2%)	16 (11.8%)	
No	24 (63.2%)	14 (36.8%)	
Measuring blood glucose at home			0.001
Yes	32 (69.6%)	14 (30.4%)	
No	112 (87.5%)	16 (12.5%)	
How frequently do you measure your blood sugar at home?			0.001
Every day	29 (80.6%)	7 (19.4%)	
Every week	38 (100%)	0 (0%)	
Every month	40 (88.9%)	5 (11.1%)	
Once feel unwell	26 (70.3%)	11 (29.7%)	
Last measure			0.565
6 months	47 (81%)	11 (19%)	
1 year	44 (80%)	11 (20%)	
Never	53 (86.9%)	8 (13.1%)	

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Conflicts of interest

There are no conflicts of interest.

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