

# Awareness, knowledge, and practices related to diabetic retinopathy among diabetic patients in primary healthcare centers at Riyadh, Saudi Arabia

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## ABSTRACT

**Context:** Diabetic retinopathy (DR) is a microvascular complication for diabetes mellitus (DM), with around 35% of diabetic patients developing some form of DR. **Aims:** This study assessed the awareness toward DR, practice of regular eye examination, and DM control among diabetic patients. **Settings and Design:** This was a cross-sectional study among diabetics at two primary healthcare centers in Riyadh, Saudi Arabia, who were selected by convenience sampling. **Methods and Materials:** The questionnaire contained sections for demography, knowledge, attitude, and practice toward DR, and compliance to DM treatment. The association of awareness about retinopathy with demographics was compared. **Statistical Analysis Used:** The association of awareness about retinopathy and education level with demographics and compliance with treatment were compared using Chi-square test. **Results:** In total, 280 diabetic patients were included, 187 (67%) were males, mean age was  $58.9 \pm 10.1$  years, and median duration of diabetes was 10 years. There was good awareness about DR, diabetes was well controlled in 170 (61%) patients, but less than half (45%) had their eyes checked within 1 year. Patients with education level of high school and above had higher awareness than those with no formal education ( $P < 0.001$ ). Also, those with income level  $>10,000$  SR had higher awareness than those with income  $\leq 5,000$  SR ( $P < 0.05$ ). **Conclusion:** There was high awareness among the diabetic patients regarding DR but annual check-up was done in less than half of the patients. Improvement is required for scheduling annual eye examinations for the early detection of DR.

**Keywords:** Awareness, compliance, diabetes mellitus, diabetic retinopathy, eye examination

## Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by high levels of blood glucose. It causes damage to different organs and body tissues, such as the heart, nerves, kidneys, eyes, and blood vessels.<sup>[1]</sup> DM classified into three major types: type 1 diabetes, type 2 diabetes, and gestational

diabetes.<sup>[2]</sup> Diabetic retinopathy (DR) is one of the microvascular complications for DM. It can affect 24% of diabetic patients who have had the disease for 10–15 years.<sup>[3]</sup> It is estimated that globally around 35% of all diabetic patients develop some form of DR.<sup>[4,5]</sup>

In Saudi Arabia, the prevalence for DR was found to be 28%–36% among diabetic patients in studies from different areas of the country.<sup>[6–9]</sup> DR is the leading cause of avoidable visual impairment and blindness worldwide.<sup>[10]</sup> Diabetes glycemic

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**How to cite this article:** AlHargan MH, AlBaker KM, AlFadhel AA, AlGhamdi MA, AlMuammar SM, AlDawood HA. Awareness, knowledge, and practices related to diabetic retinopathy among diabetic patients in primary healthcare centers at Riyadh, Saudi Arabia. *J Family Med Prim Care* 2019;8:373-7.

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10.4103/jfmpc.jfmpc\_422\_18

control is an important factor in DR. People with poor glycemic control have a higher risk for DR;<sup>[11]</sup> a recent study from Australia showed that diabetic patients with poor indicators of glycemic control had three to four times more chances of DR as compared with those with better control.<sup>[12]</sup> The duration of having DM is also an important and significant factor in developing DR. The longer the duration of DM, the higher is the risk for DR.<sup>[3,11]</sup> The majority of DR patients present in late stages due to the silent nature of the disease.<sup>[13,14]</sup> Hence, screening annually is essential for early detection as it decreases the prevalence of visual impairment and blindness in diabetic patients and allows intervening in a timely manner.<sup>[9,14-16]</sup>

Diabetes mellitus is a public burden on Saudi Arabia as 23%–32% of its adult population suffers from the disease.<sup>[17-19]</sup> Saudi Arabia is also among the top 10 countries with the prevalence of the disease.<sup>[20]</sup> As mentioned earlier, DR prevalence was found to be 31% among diabetic patients in Riyadh region, Saudi Arabia.<sup>[6]</sup> Understanding the level of public awareness of a disease condition helps the educators to plan a future program that increases the level of knowledge in the diagnosis, complications, and management among patients. The level of awareness and knowledge about DR is a crucial part for the early diagnosis, management, and prevention of potential visual impairment.<sup>[19,20]</sup> Awareness of DR has been found to have a positive effect on practices related to prevention of retinopathy.<sup>[21]</sup> Recent studies on DR have been published from Al Jouf and Hail provinces and Jeddah in Saudi Arabia among diabetic patients.<sup>[22,23]</sup> To the best of our knowledge, no such study has been published on DR awareness, knowledge, and practice in Riyadh, Saudi Arabia.

More information is needed regarding the awareness, knowledge, and practices from diabetic patients about DR as the incidence and prevalence rate of diabetes is increasing in Saudi Arabia.<sup>[24]</sup> This study aimed to assess the awareness, knowledge level and practice toward DR, the compliance to regular eye examination, and DM control among diabetic patients in National Guard Comprehensive Specialized Clinics (NGCSC) and Health Care Specialty Center (HCSC), which are part of King Abdulaziz Medical City in Riyadh, Saudi Arabia.

## Methods

This was a cross-sectional study conducted at two primary healthcare centers, which are part of the tertiary care health facilities at King Abdulaziz Medical City in Riyadh. Diabetic patients coming to the two centers were selected by convenience sampling to complete a self-administered questionnaire. The questionnaire was developed based on two previously published studies,<sup>[19,22]</sup> questions from both studies were included based on the objectives of our study. The questions were translated from English to Arabic by forward–backward translation. Pilot testing was done on 25 diabetic patients to assess the reliability of the questionnaire, which gave a Cronbach's alpha value of 0.88. The questionnaire contained five sections (demographic,

knowledge about DR, attitude toward DR, practice toward DR, and compliance to DM treatment).

A similar study from Saudi Arabia on the awareness level of DR showed a 76% awareness.<sup>[22]</sup> Using this reference as a reference distribution of the level of awareness with a confidence level of 95%, and margin of error of 5%, the required sample size was estimated to be 280. In total, 140 patients were included from each of the two primary healthcare centers.

SPSS version 20 was used for data analysis. The categorical variables are presented as frequencies and percentages, whereas the numerical variables are presented as mean  $\pm$  standard deviation. The association of awareness about retinopathy and education level with demographics and compliance with diabetes treatment were compared using the Chi-square test. A *P* value  $<0.05$  was considered to show a statistically significant association. Approval for the study was obtained from the Institutional Review Board of the hospital before starting the study. A consent form was provided to the patients and only those who agreed to participate were included in the study.

## Results

A total of 280 diabetic patients participated in the study. Of these patients, 187 (67%) were males and 93 (33%) were females. The youngest participant was aged 25 years, and the oldest was 90-year old, the mean age was  $58.9 \pm 10.1$  years. The majority of the patients, i.e. 237 (85%) did not know about the type of diabetes (type 1 or 2) they had. The median duration since the diagnosis of diabetes mellitus was 10 years (IQR: 5, 15 years); there were 88 (22%) who were diagnosed with the disease within the last 5 years, whereas 108 (39%) had diabetes for  $>20$  years (maximum reported duration was 40 years). Family history of DM was reported by 200 (71%) patients and most of the patients, i.e., 197 (70%) were taking only tablets for treatment of diabetes [Table 1]. The education level was generally low with only 49 (18%) patients reporting as completed high school or above. The income level for the majority, i.e., 175 (62%) was also reported as low being SR  $\leq 5,000$ .

The patients' responses to awareness about DR showed good awareness for the three questions. There were 247 (88%) who were aware that diabetes mellitus can affect the retina; whereas 214 (76%) were aware that control of blood sugar reduces the risk of DR, and 186 (66%) patients were aware that DR can lead to blindness. The main source of information about diabetes mellitus and DR was reported to be by doctors (58%), followed by family and friends (18%), whereas 42 (15%) stated they did not get any information [Table 2].

More than half, i.e. 170 (61%), respondents were stated that their diabetes was well controlled, whereas 247 (88%) said that they adhered to their current treatment plan. There were 192 (69%) respondents who checked their blood sugar at home; these included 60 (21%) who checked it every day, and another 47 (17%)

who checked their blood sugar at home at least once a week. With regards to eye examination, 135 (48%) had their eyes checked at least once a year, and another 20 (7%) had it every 2 years, whereas there were 125 (45%) who had >2 years since their eye examination. When asked about whom they would consult in the event of an eye problem, almost all of them, i.e., 259 (93%) said that they would go to an ophthalmologist (data not shown).

The awareness that DM is associated with DR, control of DM reduces the risk of DR, and that DR can lead to lead

to blindness was compared between different demographic variables [Table 3]. There was no difference in the awareness of males and females for all three questions ( $P > 0.05$ ). The awareness was found to be associated with the level of education and monthly income. Awareness was highest in respondents with high school or above education for all three questions, followed by those with elementary/middle school education, and was lowest in those with no formal education ( $P < 0.001$ ). Also, persons with income >10,000 SAR showed the highest awareness, followed by those with income from 5,001 to 10,000 SAR, and those with income of up to SAR 5000 had the lowest level of awareness ( $P < 0.05$ ).

**Table 1: Demographic characteristics of the patients (n=280)**

	n (%)
Gender	
Male	187 (67)
Female	93 (33)
Age in years (mean±SD)	58.9±10.1
Type of DM	
Type 1	7 (2)
Type 2	36 (13)
Do not know	237 (85)
Duration since diagnosis (year)	
≤5	88 (31)
6-10	84 (30)
≥11	108 (39)
Family history of DM	
Yes	200 (71)
No	80 (29)
Type of treatment for DM	
Tablets only	197 (70)
Injection only	37 (13)
Both tablets and injections	46 (16)
Education level	
No education	97 (34)
Elementary or middle school	134 (48)
High school	27 (10)
University or higher	22 (8)
Monthly Income (SAR)	
≤5,000	175 (62)
6,000-10,000	69 (25)
11,000-20,000	25 (9)
≥20,000	11 (4)

DM: Diabetes mellitus

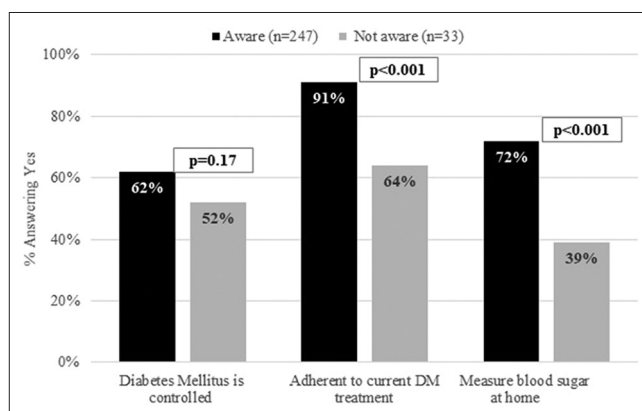
**Table 2: Diabetes patients' awareness about diabetic retinopathy (n=280)**

	n	Percentage
Aware that diabetes mellitus can affect the retina	247	88
Aware that blood sugar control may reduce the risk of diabetic retinopathy	214	76
Aware that diabetic retinopathy can lead to blindness	186	66
Main source of information about diabetes mellitus and diabetic retinopathy:		
Doctors	162	58
Family and friends	50	18
Internet and magazines	26	9
I did not get any information	42	15

Figure 1 shows the compliance with the management of their diabetes was compared between those who were aware about DM affecting the retina and those who were not aware. There was no difference in the stated control of DM between the two groups ( $P = 0.17$ ), but there was a significant difference with regards to the adherence to treatment and checking of blood sugar at home. It was found that in the group that was aware 91% were adhering to their current DM treatment as compared with 64% in the not aware group ( $P < 0.001$ ). Also, 72% of the patients in the aware group were measuring their blood sugar at home as compared with 39% in the not aware group ( $P < 0.001$ ).

## Discussion

The aim of the study aim was to assess the level of diabetic patients' awareness, attitude, practice, and compliance in Riyadh, Saudi Arabia. DR is a leading cause of avoidable visual impairment and blindness and patients' awareness and compliance plays an important role in the prevention of DR.<sup>[10]</sup> The study found awareness to high among the diabetic patients regarding DR with more than two-thirds being aware that DR can lead to blindness and almost all (88%) being aware that DM can affect the retina. Three-fourths of the patients were also aware that control of blood sugar may reduce the risk for DR. There were more than two-third of the patients who checked



**Figure 1: Association between awareness about diabetic mellitus affecting the retina and compliance with management of diabetes mellitus**

**Table 3: Association between demographics of the respondents and awareness of relationship between diabetes mellitus (DM) and diabetic retinopathy (DR)**

	<i>n</i>	DM affects the retina	Control of DM reduces risk of DR	DR can lead to blindness
Gender				
Male	187	162 (87%)	141 (75%)	125 (67%)
Female	93	85 (91%)	73 (78%)	61 (66%)
<i>P</i> -value		0.24	0.57	0.83
Education				
No formal education	97	76 (78%)	61 (63%)	50 (52%)
Elementary/middle school	134	123 (92%)	108 (81%)	93 (69%)
High school and above	49	48 (98%)	45 (92%)	43 (88%)
<i>P</i> -value		<0.001*	<0.001*	<0.001*
Income level				
Up to 5000	175	148 (85%)	126 (72%)	106 (61%)
5001-10,000	69	64 (93%)	55 (80%)	52 (75%)
> 10,000	36	35 (97%)	33 (92%)	28 (78%)
<i>P</i> -value		0.04*	0.03*	0.03*

\*Significant at  $P < 0.05$ 

their blood sugar at home; just over half of the patients got their eyes checked in 2 years, but there were almost half of the respondents who did not have an examination in the last 2 years.

The results of this study showed high level of self-reported awareness regarding DM affecting the eye, which is similar to other studies that has been done locally in Saudi Arabia in the areas of Hail and Al Jouf (76%) and Jeddah (83%).<sup>[22,23]</sup> Regionally, studies from Oman (93%),<sup>[25]</sup> Jordan (88%),<sup>[19]</sup> and Turkey (88%)<sup>[26]</sup> also showed a similar high level of awareness regarding awareness about DM affecting the eyes as in our study results of 88%. Globally, Switzerland (96%),<sup>[27]</sup> and Malaysia (86%)<sup>[28]</sup> also had high awareness, whereas one study from the rural Tamil Nadu area of India showed the lowest awareness (74%)<sup>[29]</sup> with regards to eye disorder and DM.

The current study showed a significant association between having some formal education and awareness about all the three questions regarding awareness about DM and retinopathy. This was similar to the studies from Jordan<sup>[19]</sup> and Malaysia,<sup>[28]</sup> both of which showed that diabetic patients having primary level or above education had better awareness than those patients who had no formal education. The main source of information about DM and DR for more than half of the diabetic patients was from their doctors, followed by their family and friends; this is similar to the findings from the two studies from Jordan and Malaysia.<sup>[19,28]</sup>

The recommended practice to routine eye check-up for diabetic patients is to have a yearly eye exam. The purpose of routine eye examination is the early diagnosis of DR and the prevention of its complications because of the silent course of the disease. This shows a major issue that leads to avoidable complications of DM. The current study found that almost half (48%) of the participants had an annual eye exam, and another 7% had an eye exam within the last 2 years. This is lower than the proportion of diabetic

patients who reported having an eye exam in the studies from Switzerland (71%)<sup>[27]</sup> and Jordan (76%).<sup>[19]</sup> There were around half of the diabetic patients (45%) in this study who did not have an eye examination in the last 2 years.

The strength of this study included the relatively larger than the other previous studies reported in the literature. Also, the patients were selected from the primary health care centers instead of the eye clinics, which gave a better representation of the awareness and eye practice of the diabetic patients. The limitation of the study included that education level of the patients in this study was lower than that of the general population. So, the results may not reflect that of all the diabetic patients in Riyadh, but can be generalized more to the lower income group who also have lesser education levels. The results regarding awareness and practice were self-reported by the patients and not verified by checking with their medical records. So, there is a possibility of over-reporting by some of the patients.

## Conclusion

The study found a high level of awareness about association between diabetes mellitus and eye problems among the diabetic patients. However, the practice of checking blood sugar regular and having annual eye examination was found to be low among the patients. There is need to increase the motivation of the patients for regular eye examination. The medical doctors can be the best source for providing this motivation since a high proportion of patients reporting that they received their information from their doctors.

## Acknowledgements

We would like to thank the members of the Research Unit, College of Medicine, Dr. Nazish Masud for helping us in our study, Dr. Emad Masuadi for helping with the data analysis, and Dr Aamir Omair for reviewing and editing the final version of the manuscript.

## Ethical consideration

Approval was obtained from King Abdullah International Medical Center's IRB before starting data collection and an agreement consent has been collected from participants. No disclosure of patients' information has happened. Participants' privacy was maintained, and a unique ID number/code was given for each participant. Only research team members had access to the data. The data were stored on a private computer.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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