

Awareness of diabetic retinopathy among Saudis with diabetes type 2 in Riyadh city

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ABSTRACT

Objective: To assess awareness of diabetic retinopathy (DR) for Saudis with diabetes mellitus (DM) type 2 in Riyadh City. **Methods:** A cross-sectional study that used self-administered questionnaires conducted in primary healthcare centers in Riyadh City between October and December 2019. **Results:** There were 267 Saudi participants with diabetes mellitus type 2 visiting primary healthcare clinics. (52.4%) were aged 40 years or above at time of diagnosis with diabetes. (73%) had diabetes for at least 5 years. Most of the participants have a good blood glucose control and they do home measurements. In regard to DR, (64.4%) of participants had no subjective or objective indicators of retinopathy, and (70%) had visited ophthalmology clinics. Majority of the participants were advised about DR or referred to an ophthalmologist by their primary physician, with the percentages being (64.8%) and (59.6%), respectively. Regarding other risk factors of DR, (19.5%) had a family history of DR, (23.2%) of participant are smokers and (41.6%) were hypertensives. Majority of the participants were aware about all the aspects of DR, its consequences, and appropriate management except the laser therapy. In terms of area of living and education respondents, who lived in the center of Riyadh City and the secondary level or less educated participants had the lowest level of education. **Conclusions:** Awareness of DR is acceptable but should not lead this information to reduced awareness and educational programs. Outreach researchers' efforts should cover other directions instead awareness of DR.

Keywords: Awareness, diabetes mellitus type 2, diabetic retinopathy, eye disease, Saudis

Introduction

Diabetes mellitus (DM) is a disorder, characterized by an imbalance in blood glucose levels. The prevalence of DM is increasing globally.^[1] The global diabetes prevalence in 2019 is estimated to be 9.3% (463 million people), rising to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045.^[2] As a result, it is expected that the number of diabetic patients and

mortality rate will increase by 54% and 38%, respectively in 2030. Also, an improvement in management will allow patients to live longer, which may lead to a higher prevalence.^[3] In Saudi Arabia, over 25% of the adult population is suffering and that figure is projected to more than double by 2030.^[4] There are many complications of DM, such as nephropathy, cardiovascular problems, neuropathy, and diabetic retinopathy.^[1]

Diabetic retinopathy (DR) is the most common cause of blindness and is the most frequent microvascular complication of DM. Globally, the prevalence of DR has markedly increased.^[5] The prevalence ranged from 19.7% to 26.1% in the central region,

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whereas studies in other regions of Saudi Arabia suggested a prevalence ranging from 27.8% to 36.4%.^[6-10] Previous studies have shown that there are multiple risk factors that may lead to DR and its progression, including the age and type of DM, genetic susceptibility, ethnicity, blood glucose control, body mass index (BMI), lipid levels, pregnancy, puberty, cataract surgery, hypertension, nephropathy, type of DM and duration.^[11-14] Insulin resistance in the absence of overt hyperglycemia could be an early driver of retinopathy.^[15]

It is recommended that the annual screening for type 1 diabetes should start after 5 years of diagnosis, while for type 2 diabetes it should begin at the time of diagnosis.^[16]

The interventions include diet, physical activity, medications and blood pressure and lipids control reduce diabetic retinopathy and other complications.^[17]

Expanding the degree of attention regarding DR among people with DM is viewed as a significant factor for prevention and early management of DR.^[18]

A lack of awareness about DM, DR, ordinary eye assessments, and the advantages of treatment can lead to poor compliance with the guidelines and delays in referrals to ophthalmology.^[19,20] It was found that adequate knowledge, increased duration of diabetes, and presence of neurological complications increased independent adherence to screening.^[21] From a financial point of view, the investigations and treatment of advanced diseases may influence the patient's personal satisfaction and increase the money-related expenses for his/her health.^[22]

Varied levels of awareness, about DR among patients with diabetes, have been published in various nations worldwide. For instance, in Australia, it was reported that 37% of the participants with DM were aware about the ocular complications of DM^[23] as compared to the 27% in India,^[24] and 65% in the United States who were aware of DR.^[25] In the Arabic region, a study conducted in Jordan found that (a) 88.2% participants were aware that DM could affect the eyes, and (b) 81% were aware that DR could lead to blindness.^[26] Locally, in Jeddah, 82.6% of the participants were aware that DM has a harmful impact on their eyes, and mentioned that doctors, TV, and relatives were reliable sources of information on the subject.^[27] In two studies conducted in the West and North of Saudi Arabia, it was found that two-thirds and three-quarters of people, respectively, had good knowledge about DR.^[28,29] Recently, a study published in 2017 about "Common Eye Diseases among Saudi Adults in Riyadh City" found that 88.6% of people were aware of diabetic eye diseases.^[30]

To increase public awareness about DR and its complications, a more widespread educational program and continuous assessment of awareness are desirable. This is, in addition to the concerted efforts between governments and the private sector to help raise health awareness by providing community and health initiatives.

Few studies have been performed to measure the levels of awareness about DR and its risk factors in the Saudi community.^[28] Therefore, we conducted a community-based survey to determine baseline awareness regarding DR in Riyadh City.

Methods

We conducted a quantitative, observational cross-sectional study among Saudis with DM type 2, who visited primary healthcare centers in Riyadh City, between October and December 2019.

A pilot study was conducted with 30 participants who were asked to complete a self-administered questionnaire. The questionnaire was modified with regard to the literature and was obvious and understandable for all. Participants were selected through the convenient sampling method. The inclusion criteria comprised Saudi individuals with DM type 2 in Riyadh City. To ensure there was no duplication of data, the top of every questionnaire had the sentence - "Please don't fill the questionnaire twice."

Study approval was obtained from the College of Medicine Research Center, King Saud University, Riyadh, Saudi Arabia 8-11-2018. The sentence, "completion of the following questionnaire will be taken as an indication of your consent to participate," was added at the top of the questionnaire to obtain informed consent.

Sample size calculations estimated that the minimum sample size required was 156 from the Saudi population in Riyadh city.^[31] This was estimated by using the sample size calculation for a single proportion: $N = (z)^2 p^*(1-p)/d^2$, where P was for proportion, and d for the margin of error, with a 0.886 (88.6%) for awareness of DR in Al Rashed *et al.*'s study,^[26] 95% confidence level, and 5% margin of error.

Data were analyzed using the Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA). Continuous variables were expressed as mean \pm standard deviation, and categorical variables were expressed as percentages. The Kruskal–Wallis test was used for continuous variables without a normal distribution. Cronbach's alpha was used to assess the reliability and internal consistency of the items in the questionnaire. The Shapiro–Wilk test was used to assess the normality of the data. The P value <0.05 was considered statistically significant.

Reliability of the questionnaire: Cronbach's alpha was 0.843 for all items. This reflected good reliability and internal consistency of the items in the questionnaire.

Results

Of the 350 completed surveys, 267 met the inclusion and exclusion criteria. "There were 136 males (51%) and 131 females (49%), of which, 179 participants (67%) were 45 years or older in age. All participants lived in Riyadh, with (41.9%) of them living in east of Riyadh. Regarding their education level, (59.9%) had completed

secondary school or less, while the remaining (40.1% completed university and above. For the medical field association, (95.5%) of participants were not healthcare workers and they did not have any medical education.

More than half of the participants (52.4%) were aged 40 years or above when they were diagnosed with diabetes. Of the respondents, (73%) had diabetes for at least 5 years and (60.5%) of them had it for 10 years or longer. Of the participants, (65.9%) had a desirable blood glucose reading at the time of visiting their physician and (73.4%) measured their blood glucose at home. Regarding treatment, 130 participants (48.7%) were put on oral hypoglycemic agents (OHA) and (39.7%) on insulin alone or with OHA. Bad exercise habits (less than 60 min or no exercise at all per week) were noted for (58.4%) of the participants.

In questions related to DR, (64.4%) of participants had no subjective or objective indicators of retinopathy, and (70%) had visited ophthalmology clinics during the last year. Majority of the participants were advised about DR or referred to an ophthalmologist by their primary physician, with the percentages being (64.8%) and (59.6%), respectively. Regarding other risk factors of DR, (19.5%) had a family history DR, (23.2%) of participant smokers and (41.6%) were diagnosed as hypertensives.

Majority of the participants were aware about all the aspects of DR, its consequences, and appropriate management. The only questionable aspect for the participants was about laser therapy. [Table 1]

There was no significant difference in the awareness levels between groups of different categories, except the level of educational and area of living. Regarding low awareness, respondents who lived in the center of Riyadh City had the lowest awareness score which was 2 times lower than that of others. In terms of education, the secondary level or less educated participants were 1.8 times lower than the others with higher education. [Table 2]

Discussion

This study addressed the demographic, social characteristics, and knowledge of diabetic retinopathy among Saudis with type 2 diabetes mellitus visiting primary health care centers in Riyadh City.

Sociodemographic characteristics

Most of our participants were 45 years or above, with an education level of secondary school or less, and has no association with the medical field.

DM and DR-related characteristics

Majority of respondents (73%) had diabetes for more than 5 years and 60.5% of them had it for more than 10 years. Therefore, the natural course of DM made them more vulnerable to DR as the

Table 1: Awareness of DR among patients with DM

Questions related to awareness of DR related to DM	Correct answer	
	Number	Percentage
Does Diabetes Mellitus can affect the retina of the eye?	224	83.9
Does Diabetic Retinopathy lead to blindness?	196	73.4
Does controlling blood sugar reduce the risk of eye disease related to diabetes?	217	81.3
Should you screen your eyes when you have been diagnosed with Diabetes at the first time?	227	85.0
Is laser therapy for eye diseases related to diabetes prevents further deterioration of vision?	130	48.7
Is your main source of information about DM and DR reliable?	192	71.9
Is regular eye examination necessary for diabetics?	202	75.7
Can a Diabetic Patient have eye problems at the same time of Diabetes diagnosis?	171	64.0
Do you think Retinopathy is a treatable condition?	186	69.7
Should a person with DR undergo an eye check up more frequently than those for screening (for example every 6 months or less)?	192	71.9
Do you think regular screening should be every 1 to 2 years for Diabetic Retinopathy if both eyes are good?	192	71.9

Table 2: Univariate analysis for association between low awareness of DR and selected variables

Variable	Odds ratio	95% CI		P
		Lower	Upper	
Gender				
Female	1.331	0.807	2.195	0.262
Male**	1.000			
Educational level				
Secondary or less	1.849	1.093	3.129	0.022*
University and above**	1.000			
Duration of DM				
<5 y	0.589	0.253	1.373	0.220
5-10 y	0.790	0.349	1.790	0.572
10-20 y	1.526	0.689	3.377	0.298
>20 y**	1.000			
FHx of DR				
Yes**	1.000			0.276
No	1.475	0.733	2.970	
Blood Glucoses levels				
Controlled**	1.000			0.112
Uncontrolled	1.526	0.906	2.568	
Area inside Riyadh				
East**	1.000			
West	0.270	0.105	0.694	0.007
North	0.753	0.360	1.574	0.451
South	1.364	0.522	3.563	0.527
Central	2.063	1.034	4.117	0.040

* Significant p value. ** Used as a reference

duration increased alongside other risk factors of DR, which were prevalent in the participants by (41.6%), (23.2%), and (19.5%) for

hypertension, smoking, and family history of DR, respectively. Almost half of the participants used OHA alone, (39.7%) used insulin either alone or in combination with OHA, (73.4%) had measured their blood glucose at home, and (65.9%) had a controlled blood sugar level when they were visiting their physician. A higher percentage of individuals had controlled blood sugar levels and used a home measurement, indicating a positive attitude towards their disease. This could also explain the reason for a high percentage of participants (64.4%) not having developed DR as yet. On the other hand, unfortunately (58.4%) had less than 60 min or no exercising at all, which could reflect a negative attitude towards a healthy lifestyle. Regarding the DR attitude on the side of healthcare providers, especially physicians, (40.5%) of the participants were not referred by their primary physician, and (35.2%) were not given advice or instructions about DR from their physicians. These percentages were considered high and can be explained either by bad practice or a lack of knowledge in those physicians. It was noted that the percentage of diabetics who checked their eyes last year was (70%), and it did not interfere with what was mentioned previously about the DR attitude in physicians because 19.9% of the participants were aware of DR and went by themselves to ophthalmologists.

Knowledge and awareness of DR

Of the participants, (83.9%) knew that DM could affect their eyes, which was very similar to the (82.6%) reported in a study carried out in Jeddah and slightly higher than other studies carried out in north of Saudi Arabia and Taif city by percentages of (75.6%) and (79.5%), respectively.^[23-25] This small difference between percentages in different areas can be such information is well known, even in the Saudi population. When we compare this finding with other studies carried out in other countries like Malaysia (86%) and Jordan (88.2%), which is slightly higher than our country, the difference in sample size and sampling technique may contribute to these differences.^[21,22] With regard to whether DM could lead to blindness, we found that (73.4%) which did not have much difference with Almalki *et al.*'s study and was much higher than Alzahrani *et al.*'s study in which (59%) could be attributed to the education level. Since Alzahrani *et al.*'s study has the highest percentage of people with a low education level, it is reasonable for this justification to not interfere with the point of DM affecting the eyes because it is more popular than point of DM can cause blindness since eye diseases from DM broad spectrum categorize and the blindness is one of them.^[23,24] Patients' awareness about their disease process and high blood glucose levels being a risk for complications, especially DR, was achieved by (81.5%). This was consistent but slightly higher than Almalki *et al.*'s study and could be attributed to previously mentioned points in comparison between studies.^[24]

With regard to the awareness about eye screening, (85%) of the participants believed that they had to check their eyes when they were diagnosed for the first time with type 2 DM, (75.7%) knew that they had to undergo regular screening for diabetics, (71.9%)

knew that regular screening had to be performed every 1 to 2 years and if the eye disease developed, screening had to be more frequent, that is, in 6 months or less. When we compare these findings with other studies carried out in Saudi Arabia, we have higher awareness and this can be attributed to many factors such as our data collected in 2019, while their data were collected from 2014 to 2016.^[23-25] This time, variance with recent educational and awareness trends in social media may cause an increment in the awareness levels. With regard to the awareness about DR treatments, (69.7%) believed that DR was treatable and (48.7%) believed that laser therapy could prevent further deterioration of DR. These findings were consistent with other studies carried out in Saudi Arabia.^[23-25] Awareness about treatment was not high and this was expected because popular trends in patient education and awareness campaigns concentrated on prevention rather than on the treatment of DR. Regarding the sources from where the participants drew their information, (71.9%) of them used reliable sources of information about DM and DR, which were consistent with Alzahrani *et al.*'s study and was not concern for other studies.^[23] Overall, higher education was associated with higher knowledge, as was found in Almalki *et al.*'s study, which does not need any justification.^[24] The area of living was significantly associated with the level of awareness this may due to sample size variation between these areas in this study.

Strengths and limitations

One of the limitations of this study is its limited generalizability for Saudi Arabia because this study was conducted in Riyadh city. One of the strengths of this study is concentrating only on patients with type 2 DM.

Conclusion

The awareness of DR is considered acceptable and emphasize high efforts that carried out by primary health care physicians. These results indicate the application of modern practice of family medicine in Saudi Arabia which depends on prevention by increasing the awareness. This information should not underestimate or lead to reduced awareness and educational programs. The efforts of researchers towards awareness in the field should cover other directions as well, rather than awareness of DR only.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

References

- WHO 2018 Diabetes [Internet]. [cited 2018 Oct 30]. Available from: <https://www.who.int/news-room/fact-sheets/detail/diabetes>.
- Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, *et al.* Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International diabetes federation diabetes Atlas. *Diabetes Res Clin Pract* 2019;157:107843.
- Rowley WR, Bezold C, Arikian Y, Byrne E, Krohe S. Diabetes 2030: Insights from yesterday, today, and future trends. *Popul Health Manag* 2017;20:6-12.
- Alwin Robert A, Al Dawish MA. Microvascular complications among patients with diabetes: An emerging health problem in Saudi Arabia. *Diab Vasc Dis Res* 2019;16:227-35.
- Ting DS, Cheung GC, Wong TY. Diabetic retinopathy: Global prevalence, major risk factors, screening practices and public health challenges: A review. *Clin Exp Ophthalmol* 2016;44:260-77.
- Alaboud AF, Tourkmani AM, Alharbi TJ, Alobikan AH, Abdelhay O, Al Batal SM, *et al.* Microvascular and macrovascular complications of type 2 diabetic mellitus in Central, Kingdom of Saudi Arabia. *Saudi Med J* 2016;37:1408-11.
- Al-Rubeaan K, Abu El-Asrar AM, Youssef AM, Subhani SN, Ahmad NA, Al-Sharqawi AH, *et al.* Diabetic retinopathy and its risk factors in a society with a type 2 diabetes epidemic: A Saudi national diabetes registry-based study. *Acta Ophthalmol* 2015;93:e140-7.
- Alabdulwahhab KM. Prevalence and risk factors of diabetic retinopathy in Saudi Diabetics in Majmaah City. *Australas Med J* 2016;9:531.
- Hajar S, Al Hazmi A, Wasli M, Mousa A, Rabi M. Prevalence and causes of blindness and diabetic retinopathy in Southern Saudi Arabia. *Saudi Med J* 2015;36:449-55.
- Ahmed RA, Khalil SN, Al-Qahtani MA. Diabetic retinopathy and the associated risk factors in diabetes type 2 patients in Abha, Saudi Arabia. *J Family Community Med* 2016;23:18-24.
- Ting DS, Cheung GC, Wong TY. Diabetic retinopathy: Global prevalence, major risk factors, screening practices and public health challenges: A review. *Clin Exp Ophthalmol* 2016;44:260-77.
- Yun JS, Lim TS, Cha SA, Ahn YB, Song KH, Choi JA, *et al.* Clinical course and risk factors of diabetic retinopathy in patients with type 2 diabetes mellitus in Korea. *Diabetes Metab J* 2016;40:482-93.
- Tan GS, Gan A, Sabanayagam C, Tham YC, Neelam K, Mitchell P, *et al.* Ethnic differences in the prevalence and risk factors of diabetic retinopathy: The Singapore epidemiology of eye diseases study. *Ophthalmology* 2018;125:529-36.
- Lee R, Wong TY, Sabanayagam C. Epidemiology of diabetic retinopathy, diabetic macular edema and related vision loss. *Eye Vis* 2015;2:17.
- Bao YK, Yan Y, Wilson B, Gordon MO, Semenkovich CF, Rajagopal R. Association of retinopathy and insulin resistance: NHANES 2005-2008. *Curr Eye Res* 2020;45:173-6.
- AAO Quality of Care Secretariat, Hoskins Center for Quality Eye Care. Screening for Diabetic Retinopathy - 2014 [Internet]. [cited 2014 Oct]. Available from: <https://www.aao.org/clinical-statement/screening-diabetic-retinopathy>.
- WHO 2020 Diabetes [Internet]. [cited 2020 may 15]. Available from: https://www.who.int/health-topics/diabetes#tab=tab_3.
- Srinivasan NK, John D, Rebekah G, Kujur ES, Paul P, John SS. Diabetes and diabetic retinopathy: Knowledge, attitude, practice (KAP) among diabetic patients in a tertiary eye care centre. *J Clin Diagn Res* 2017;11:NC01-7.
- Wang S, Tikellis G, Wong N, Wong TY, Wang JJ. Lack of knowledge of glycosylated hemoglobin in patients with diabetic retinopathy. *Diabetes Res Clin Pract* 2008;81:e15-7.
- Muecke JS, Newland HS, Ryan P, Ramsay E, Aung M, Myint S. Awareness of diabetic eye disease among general practitioners and diabetic patients in Yangon, Myanmar. *Clin Exp Ophthalmol* 2008;36:265-73.
- Alwazae M, Al Adel F, Alhumud A, Almutairi A, Alhumidan A, Elmorshedy H. Barriers for adherence to diabetic retinopathy screening among Saudi Adults. *Cureus* 2019;11:e6454.
- Schoenfeld ER, Greene JM, Wu SY, Leske MC. Patterns of adherence to diabetes vision care guidelines: Baseline findings from the Diabetic retinopathy awareness program. *Ophthalmology* 2001;108:563-71.
- Livingston PM, Wood CA, McCarty CA, Harper CA, Keeffe JE, Taylor HR. Awareness of diabetic retinopathy among people who attended a diabetic retinopathy screening program. *Med J Aust* 1998;169:117.
- Hussain R, Rajesh B, Giridhar A, Gopalakrishnan M, Sadasivan S, James J, *et al.* Knowledge and awareness about diabetes mellitus and diabetic retinopathy in suburban population of a South Indian state and its practice among the patients with diabetes mellitus: A population-based study. *Indian J Ophthalmol* 2016;64:272-76.
- Tajunisah I, Wong P, Tan L, Rokiah P, Reddy S. Awareness of eye complications and prevalence of retinopathy in the first visit to eye clinic among type 2 diabetic patients. *Int J Ophthalmol* 2011;4:519-24.
- Bakkar MM, Haddad MF, Gammoh YS. Awareness of diabetic retinopathy among patients with type 2 diabetes mellitus in Jordan. *Diabetes Metab Syndr Obes* 2017;10:435-41.
- Alzahrani SH, Bakarman MA, Alqahtani SM, *et al.* Awareness of diabetic retinopathy among people with diabetes in Jeddah, Saudi Arabia. *Ther Adv Endocrinol Metab* 2018;9:103-12.
- Almalki NR, Almalki TM, Alswat K. Diabetics retinopathy knowledge and awareness assessment among the type 2 diabetics. *Open Access Maced J Med Sci* 2018;6:574-7.
- Al Zarea BK. Knowledge, attitude and practice of diabetic retinopathy amongst the diabetic patients of AlJouf and Hail Province of Saudi Arabia. *J Clin Diagn Res* 2016;10:NC05-8.
- Al Rashed WA, Bin Abdulrahman AK, Zarban AA, Almasri MS, Mirza AS, Khandekar R. Public awareness regarding common eye diseases among Saudi Adults in Riyadh City: A quantitative study. *J Ophthalmol* 2017;2017:9080791.
- The fifteenth guide-2015 [Internet]. General Authority for Statistics. 2015 [cited 2017 Dec 9]. Available from: <https://www.stats.gov.sa/en/97>.