

Original article

# Diabetic retinopathy: Knowledge, awareness and practices of physicians in primary-care centers in Riyadh, Saudi Arabia



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## Abstract

**Purpose:** Diabetic retinopathy (DR) is a serious cause of irreversible blindness and is the most common complication of diabetes. Annual fundus examination for diabetics aids in the prevention of blindness and allows intervening at a timely manner. As primary care physicians (PCP) are the main providers for diabetic care in Saudi Arabia, we aim to evaluate the current knowledge and awareness, and to assess practices among PCP regarding DR.

**Methods:** We conducted a cross-sectional study covering 46 randomly selected primary-care centers in Riyadh during October 2015. A Self-administered questionnaire was distributed to PCP containing 3 sections. The first section covered participants' demographics and professional background. The second section contained multiple-choice questions on knowledge related to diabetes and DR. The third section was to assess physicians' practices.

**Results:** A total of 216 PCPs completed the questionnaire. The mean overall knowledge score was  $57 \pm 14$  out of 100. There was a significant difference in knowledge score between physicians who had obtained a subspecialty degree in family medicine compared to others ( $59 \pm 14$ ,  $53.3 \pm 14$  respectively;  $P = 0.003$ ). Only 19% of PCPs were aware of anti-vascular endothelial growth factor (VEGF) injections as a modality of treatment. A defect was found in the screening and follow-up of type 1 diabetics, and only 24% of physicians correctly referred patients with type 1 diabetes to an ophthalmologist.

**Conclusion:** Our study uncovered areas of defects in knowledge among PCP regarding DR. This needs to be addressed in future seminars and workshops with an emphasis on the proper ophthalmological screening and management of diabetic patients.

**Keywords:** Diabetic retinopathy, Diabetes, Blindness prevention, Primary care, Screening guideline

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## Introduction

Diabetes mellitus constitutes a major threat on health and economy worldwide. The global prevalence of diabetes is on the rise reaching to epidemic proportions in some regions. In 2015, Saudi Arabia had the highest prevalence of 17.6% in the Middle East and North Africa Region (MENA). As the number of diabetics is increasing, more complications of

the disease will be encountered which may lead to significant morbidity, disability and early mortality.<sup>1</sup>

Diabetic retinopathy is one of the serious causes of irreversible blindness and is the most common complication of diabetes.<sup>2</sup> Globally, 34.6% of all diabetic patients develop some form of diabetic retinopathy.<sup>3</sup> In Saudi Arabia the prevalence of diabetic retinopathy was studied in the capital (Riyadh region) and it was found to be 31.3%. It was also looked at in other cities in Saudi Arabia such as AlTaif and

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Al-Hasa, and a prevalence of 33% was found in both. The highest prevalence was found in Al-Madinah region with 36% of all diabetic patients having some form of DR.<sup>4-7</sup>

Controlling the blood sugar and the blood pressure can prevent and delay the progression of DR as was shown in many previous studies.<sup>8,9</sup> Tight blood sugar control decreased the onset of DR by 76% and slowed the progression of DR by 54%.<sup>9</sup> Also, a timely laser photocoagulation when indicated aids in the prevention of blindness in early-detected cases.<sup>10,11</sup> However, due to the silent nature of the disease, the majority of patients present late with irreversible advanced stages.<sup>11,12</sup> Thus, regular screening is very crucial in early detection of DR changes. That highlights the importance of physicians' awareness of the standardized diabetes-screening guidelines and the importance of implementing them in their practice.

Data from several studies have identified a suboptimal screening pattern where only 31–53% of patients were found to have an annual eye examination.<sup>13-17</sup> This could be attributed to patients' misunderstanding and noncompliance or to physicians' late referral to an ophthalmologist. For instance, a study done in Pennsylvania reported that only 72% of PCPs routinely refer diabetic patients to ophthalmology clinics.<sup>18</sup> On the other hand less than half of physicians do so by a study conducted in southern India.<sup>19</sup>

Because PCPs are the main providers for diabetic care in Saudi Arabia, assessing their knowledge, awareness and practices regarding DR is a determining factor for blindness prevention. Studies addressing diabetic eye disease awareness among PCPs have been conducted in other countries.<sup>19-24</sup> Khandekar et al., who studied Omani physicians, demonstrated some limitation in knowledge and practice of eye care.<sup>20</sup> A survey of the Canadian family physicians highlighted some areas of knowledge defects regarding screening guidelines of diabetic retinopathy.<sup>21</sup> However, the status of this matter is yet to be determined in our country.

We lack data about the current status of practices, knowledge and awareness of PCP in Riyadh in regard to diabetic retinopathy, as PCP are the main care providers of diabetic care in Riyadh, Saudi Arabia. In this paper we aim to evaluate the current knowledge and awareness, and to assess practices among PCP regarding DR. Assessing knowledge will map out areas of defects to be addressed in future seminars and workshops, while evaluating practices will help constructing efficient strategies to deliver the optimal care to all patients.

## Methods

We conducted this cross-sectional study in all ministries of health-primary care centers, all over the city of Riyadh in Saudi Arabia, during the month of October 2015. Since no previous studies were conducted in Saudi Arabia, we assumed that 50% of the physicians have a relatively low level of knowledge regarding diabetic retinopathy. With a precision of 5% at 95% confidence level and an additional 10% to compensate for refusal, our calculated sample size was 422 physicians. A list of all 418 primary care centers in Riyadh region was drawn up from the Ministry of health Web site. The list was further filtered to include only centers placed inside Riyadh city. Random number table was used to select 50 primary care centers, as each center has an average num-

ber of 8–10 PCPs per center. Out of the total 50 centers selected, 46 centers agreed to be enrolled in our study. All physicians working in the randomly selected centers were included in the study.

The questionnaire was designed by the authors to aid in data collection. It is written in English and consists of 3 main sections. The questions in the questionnaire were answered by two different senior retina specialists and the correct answers were set accordingly and scored. The first section focused on physicians' demographics and professional background. The second section contained 14 main multiple-choice questions on knowledge covering topics related to diabetes screening, symptoms of diabetic retinopathy and modalities of treatment. A Score of one was given for each correct answer and zero for the wrong or did not know answers. The final score of knowledge was calculated to be out of 100%. The last section, which had a total of 9 questions, assessed physicians' practices in regard to how routinely they screen diabetics, when do they refer them to an ophthalmologist, patient education regarding DR and whether they have ever used an ophthalmoscope. The questionnaire was pretested by a pilot study on 20 primary care physicians from three different centers. Each physician was asked to answer the questionnaire 2 times one week apart. The answers were compared and then the questionnaire was tested by a statistician, and was found to be valid.

Statistical analysis was carried out using social science version 21 SPSS v21. Descriptive statistics for all variables were performed, including the mean and standard deviation. Inferential analysis was conducted to detect the association among different study variables. Analysis of variance (ANOVA) test with a *p*-value < 0.05 was set as a statistically significant result.

An informed consent was provided at the top of each questionnaire indicating the purpose of the study, benefits of participation and the right to withdraw. The physicians were instructed to answer the questions without referring to any textbook or colleagues.

## Results

### *Background characteristics*

A total of 216 general physicians completed the questionnaire (a response rate of 51%). Male physicians were more than female, 126 (58.3%) and 90 (41.7%), respectively. Ages ranged from 24 to 63 years with a mean of 40.8 ± 9.2 years. Most physicians were non-Saudi 139 physicians (64.4%). 142 physicians (65.7%) were Family physicians, 10 (4.6%) Pediatricians, 8 (3.7%) Internists, and 56 (25.9%) General physicians. Duration of practice varied from 0 to 32 years, with a mean of 13.3 ± 8.4 years (Table 1).

### *Knowledge*

A defect was noticed in areas of screening and follow-up of type I diabetics. Only 52 (24%) of physicians referred patients with type I diabetes to an ophthalmologist as per the diabetic screening guidelines (five years after diagnosis). 90 (42%) of physicians were found to mistakenly refer type I diabetics at the time of diagnosis. 22 (10%) referred type I diabetics two years after diagnosis, 20 (9%) referred type I diabetics one

**Table 1.** Demographic characteristics.

Demographic characteristics		N	%
Gender	Male	126	58.3
	Female	90	41.7
Nationality	Saudi	77	35.6
	Egyptian	53	24.5
	Sudanese	30	13.9
	Syrian	6	2.8
	Jordanian	6	2.8
	Indian	10	4.6
	Pakistani	20	9.3
Other	14	6.5	
Medical specialty	Family Medicine	142	65.7
	Pediatrics	10	4.6
	Internal Medicine	8	3.7
	General Physician	56	25.9
Years in practice	<5	47	21.8
	6–10	43	19.9
	11–15	46	21.3
	16–20	29	13.4
	>20	51	23.6
Total		216	100

year after diagnosis and 32 (15%) did not know when to refer them. On the other hand 154 (71%) referred patients with type II diabetes as per the guidelines. 10 (5%) referred type II diabetics five years after diagnosis, 12 (5%) referred type II diabetics two years after diagnosis, 34 (16%) referred type II diabetics one year after diagnosis and 6 (3%) did not know when to refer them.

Regarding symptoms of diabetic retinopathy, only 100 (46%) of physicians knew that patients usually present with no symptoms at early stages due to the silent nature of the disease early on. 164 (76%) of physicians considered a decrease in visual acuity as the earliest presentation of DR and around 104 (50%) of physicians considered photosensitivity. When asked to identify high risk factors to develop diabetic retinopathy, 210 (97%) of physicians identified uncontrolled diabetics as a high risk factor to develop DR. Around 196 (90%) identified longer duration of DM and hypertension, and only 27% identified pregnancy.

Only 116 (53%) agreed on a dilated fundus examination as the test of choice to evaluate diabetic retinopathy. 44 (20%) chose direct handheld ophthalmoscope, 18 (8%) chose fluorescein angiography, 8 (4%) chose ultrasonography of the eye and 30 (15%) did not know. Another defect in knowledge was detected in the treatment options. 166 (77%) of physicians agreed on laser photocoagulation as a modality of treatment. However, the majority were not aware of vitrectomy and intravitreal injections either anti-VEGF or steroids as a modality of treatment. Only 50 (23%) of physicians mentioned vitrectomy, 40 (19%) mentioned anti-VEGF intravitreal injections and 30 (14%) identified corticosteroids intravitreal injections as a modality of treatment (Table 2).

**Table 2.** Modalities of treatments.

	Laser photocoagulation		Vitrectomy		Intravitreal anti-VEGF		Intravitreal corticosteroids	
	N	%	N	%	N	%	N	%
YES	166	76.9	50	23.1	40	18.5	30	13.9
NO	12	5.6	70	32.4	72	33.3	76	35.2
DON'T KNOW	38	17.6	96	44.4	104	48.1	110	50.9

The mean overall knowledge score for all the respondents was  $57 \pm 14$  out of 100 (range 24–88). There was a significant difference in knowledge score between physicians who had obtained a subspecialty degree in family medicine compared to others ( $59 \pm 14$ ,  $53.3 \pm 14$  respectively;  $P = 0.003$ ). Knowledge was significantly higher for physicians with more than 15 years of practice as compared to physicians with <5 years of practice ( $60.7 \pm 13$ ,  $51.8 \pm 17$  respectively;  $P = 0.006$ ). Male physicians scored better than females, 16 (13%) and 6 (6.7%) respectively, were in the high knowledge group with a score of >75 of 100, but that were not found to be statistically significant (Table 3).

### Practices

140 (65%) of physicians routinely refer their diabetic patients to an ophthalmologist. 26 (12%) refer their patients only when they develop an eye complaint and 30 (14%) refer only those with a long duration of diabetes. 16 (7%) of physicians were found to only refer their patients if they were type II diabetics and 4 (2%) of physicians only refer their patients if they were type I diabetics. Two third of the respondents follow up with the patients whom they had referred to an ophthalmologist. 84 (40%) of physicians spend 15–30 min to explain the management of diabetes to their patients. 36 (17%) require less time and 8 (3%) require more time. 88 (40%) of physicians agree that the time spent to explain depends upon the patient.

204 (95%) of physicians consulted their patients in regard to diet and exercise. On the other hand 188 (87%) of physicians consulted their patients on losing weight. 140 (65%) of physicians claimed the capability of using an ophthalmoscope and 116 (54%) examined their diabetic patients with it. In regard to the main sources that physicians use to update their knowledge on DR, the majority relied on the Internet and medical books as a main source of information (77.8% and 66.8% respectively), while 41% relied on seminars, and 32% on journals. Television and newspapers were the least used sources (14% and 8% respectively). 91 (42%) of physicians were involved in DM public awareness programs to educate the public in the last year (Table 4).

### Discussion

This paper aimed to study one main axis incorporated in the health care of diabetics, the primary care physician. This research was conducted to assess the current knowledge, awareness, and practices of primary care physicians toward diabetic retinopathy. Results revealed multiple defective areas in screening guidelines, risk factors, screening tools and modalities of treatment.

24% of respondents knew the current screening recommendation for type I diabetics, as opposed to 71% for type

**Table 3.** Correlation between knowledge and demographic characteristics.

Characteristics		N	%	Knowledge						Mean Knowledge	
				Poor (<50)		Moderate (50–75)		High (>75)		Mean ± SD	P-value
				N	%	N	%	N	%		
Gender	Male	126	58.3	36	28.6	74	58.7	16	12.7	57.6 ± 15	0.5
	Female	90	41.7	30	33.3	54	60	6	6.7	56.4 ± 13	
Nationality	Saudi	77	35.6	21	27.3	49	63.6	7	9.1	57.6 ± 13	0.724
	Others	139	64.4	45	32.4	79	56.8	15	10.8	56.9 ± 14	
Medical sub-specialty	Family medicine	142	65.7	36	25.4	84	59.2	22	15.5	59 ± 14	0.003
	Others	74	34.3	30	40.5	44	59.5	0	0	53.3 ± 14	
Years in practice	≤5	47	21.76	23	48.9	20	42.6	4	8.5	51.8 ± 17	0.006
	6–10	43	19.9	9	20.9	32	74.4	2	4.7	57 ± 12	
	11–15	46	21.3	15	32.6	27	58.7	4	8.7	56.4 ± 12	
	>15	80	37	19	23.8	49	61.3	12	15	60.7 ± 13	

**Table 4.** Preferred learning resources.

Learning resources	N	%
Seminars	88	40.7
Radio/TV	31	14.4
Internet	144	66.7
Newspaper	17	7.9
Senior medical personal	52	24.1
Books	168	77.8
Journals	69	31.9

II diabetics. This discrepancy between the two types could be attributed back to the fact that in Saudi Arabia, type II diabetics are managed usually in primary care clinics. On the other hand, type I diabetics are followed up by endocrinologists. Same figures were detected in a study done by Delmore et al. in Canada.<sup>21</sup>

In our healthcare system, pregnant women follow up with PCPs throughout their pregnancy period. During that period, the PCP is the one responsible to deliver the optimal care i.e. assurance and education, handling referrals, providing vitamin and supplements, examination, laboratory tests. Yet, only one third of physicians identified pregnancy as a risk to develop DR. Thus, proper screening guidelines for diabetic pregnant women should be included in the physicians continuing educational programs.

Two third of PCPs claimed the capability of using an ophthalmoscope, and 54% have examined their diabetic patients with it. Only 53% agreed on dilated pupil examination as the test of choice to evaluate diabetic retinopathy. Trained PCPs could be first-level screeners for diabetic retinopathy. However, the chance of missing retinopathy changes by physicians had been stated to be high.<sup>25</sup> This could lead to presentation of retinopathy cases in advanced stages when limited intervention can be offered to save the eyesight. From that we have to prioritize our efforts to be directed toward educating the physicians first, as it is crucial to know and follow screening guidelines for diabetic retinopathy. After insuring optimal knowledge, efforts could be directed toward incorporating training sessions for physicians in future workshops.

A potential gap was detected in the treatment options for DR as the majority of our sample were not aware of vitrectomy and intravitreal injections either anti-VEGF or steroids as a modality of treatment. Same figures were documented in another study by Kaliyaperumal et al.<sup>19</sup>

Our sample had a range of more than 30 years in practice. This wide range allowed us to investigate how knowledge might vary with experience. Also, we were able to correlate the level of knowledge between different subspecialties. However, we should be cautious while interpreting those results since they were obtained from a sub group analysis.

42% of physicians were involved in DM public awareness programs to educate the public in the last year, which is considered to be double the proportion of a result reported previously in another study.<sup>19</sup> This proves that our physicians are enthusiastic and aware of their role in the community. They should be further encouraged to utilize all possible chances to educate the public and promote health in the community.

Most PCPs were found to rely on the Internet as a main source of information. Almost half selected seminars as a main source of information. This information can be utilized when assembling the continuous educational plan for physicians.

As PCPs are the main source of information to patients especially in rural areas where illiteracy is prominent, this further accentuates their major role when it comes to delivering the best standard of care to patients. An efficient and competent physician must be oriented and have the full scope of the common conditions they face in their daily practice.

## Limitations

One of the limitations in our study was the random choice of ministry of health-primary care centers, which may have not covered all 5 regions in the city of Riyadh equally. Another limitation of our study is that we only included PCP working in primary health-care centers without including PCP in governmental hospitals. Thus, we were unable to compare the PCP in those two different healthcare settings. We should also be cautious in generalizing our study outcome to PCP of Saudi Arabia, as the study only reflects the practice of PCP in the capital city Riyadh.

## Conclusion and recommendations

Our study uncovered areas of defect in the current knowledge among PCPs regarding diabetes and diabetic retinopathy. Multiple defective areas in screening guidelines, risk factors, screening tools and modalities of treatment were found.

The trends of practice followed in primary healthcare centers were overall satisfactory. As most of PCPs tend to follow-up their patients, the time spent to explain management plan is tailored upon each patient to satisfy their needs. Patients are consulted regarding the importance of lifestyle modifications, exercise and diet.

Giving that efforts should be directed toward healthcare promotion in our community, different learning resources must be accessible for all physicians. Various teaching methods should be implemented. More importantly, future seminars for primary-care physicians should emphasize on the proper ophthalmological screening and management of diabetic patients.

### Competing interests

This research has no significant competing financial, professional or personal interests that might have influenced the performance or presentation of the work described in this manuscript.

### Conflict of interest

The authors declared that there is no conflict of interest.

### Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.sjopt.2017.01.001>.

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