ORIGINAL ARTICLE

Knowledge, attitudes, and practices regarding diabetic retinopathy among primary health care physicians in Al-Hasa, Saudi Arabia

A.E. ALHEJJI[1], M.A. ALSULTAN[2], M.A. ALSHAREET[2], F.A. ALKHAMIS[1], M.A. ALJAAFARY[1], A.I. ALSHAQAQIQ[1], M.R. NABOULI[3], S. IBRAHIM ALI[4]

[1] King Faisal University, Saudi Arabia; [2] King Faisal University, Saudi Arabia; [3] Department of Internal Medicine, College of Medicine, King Faisal University, Saudi Arabia; [4] Department of Community Medicine, College of Medicine, King Faisal University, Saudi Arabia

Summary

Background. *Diabetic retinopathy (DR) has been shown to be the third most observed cause of visual loss in Saudi Arabia. In the Al-Hasa region in particular, the prevalence of DR has been shown to be 30%. Primary health centre (PHC) physicians play a central role in the early detection and prevention of DR. The aim of this study was to evaluate the knowledge, attitudes, and practices regarding DR of PHC physicians in Al-Hasa, Saudi Arabia.*
Methods. *A cross-sectional descriptive study was conducted at PHCs in Al-Hasa, Saudi Arabia. A self-administered questionnaire was provided to every participant along with a consent form. Out of 71 centres in the region, 63 were included in this study. The questionnaire consisted of three sections and a total of 18 questions. Statistical analysis was carried out using the Statistical Package for the Social Sciences version 21 software program (IBM Corp., Armonk, NY, USA).*

Results. *One hundred forty-one of 209 physicians completed the questionnaire for a response rate of 67%. The mean of overall knowledge score for all participants was 2.6 ± 1.16 points out of four points. Only 34 (24.1%) of the participants correctly referred their diabetic patients according to the guidelines of the American Academy of Ophthalmology. Additionally, only 52 (36.9%) physicians educated their patients regarding the early detection of diabetic complications.*
Conclusion. *The present study concluded that there exist gaps in applying the correct guidelines. Physicians' attitudes toward patient education were overall satisfactory. Further medical symposiums and workshops are warranted to teach physicians about diabetic complications and screening schedules, including DR.*

Introduction

Diabetes is the most common chronic disease related to metabolic and endocrine impairment [1, 2]. About 382 million people are affected by diabetes and, every minute, about 10 people die from its complications [2]. Long-term duration of diabetes, poor control of blood glucose, and genetic basis are possible risk factors for the development of microvascular complications of diabetes, including diabetic retinopathy (DR) [3, 4]. DR is one of the most common complications of diabetes and the leading cause of blindness in the productive age range [5]. Seventy-eight percent to 97% of type 1 diabetes patients and 60% to 80% of type 2 diabetes patients will develop some degree of DR after more than 15 years with the disease [6]. In Saudi Arabia, it has been shown that DR is the third most observed cause of visual loss [7]. DR affects 31.3% of diabetic patients in Saudi Arabia [7, 8]. In the Al-Hasa region, the prevalence of DR has shown to be 30% [5, 9].

Although the rate of blindness due to DR is high, early detection, the application of effective screening programs, and efforts to control the risk factors for DR are crucial to delay the onset and slow the progression of the condition [3, 9]. According to the American Academy of Ophthalmology guidelines, immediate evaluation of DR in type 2 diabetes patients at the time of diagnosis and annually thereafter should occur [10]. On the other hand, in type 1 patients, ophthalmoscopy screening is initiated beginning at five years after diagnosis and annually from then [6, 10]. A study performed in Riyadh found that 71% of physicians referred type 2 diabetes patients to an ophthalmologist correctly, while only 24% of physicians did a correct referral for type 1 diabetes patients [11]. Another study conducted in Tabuk City suggested that only 27.6% of general practitioners (GPs) follow the guidelines correctly regarding referring type 1 diabetic patients [12]. On the other hand, a study in Taif City revealed that the majority of GPs have good knowledge and attitudes toward DR screening in general [13].

Physicians who work in primary health centres (PHCs) have a central role in the early detection and prevention of DR [9]. They represent the first line of management of diabetes and referrals if complications take place [14]. The aim of this study was therefore to evaluate the knowledge, attitudes, and practices regarding DR among PHC physicians in Al-Hasa, Saudi Arabia.

Methods

A cross-sectional descriptive study was conducted at PHC centres in Al-Hasa, Saudi Arabia between October

2017 and February 2018. The study population consisted of all physicians working in PHC centres in this region during this time period. According to the 2016 version of the statistical yearbook of the Saudi Ministry of Health, there are 453 physicians distributed among 71 PHC centres in Al-Hasa and the affiliated villages [17]. With a precision of 5% at a 95% confidence level, the calculated sample size was 209 physicians. The participants of the study were randomly selected according to lists provided from the health sectors. All physicians of PHC centres in Al-Hasa who were involved in diabetic patients' care were eligible for inclusion in this study, while other health care providers and physicians who work at hospitals and secondary health care centres as well as those not involved in the care of diabetic patients were excluded. Ethical approval was given by the research committee of the College of Medicine, King Faisal University and the institutional review board committee of King Fahad Hospital in Hofuf. The questionnaire used herein was taken from a previous study and modified [11]. A pilot survey was conducted for the investigation and validation of the questionnaire, in which 10 questionnaires were distributed in four different PHCs. The outcome of this pilot study was that the questionnaire was clear and valid. The pilot survey participants were subsequently excluded from the main study population.

A self-administered questionnaire in the English language was given to every participant along with a consent form declaring that the collected data would be confidential and used only for research purposes. The questionnaire consisted of three sections and a total of 18 questions, with seven questions being about demographic and professional data, four questions being about knowledge regarding DR, and seven questions being about attitudes and practices toward DR screening, respectively. In the knowledge section, a score of one point was given for each correct answer, while zero points were awarded for wrong answers (total is four points). The study participants were instructed to answer all questions without referring to any textbook or colleagues. Statistical analysis was carried out by using the Statistical Package for the Social Sciences version 21 software program (IBM Corp., Armonk, NY, USA). Descriptive statistics for all variables were performed, including means, medians, interquartile ranges, and standard deviations (SDs). An inferential analysis was conducted to detect the association among different study variables. Analysis of variance (t-test) was used to detect the differences in mean score between different subgroups stratified according to gender, age, medical specialty, and primary health sector. A p-value of less than 0.05 was set as a statistically significant result.

Results

A total of 141 physicians completed the questionnaire for a response rate of 67%. Eighty-seven (61.7%) of these were male, while 54 (38.3%) were female. Mean age was 33.0142 years (SD: 6.8889 years, range: 25-58 years). Years of medical practice ranged from less than

Tab. I. Demographic data of PHC physicians.

Variable	Category	N	%
Gender	Male	87	61.7
	Female	54	38.3
Health sector	Omran	41	29.1
	Hofuf	51	36.2
	Mubaraz	49	34.8
Nationality	Saudi	107	75.9
	Non-Saudi	34	24.11
Medical specialty	Family medicine	56	39.7
	Internal medicine	10	7.1
	GP	75	53.2

one year to 25 years, with a mean of 5.5674 years (SD: 5.39120 years) (Tab. I).

The mean score of knowledge was 2.560 ± 1.161 points out of four points. Eight participants (6.4%) scored zero points, while 16 (11.3%) scored one point, 37 (26.2%) scored two points, 45 scored three points (31.9%), and 34 (24.1%) scored four points. The mean score was between 2.367 and 2.753 (CI = 95%). With a cut-off of 50% of the ideal score, 56% had good knowledge and 44% had poor knowledge. Only 58 (41.1%) participants followed the correct protocol in referring newly diagnosed type 1 diabetic patients for fundoscopy. More than half of the participants (57.4%) knew the correct interval of follow-up for type 1 diabetic patients according to recent guidelines for DR screening. The majority of the subjects (83.7%) followed the recent guidelines for the newly diagnosed type 2 diabetic patients. About three-quarters of the participants (73.8%) were aware of DR screening intervals for type 2 diabetic patients (Tab. II).

The time physicians usually spent explaining the management of diabetes to their patients varied among the study subjects, with 13.5% taking less than 15 minutes, 31.2% taking 15 to 30 minutes, and 6.4% taking more than 30 minutes, respectively, while the rest (48.9%) answered that it depends upon the patient. Most physicians (89.4%) reported instructing their diabetic patients to apply lifestyle modifications (e.g., diet and exercise), 63.8% taught them about the disease itself, and 63.1% educated their patients on the importance and necessity of adhering to the treatment plan and follow-up visits. Nevertheless, only 36.9% taught their patients about how to detect complications early.

Considering the number of patients seen by PHC physicians per week, 79.4% of them reported that they saw 10 or less type 1 diabetic patients, 14.9% saw between 11 and 20 patients, 3.5% saw between 21 and 30 patients, and 2.1% reported consulting more than 30 type 1 diabetic patients. Separately, 41.1% of the physicians responded that, weekly, they saw 25 or less type 2 diabetic patients, 31.9% reported that they saw between 26 and 50 patients, and 9.2% of the participants mentioned a range of 51 to 75 patients. Only 13.5% of all participants reported consulting 76 to 100 type 2 diabetic patients on a weekly basis, while the rest (4.3%) of the participants reported having more than 100 type 2 diabetic patients. Concerning patients' compliance with undergoing regu-

Tab. II. Knowledge and scoring regarding DR.

Variable	Category	N	%
When do you request initial fundoscopy for a newly diagnosed T1 DM patient?	At diagnosis	56	39.7
	After 1 year	20	14.2
	After 3 years	7	5
	After 5 years	58	41.1
How regularly should a type 1 diabetic patient visit an ophthalmologist?	Every 5 years	14	9.9
	Every 2 years	11	7.8
	Every year	81	57.4
	Based on ophthalmologist screening assessment	31	22
	I don't know	4	2.8
When do you request initial fundoscopy for a newly diagnosed T2 DM patient?	At diagnosis	118	83.7
	After 1 year	20	14.2
	After 3 years	2	1.4
	After 5 years	1	0.7
How regularly should a type 2 diabetic patient visit an ophthalmologist?	Every 5 years	10	7.1
	Every 2 years	10	7.1
	Every year	104	73.8
	Based on ophthalmologist screening assessment	16	11.3
	I don't know	1	0.7
Total score (Mean score = 2.560 ± 1.161 points)	0 points	8	6.4
	1 point	16	11.3
	2 points	37	26.2
	3 points	45	31.9
	4 points	34	24.1

lar fundoscopy, 25 (17.7%) of the participants reported that less than 25% of their patients underwent routine fundoscopy, while 56 (39.7%) reported 25% to 50% of their referred patients underwent the procedure. Thirty-six (25.5%) reported that 50% to 75% of their referred patients underwent fundoscopy, and 24 (17%) reported that more than 75% of their patients followed their regular referral requests to undergo fundoscopy.

According to the physicians' experiences, the barriers that prevented their diabetic patients from undergoing fundoscopy when requested included a lack of rapid appointment (44%), financial reasons (12.1%), lack of compliance (56%), no available ophthalmologist (17%) and other (6.4%). Twenty-five (17.7%) of the participants always receive a report of their referred patients regarding DR screening, 47 (33.3%) of them usually re-

ceive a report, 35 (24.8%) sometimes receive a report, and 24 (17%) rarely receive a report. Ten (7.1%) participants reported having never received a report on their patients regarding DR screening.

A comparison of the mean scores of knowledge regarding diabetes type 1 and diabetes type 2 separately concluded that there is a significant difference between the mean knowledge scores of type 1 and type 2 in favour of type 2. However, the comparison of knowledge scores between genders revealed that there is no significant difference between males and females regarding the overall score (Tab. III). There is also no significant difference in the mean knowledge scores among physicians working in different sectors, different nationalities, and medical specialities, with p-values of 0.162, 0.099, 0.159, and 0.056, respectively. Furthermore, this study, using Pearson correlation, revealed that there was no significant relationship between knowledge score and both age of the physicians and their years of practice (Tab. IV).

Discussion

This study reported that, among all participants, there was a significant difference between the mean knowledge scores of type 1 and type 2 diabetes, in favour of type 2. About half of the participants correctly referred their patients with type 1 diabetes versus 80.1% who correctly referred type 2 diabetic patients. This difference can be attributed to the fact that PHC physicians encounter more patients with type 2 than type 1 diabetes on a daily basis, as type 1 diabetics are usually followed by endocrinologists. Our results are similar to the findings of Preti et al., [15] who reported correct referral

Tab. III. Knowledge scores for physicians by gender and type of diabetes.

	Gender	N	Mean	Std. deviation	T	p-value
Scores	Male	87	2.4828	1.14995	-1.476	0.142
	Female	54	2.7778	1.16013		
	Type 1	141	0.9858	0.74628	7.387	0.0001
	Type 2	141	1.6028	0.65334		

Tab. IV. Knowledge scores for physicians by age and years of medical practice.

	Age	Years of practice	Score	
Age	Pearson correlation	1	0.869	-0.033
	Sig. (two-tailed)		0	0.695
	N	141	141	141
Years of practice	Pearson correlation	0.869	1	-0.013
	Sig. (two-tailed)	0		0.877
	N	141	141	141
Score	Pearson correlation	–0.033	–0.013	1
	Sig. (two-tailed)	0.695	0.877	
	N	141	141	141

rates of 36.9% and 86.9% for type 1 and type 2 diabetes, respectively. Similarly, Al-Rasheed et al. [11] reported a correct referral rate of 24% for type 1 diabetics versus one of 71% for type 2 diabetics.

The present study showed no significant difference between males and females in the mean scores of knowledge. Similar findings were reported by Al-Rasheed et al. [11]. Furthermore, it also found no significant difference in the mean knowledge score upon comparing it among physicians of different age groups and years of medical practice since graduation. These results are similar to the findings of Al-Ghamdi et al. [13], who reported no significant difference in the mean knowledge score between physicians with less than five years and five to 10 years of practice. This is contrary, however, to the findings of Preti et al. [15], who reported a correct referral rate of 54.8% for GPs who had graduated five years ago versus that of 22.1% for GPs who had 20 years or more of experience since their graduation. Al-Rasheed et al. [11] separately reported higher knowledge scores in physicians with more than 15 years of practice as compared with physicians with less than five years of practice.

This study found that the majority of the participants reported that a high percentage of their patients didn't undergo fundoscopy if requested; however, the percentage of compliance is anticipated to decrease further over the passage of time as the Alfadda and Abdulrahman study in Saudi Arabia showed [16]. According to the participants' experiences, the most influential barrier was the lack of patient compliance followed by the lack of rapid appointment. The lack of rapid appointment can be attributed to the fact that there exists a limited number of ophthalmologists [17] in conjunction with a high and still-increasing number of DR cases in the Al-Hasa area [9]. Therefore, it's convenient to suggest that physicians in the PHCs should be the ones who perform routine fundus examinations for DR screening, as they are qualified to screen for DR and perform fundoscopy, as it was proven by Verma et al. [18] and Askew et al. [19] that GPs are able to detect DR changes nearly as accurately as ophthalmologists. However, in the study conducted by Al-Ghamdi et al. in Taif, Saudi Arabia, only one-third of the included 180 GPs felt confident in performing fundoscopy [13]. Thus, this study suggests that PHC physicians must be trained and provided with proper equipment to be able to perform fundoscopy to screen for DR in PHCs without referring diabetic patients to an ophthalmologist.

Only a small percentage of physicians responded that they invested less than 15 minutes in teaching their patients about diabetes. The majority of physicians educate the patients about the disease itself, the appropriate lifestyle modifications, and the importance of adhering to treatment and regular follow-up visits. However, about two-thirds didn't educate their patients about the early detection of diabetic complications, including DR screening. Not having an adequate perception of the complications of diabetes was found to be the most common cause of the lack of compliance with undergoing regular fundoscopy examinations in previous studies conducted in Saudi Arabia, India, Malaysia, and Ireland [20-24]. Therefore, PHC physicians

should be advised to place more emphasis on teaching their diabetic patients about both the potential complications and the importance of undergoing regular screening.

Limitations

There are a few limitations of this study. First, the response rate of this study was 67%. The study also didn't cover all PHC centres in Al-Hasa and the affiliated villages; therefore, the study results shouldn't be generalized to all PHC physicians across the region, country, or other parts of the globe.

Conclusion

PHC physicians have a crucial role in the early detection and prevention of DR. Regarding these physicians' knowledge, the present study concluded that there are gaps in applying the correct guidelines. The physicians' attitudes toward patient education were overall satisfactory. Most of the physicians dedicated enough time to their patient management efforts. Medical symposiums and workshops are warranted to teach PHC physicians about the seriousness of diabetic complications and the appropriate screening schedules. Moreover, training programs must be organized for PHC physicians to master fundoscopy so as to perform it at PHCs without referral to an ophthalmologist, since the most reported barrier to screening nonadherence was the lack of rapid appointment.

Acknowledgements

Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

AEA conceived and designed the research project, collected and analysed the data, contributed to the writing of the manuscript, critically revised the manuscript, and approved the final manuscript. MA Alsultan, MA AlShareet, FAA, MAA, and AIA collected and analysed the data, contributed to the writing of the manuscript, critically revised the manuscript, and approved the final manuscript. MRN contributed to the writing of the manuscript, critically revised the manuscript and approved the final manuscript, and supervised and coordinated the research implementation. SIA analysed the data, critically revised the manuscript, and approved the final manuscript.

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Correspondence: Ahmad Essa Alhejji, Medical Student, King Faisal University, Al-Hasa, Saudi Arabia - Tel. 00966544319914 - E-mail: f.ahmad.999@hotmail.com

Appendix 1

Knowledge and awareness regarding diabetic retinopathy among general practitioners in Al-Ahsa, Saudi Arabia

We would highly appreciate your assistance with this research, which is being conducted to observe the practice of general practitioners towards diabetic retinopathy. This research was designed in order to give us a clear view of how diabetic retinopathy is screened in Al-Ahsa region and whether or not there are any obstacles that prevent the general practitioners from screening. If you want to participate in this research, please complete the consent form below.

I hereby give voluntary permission to be a part of the study conducted by the student's scholars of College of Medicine, King Faisal University, Al-Ahsa.

I know I do not have control or access to the final results of the research. However, I can access my personal data if available.

I have informed that my identity will be kept confidential by the Students scholar/Researchers.

Participant's signature: ………………….…..Date/Time/Place: …………………

Demographic data:

1. **Gender:**
   Male ☐ Female ☐
2. **Age:** ……….
3. **Years of service as a GP:** …
4. **Place of graduation:** ……………………
5. **Health sector:**
   Omran ☐ Hofuf ☐ Mubarraz ☐ Other: …
6. **Nationality:**
   Saudi ☐ Egyptian ☐ Sudanese ☐ Syrian ☐ Jordanian ☐
   Indian ☐ Pakistani ☐
   Other nationality, specify_____
7. **Medical specialty:**
   Family medicine ☐ Pediatrics ☐
   Internal medicine ☐ General Practitioner ☐
   Endocrinology ☐

Knowledge and awareness

1. **In your daily practice, when do you request fundoscopy to a newly diagnosed T1 DM patient for the first time?**
   At diagnosis ☐
   After 1 year ☐
   After 3 years ☐
   After 5 years ☐
2. **How regular should a type 1 diabetic patient visit an ophthalmologist?**
   Every 5 years ☐
   Every 2 years ☐
   Every year ☐
   Based on ophthalmologist screening assessment ☐
   I don't know ☐
3. **In your daily practice, when do you request fundoscopy to a newly diagnosed T2**
   DM patient for the first time?
   At diagnosis ☐
   After 1 year ☐
   After 3 years ☐
   After 5 years ☐

4. **How regular should a type 2 diabetic patient visit an ophthalmologist?**

   Every 5 years ☐
   Every 2 years ☐
   Every year ☐
   Based on ophthalmologist screening assessment ☐
   I don't know ☐

Attitudes and practices

1. **How much time does it take for you to explain how to manage diabetes?**

   < 15 minutes ☐
   15 to 30 minutes ☐
   > 30 minutes ☐
   Depends upon the patient ☐

2. **Which aspects you usually educate your diabetic patients about? (Check what apply)**

   The disease: What is diabetes, symptoms and possible complications ☐
   Lifestyle suggestions to control the disease: Diet, exercise and weight loss ☐
   The necessity of sticking to the treatment plan and follow-up visits ☐
   How to detect some complications early ☐

3. **The number of DM Type 1 patients who visit your clinic weekly (on average):**

   [… …]

4. **The number of DM Type 2 patients who visit your clinic weekly (on average):**

   [… …]

5. **Do most diabetic patients undergo fundoscopy when requested?**

   Less than 25% ☐
   25-50% ☐
   50-75% ☐
   More than 75% ☐

6. **If a requested fundoscopy is not done, what is the reason?**

   Lack of rapid appointment ☐ Financial reasons ☐
   Lack of compliance ☐ No available ophthalmologist ☐
   Others: …..

7. **How often do you receive a report regarding the patient situation from the ophthalmologist?**

   Always ☐
   Usually ☐
   Sometimes ☐
   Rarely ☐
   Never ☐