

# Diabetic retinopathy: Knowledge, awareness, and practices in primary-care centers in the Kingdom of Bahrain

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## ABSTRACT

**Background:** With the growing incidence of diabetic-related complications such as retinopathy and the well-understood role of screening and telemedicine around the world in preventing and managing this potentially blinding disease, there comes the importance of awareness toward this silent eye condition. Awareness ideally should be raised both from the patients' and physicians' perspectives. This study aims to assess the awareness of primary care physicians (PCPs) towards diabetic retinopathy (DR) and its management. **Materials and Methods:** A survey considering professional background, knowledge, and practices was distributed electronically to all PCPs in the Kingdom of Bahrain and analyzed using SPSS Vs 21. **Results:** A total of 83 physicians completed the survey; 81.9% were female and 96.4% were Bahraini. More than 60% of them accurately knew screening guidelines for type 1 and 2 DR. Of the total, 72.5% would refer patients to the ophthalmologist even if asymptomatic, and 97.6% correctly stated that a dilated eye exam is the method of choice most efficient for assessing DR. Nearly 60% knew about the current treatment modalities for DR and 91.3% knew about the presence of a national screening program in the Kingdom. **Conclusion:** The overall knowledge of DR was good with some potential gaps in information about screening. PCPs could benefit from regular refresher courses for more precise practices on screening and referral of retinopathy.

**Keywords:** Awareness, diabetic retinopathy, primary care

## Introduction

It is well known that diabetes is a global “epidemic.” In 2015, an estimated 415 million people had diabetes globally and this number is projected to increase to 642 million by 2040. Diabetic retinopathy (DR) is the leading cause of blindness and visual impairment in working-aged adults, and is associated with a poor quality of life, lower levels of psychosocial well-being, and an increased risk factor of other diabetes complications

and mortality.<sup>[1,2]</sup> The Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) are part of the Middle East and North Africa (MENA) region, which currently has the world's second-highest age-adjusted comparative diabetes prevalence at 10.8%, and, in Bahrain, a national survey revealed an overall prevalence of type 2 diabetes (T2D) of 14.3% among Bahraini nationals in the working age group.<sup>[3]</sup> DR is the most common cause of visual impairment amongst Bahraini nationals reaching up to 41.5%.<sup>[4]</sup>

Intensively controlling blood sugar levels can reduce the risk of microvascular complications in the eye in type 1 diabetics (T1D) and HbA1c is seen as a marker for glycemic control and a predictor for risk of diabetic complications.<sup>[5]</sup> In eyes that

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have developed high-risk characteristic related to DR, prompt treatment with scatter or pan-retinal photocoagulation (PRP) is clearly advisable to significantly reduce the rate of severe visual loss.<sup>[6]</sup> Regular screening is very crucial in the early detection of DR changes especially with the silent nature of the disease; thus, highlighting the important role of primary care physicians' (PCP) awareness of the standardized diabetes screening guidelines and the essential need to implement them in their practice.

Several studies reveal a discrepancy between patient awareness of DR and attendance to screening programs.<sup>[7-10]</sup> Studies conducted in neighboring Saudi Arabia revealed some factors to non-adherence to screening programs as lack of information on the screening process and the participants' belief that screening is not effective.<sup>[4]</sup> Another study from Jeddah showed that 82% of patients are aware of diabetes affecting their eyes, but 36% reported that their doctors had not advised them about it. About 35% did not undergo their eye checkups, even though around 59% thought that DR could lead to blindness.<sup>[11]</sup>

To improve patient awareness, knowledge, and adherence to DR screening programs, one needs to assess the PCP perspective of the magnitude of this growing problem. A study by Al Rasheed R *et al.* reported that there was a significant difference in knowledge of DR scores between physicians who had obtained a subspecialty degree in family medicine compared to others. Only 19% of PCPs were aware of anti-vascular endothelial growth factor injections as a modality of treatment of DR and only 24% correctly referred T1D to an ophthalmologist.<sup>[12]</sup>

In Bahrain, PCPs are the main providers of care for diabetic patients, and hence evaluating their awareness, knowledge, and current practices for tackling and preventing DR will help address future defects and construct efficient strategies for areas of need to deliver optimal care to all diabetic patients.

This study aims to set the awareness of DR among PCP to improve the management and final outcome through enhanced collaboration between primary and secondary care facilities.

## Materials and Methods

### Study setting

This cross-sectional study engaged PCPs from all 25 primary healthcare centers across all governorates of the Kingdom of Bahrain.

### Study design

A prevalidated questionnaire was used that consisted of multiple-choice questions that included components on physician demographics, knowledge of DR, and practices used for referral and management.

### Study duration

The study was conducted from August 2021 to November 2021.

## Sampling method and size

The sample size was concluded to involve the entire cohort of PCPs in Bahrain counted 379 physicians, as it would be representative of the total population of the kingdom.

## Data collection

An anonymous electronic survey was distributed to medical practitioners via their work e-mails after consent was sought from the authorized medical personnel in the Ministry of Health. Additionally, social platforms were also included as a means of data collection and informed consent was sought from all participating physicians at the start of filling in their responses. The survey was written in English and designed to collect data about three main aspects, including physicians' demographics, their knowledge and awareness about diabetic retinopathy, and their current practices in managing patients suffering from diabetic retinopathy.

## Data analysis

Data was analyzed using SPSS version 21. Data were presented as percentages and mean  $\pm$  SD. variables included were gender, nationality, medical specialty, and years of practice.

## Ethical approval

Approval from the Secondary Health Care Research Committee (SHCRC) in the Ministry of Health was obtained before commencing the study, and informed consent was taken from all physicians.

## Results

### Physician demographics and professional background

A total number of 83 PCPs completed the survey (response rate of 22%). The majority of physicians were females with a ratio of 4.5:1. The larger number were Bahraini physicians (80, 96.4%). Most of the participants were found to be family physicians (61, 73.5%), followed by 18 family physicians holding a specialty degree (21.7%) in areas such as diabetology, dermatology, lactation, obstetrics and gynecology ultrasonography, nutrition, urology, medical education, public health and health promotion, ethics, and clinical sexology. Of the total number of physicians who took the survey, 4 were general practitioners (4.8%). Around two-fifths of the physicians ( $n = 36$ ) were experienced for more than 15 years in their respective fields, 21 spent a period of 6–10 years in clinical practice (25.3%), 14 physicians trained for 11–15 years (16.9%), and 12 had qualified for less than 5 years (14.5%) [Table 1].

### Knowledge of diabetic retinopathy

Primary healthcare clinicians were found to have adequate knowledge about the screening for diabetic retinopathy in patients with T1D. Of the total, 66% of physicians have correctly identified that they would refer T1D patients for DR screening 5 years after diagnosis as recommended by the

screening guidelines. Around 18% of physicians incorrectly opted for screening for DR at the time of diagnosis of T1D, 9.6% referred patients after 1 year of diagnosis, and 2.4% of physicians preferred screening for DR after 2 years of diagnosis. About 3.6% of physicians did not know when to refer patients for screening for the presence of DR [Figure 1a]. A reassuring level of knowledge was also established among physicians who referred patients with T2D for DR screening. Of the total, 85.5% of clinicians correctly stated that they would refer patients at the time of diagnosis, 7.2% referred patients after 1 year of diagnosis, 6% referred patients after 5 years of diagnosis, and 1.2% of physicians referred T2D patients 2 years after their diagnosis [Figure 1b].

Physicians were also asked about symptoms of DR that would prompt them to refer patients for screening, and the larger number of physicians 61 (72.5%) reported that patients can be asymptomatic but also can present with reduced visual acuity and photosensitivity. 12 physicians (17.4%) stated that they would

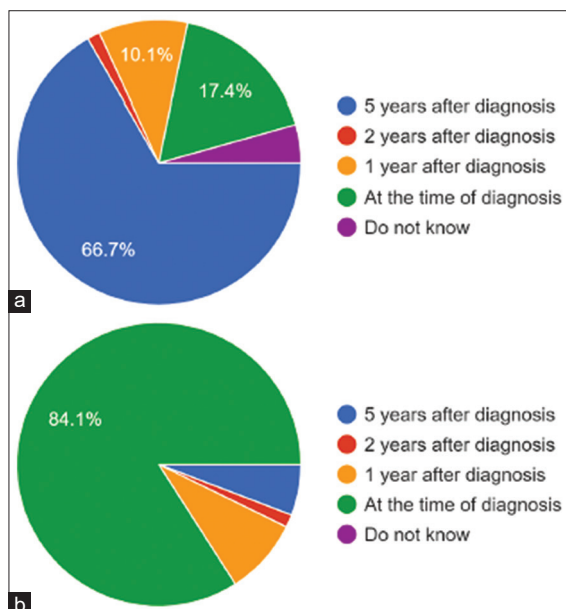
refer patients only presenting with reduced visual acuity, and 11 physicians referred patients who did not experience any visual symptoms for screening [Figure 2]. Physicians' opinions were also sought regarding the risk factors they considered that contributed to the development of DR. Seventy-one clinicians (85.5%) considered all the proposed options [uncontrolled diabetes mellitus (DM), longer duration of DM and hypertension, the age at diagnosis and pregnancy] as risk factors for DR. Five physicians (6%) identified uncontrolled DM, and longer duration of DM and hypertension, as the two main risk factors and two (2.4%) physicians considered uncontrolled DM the only risk factor for developing DR.

When asked about the test of choice required for assessing DR, almost the entire cohort of physicians (97.6%) correctly identified that a dilated fundus exam was most efficient. One physician (1.2%) mentioned the use of ultrasonography of the eye to identify DR and only one physician (1.2%) was uncertain about the diagnostic modality of choice.

Physicians also seemed to possess a fairly good level of knowledge regarding the available treatment options currently used to manage DR. More than half of the participating physicians (59%) rightly and collectively chose laser photocoagulation, vitrectomy, intravitreal anti-vascular endothelial growth factor (anti-VEGF) injections, and intravitreal corticosteroids as possible modalities of treatment. Of the total, 21 physicians (25%) had opted for laser photocoagulation as the only treatment option and were unaware of other possible approaches. 4 physicians (4.8%) chose only laser photocoagulation and intravitreal anti-VEGF injections, 3 physicians (3.6%) mentioned laser photocoagulation, intravitreal anti-VEGF injections, and intravitreal corticosteroids, and 2 physicians (2.4%) chose laser photocoagulation, vitrectomy, and intravitreal anti-VEGF injections. Only 4 physicians (4.8%) did not know about the available treatments for DR [Figure 3].

**Table 1: Demographic characteristics**

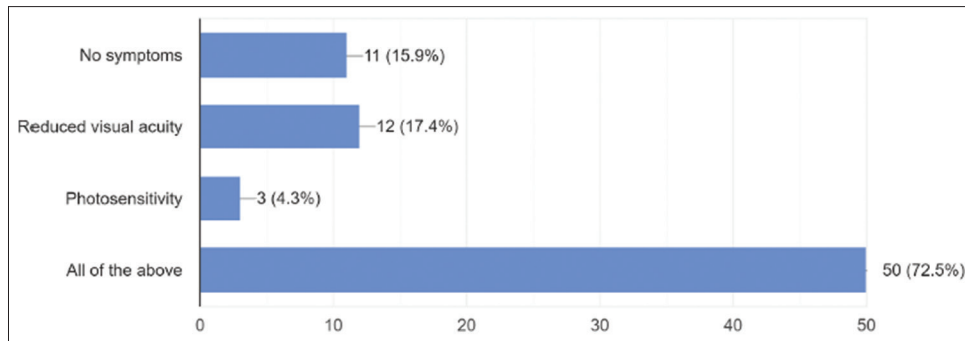
Demographic characteristics		n	%
Gender	Male	15	18.1
	Female	68	81.9
Nationality	Bahraini	80	96.4
	Egyptian	3	3.6
Medical specialty	Family medicine	61	73.5
	General practice	3	3.6
	Family medicine + subspecialty	18	21.7
	General practice + subspecialty	1	1.2
Years in practice	<5 years	12	14.5
	6–10 years	21	25.3
	11–15 years	14	16.9
	>15 years	36	43.4
Total		83	100



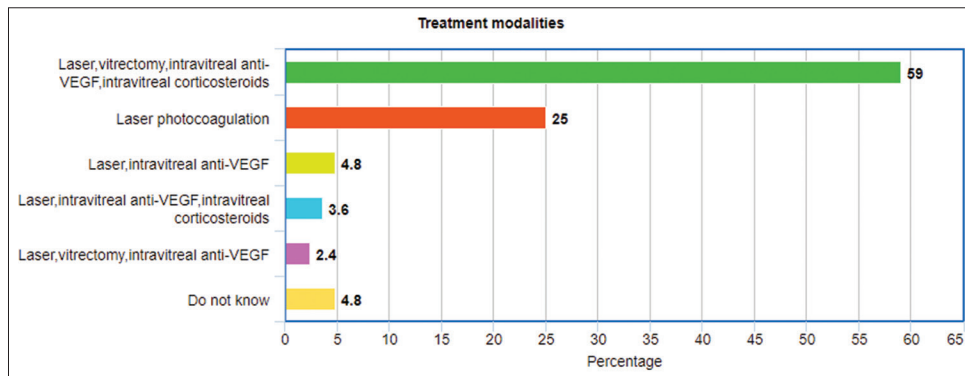
**Figure 1:** Responses to the time of referral of T1D (a) and T2D (b)

**Practices**

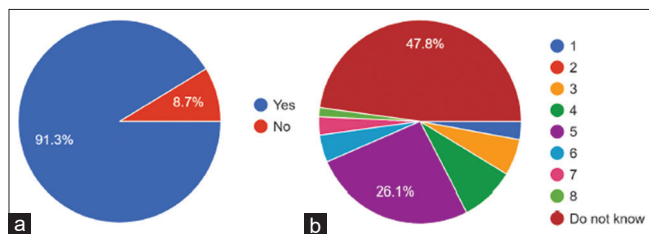
An important aspect of the study looked at the awareness of the Diabetic Retinopathy Screening (DRS) program among primary healthcare providers in Bahrain [Figure 4a]. Given the high prevalence of DM in Bahrain and the expected rise in the number of diabetic patients over the upcoming decade,<sup>[1,3]</sup> the DRS program was successfully established and currently operating in a total of 8 health centers throughout the governorates of Bahrain<sup>[13]</sup> [Figure 4b]. Physicians were asked if they knew about the program that helps early detection and management of DR in diabetic patients, and around 75 physicians (91.3%) were mindful of the program, while only 8 physicians (8.7%) did not know about it. Around 30 physicians (36%) knew about the program yet were not familiar with the health centers that provide the program. 46 physicians (55%) were able to mention a number from 1 to 8, corresponding to the number of health centers they were aware of that provide the screening program, and 2 (2.4%) physicians stated rightly that 8 health centers provide DRS. Upon further questioning, physicians were asked to mention any three



**Figure 2:** Responses to the symptoms that warrant referral to an ophthalmologist



**Figure 3:** Responses to the treatment modalities for DR



**Figure 4:** (a) Awareness of the national screening program (b) Response to the number of centers providing screening

health centers they knew that carry out DRS. Of the total, 78 physicians (94%) could successfully recognize and mention at least one health center, while 5 physicians (6%) were not able to identify any health center.

The survey also investigated physician practices regarding follow-up advice when a diabetic patient under their care mentions to them about previous DR treatment. Seventy-three clinicians (89.9%) reported that they would ensure the patient attended regularly with their ophthalmologist without any complaint. Nine physicians (8.7%) stated that they would suggest their patients continue management with their ophthalmologist whenever needed. Only 1 physician (1.2%) mentioned that they would keep following up with the patient regarding their visual complaints by themselves [Figure 5].

PCPs were further inquired regarding when they would refer their diabetic patient to an ophthalmologist. Of the total, 50

physicians (65.2%) routinely referred diabetic patients under their care to an ophthalmologist, 31 physicians (34.8%) stated that they would refer their patients only if they started to develop eye complaints [Figure 6]. In addition, 53 physicians (63.9%) followed up with their patients whom they had referred to an ophthalmologist, while 30 physicians (36.1%) said they did not complete their follow-up.

In their general daily clinical practice, 23 physicians (27.7%) said they required around 15–30 minutes to educate their diabetic patients about the management of diabetes. Around 6 physicians (7.2%) spent less than 15–30 minutes, 3 physicians (3.6%) spent more than 15–30 minutes, while the greater number of physicians 51 (61.4%) reported that the time span depended on the individual patient. All physicians counseled their diabetic patients about the importance of both losing weight as well as adjusting their diet and exercise as a vital part of managing diabetes.

The study also explored physician engagement in DM public awareness programs. Unfortunately, 61 physicians (73.5%) did not participate in any awareness program, while only 22 physicians (26.5%) were involved. Most of the participating clinicians had engaged in DM awareness programs during the last 5 years.

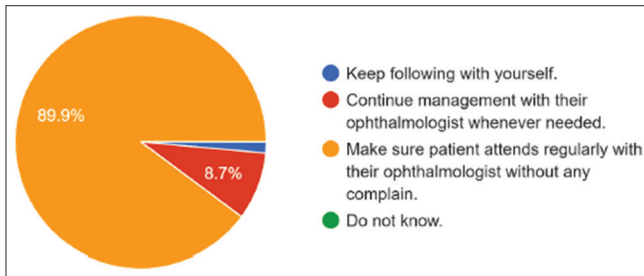
The study also explored physicians' clinical skills: 30 physicians (33.3%) confirmed their ability to examine using an ophthalmoscope, 10 physicians (11.6%) did not know how

to handle it, and about half the number of physicians (55.1%) required refresher courses [Figure 7].

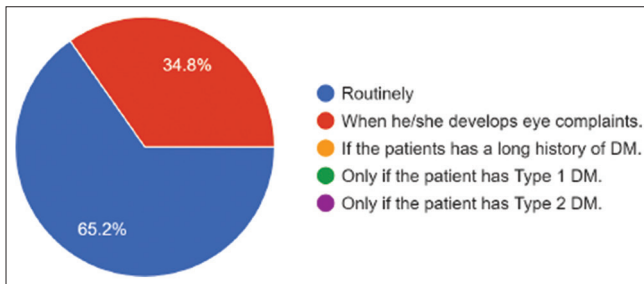
Physicians were also invited to mention their preferred education resources. Almost two-thirds of physicians favored attending seminars, 48 physicians (57.8%) used the internet, 45 physicians (54.2%) read journals, 35 physicians (42.2%) sought opinions from their seniors, 17 physicians (20.5%) used books, and only 4 physicians (4.8%) mentioned the TV/radio [Figure 8].

## Discussion

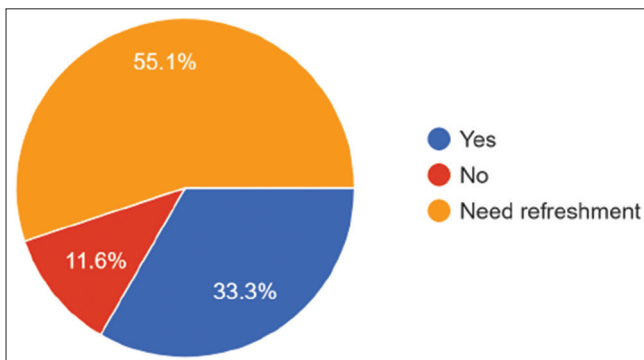
The paper aimed to study a main pillar in diabetic retinopathy prevention and that is the primary care physician. According to the results, some defects in accurate knowledge and information were detected. And despite that, there seems to be limited research locally in the region, and we were able to abstract some reassuring results.



**Figure 5:** Response to advising follow-up with an ophthalmologist if DR had been established



**Figure 6:** Responses to when would physicians refer diabetics to an ophthalmologist



**Figure 7:** Responses to the knowledge of using the ophthalmoscope

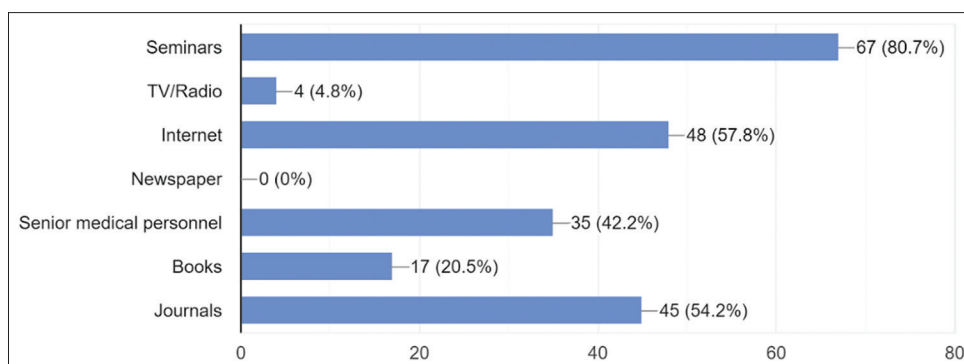
Regarding screening guidelines 66% accurately were aware of the correct time of referral for T1D, this means that 34% need updated information. However, the knowledge of T2D referral was more reassuring (85.5%). We compared this result with a study conducted by Chelliah *et al.* and Al Rasheed R *et al.*, in which 35% and 24% of general doctors have referred diabetics as per the known guidelines.<sup>[12,14]</sup>

When it came to symptoms before referral 17.4% said they would refer the patient only if the patient complained of visual acuity while the majority, 72.5%, stated that they would refer the patient whether symptomatic or not. We see that this result needs to be looked into to raise more awareness. Both types of diabetes and non-high-risk pregnancies are managed in the local health centers in Bahrain and hence 84% knew that duration of diabetes, control of sugar levels, presence of hypertension, and pregnancy possess risk factors to develop diabetic retinopathy and this was again comparable with other reports.<sup>[15]</sup>

The test of choice to diagnose diabetic retinopathy and treatment modalities both scored fairly good knowledge among the physicians; however, 55% admitted they needed refreshment on the proper use of the handheld ophthalmoscope. In comparison to research conducted by Al Rasheed R *et al.*, two-thirds of their cohort use an ophthalmoscope and 54% have examined their patients with it. However, the majority were not aware of treatment modalities.<sup>[12]</sup> Another study from Oman by Khandekar R *et al.* showed that only 22% have access to an ophthalmoscope and have used it.<sup>[15]</sup> We presume it is due to the widespread use of the diabetic screening program in primary care settings. Given the high prevalence of DM in Bahrain and the expected rise in the number of diabetic patients over the upcoming decade,<sup>[16]</sup> the DRS program was successfully established in the early 2000s and currently operating in a total of eight health centers throughout the governorates of Bahrain.<sup>[13]</sup>

The program is run by trained optometrists who use fundus cameras that take fundus photos and then refer retinopathy cases to tertiary care. This might result in a more relaxed behavior when it comes to the importance of knowing how to use the ophthalmoscope and we find our outcome with that perspective similar to other studies in the region. Al- Rashidi SH *et al.* reported good knowledge of referral guidelines for T2D compared to T1DM and that refresher courses are needed for physicians' skills in funduscopy.<sup>[17]</sup>

Furthermore, in the awareness of the program, 9.6% were not aware of the existence of such a screening system and we believe this needs to be tackled because if all PCPs knew of such screening this omits the chance even further of having missed patients with retinopathy. Only 55% could provide a number as to how many health centers in Bahrain currently run the program and only 2% accurately knew that eight health centers screen the eye. The remainder, that is 45%, did not accurately know how many health centers have screening and we see that this information needs to be reminded. About 94% of PCPs could



**Figure 8:** Preferred learning resource

mention one health center that has screening, but it would be better if they could at least be aware of three regional and close health centers as a point of reference near the patients as that would play positive feedback during patient counseling during consultations.

Regarding referrals, we found some discrepancies: the majority (88%) would ensure the patient routinely attended to his ophthalmologist even without eye complaints if he had DR treatment but when asked about when they would refer their patients only 60% stated that they would routinely practice that.

With their general practice, the majority claimed the time spent educating the patient about their diabetes and complications depended on the individual patient and yet 61.4% stated that they did not participate in any diabetes awareness programs in the past 5 years, compared to another study where 42% of PCP were involved in awareness campaigns.<sup>[13]</sup>

Since some gaps were found in the awareness results from the survey, more knowledge needs to be delivered to PCPs as most of them rely on seminars as a source of information (80.7%), compared to another study where 40% relied on seminars and the majority relied on the internet.<sup>[13]</sup> This information could be utilized to conduct evidence-based certificate courses for optimum ways of handling DR in primary care and this approach has been considered in many parts of the world.<sup>[18]</sup>

As PCPs are usually the first professional caregivers to the public in Bahrain and since the population still lacks total awareness of sugar control combined with many integrated socioeconomic factors this further emphasizes their major role when it comes to providing the best standard of care to patients. They should be fully oriented to all the complications related to the conditions they face in daily practice.

The limitations of our study were that we only were able to obtain a 22% response rate, which included 83 physicians. However, 83 PCPs for a small country might be a reasonable response. Another limitation was that we covered mostly PCPs working in the government sector compared to the private sector.

## Conclusion

As a conclusion to our study, we see that the current knowledge among PCPs regarding diabetes and diabetic retinopathy is acceptable despite some defects in screening tools and referrals, it would be recommended to have some refresher training courses on eye complications related to diabetes mellitus and the current screening program with maintenance of its annual statistics.

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## Conflicts of interest

There are no conflicts of interest.

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