



DIABETIC RETINOPATHY AND ITS SCREENING: KNOWLEDGE AND PRACTICE OF PRIMARY HEALTH CARE PHYSICIANS WORKING AT DIFFERENT PRIMARY HEALTH CARE CENTERS OF AL AHSA DISTRICT OF SAUDI ARABIA

Health Science

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ABSTRACT

Background: Diabetic retinopathy, a leading cause of blindness among the working class of people is fast emerging as one of the major cause of overall blindness. Study suggests an overall global prevalence of diabetic retinopathy to be 22.27%. Diabetic Retinopathy, the most common cause of blindness among the working age group, is preventable which can be prevented by early diagnosis and proper treatment. The key to reducing blindness due to retinopathy is early detection and treatment. The success of screening process to detect diabetic retinopathy especially at the primary level depends on the level of knowledge and pattern of practice of the primary health care physicians on diabetic retinopathy and its screening. The role of the physicians working at the primary health care centers is vital for early detection of diabetic retinopathy. The present study was a primary health care centers' based study in which the knowledge and practice of all the primary health care physicians was assessed regarding the knowledge and practice towards diabetic retinopathy and its screening. **Materials and Methods:** It was a cross sectional survey conducted at the Primary Health Centers of Al Ahsa region of Saudi Arabia. The study population was all the physicians working at different Ministry of Health operated Primary Health Care centers of Al Ahsa region of Saudi Arabia. The study sample was calculated by Epi info software assuming that 40% of the primary health care physicians will have the poor knowledge about diabetic retinopathy and its screening. To achieve this at the 95% of confidence interval with an acceptable error of 5%, at least 350 physicians were needed. The sampling was done by random sampling from the list of all the physicians working at the Primary Health care centers of Al Ahsa district. The selected participants were sent an e mail and were requested to fill the google form with the questionnaires to answer. The data were collected on a pretested, pre designed questionnaires which were made available to the participants on google form (online). The collected data were cleared, coded, entered and analyzed by the SPSS version 26. Descriptive statistics were presented using counts, proportions (%), mean $\pm$ standard deviation whenever appropriate. The association of demographic characteristics of the participants with the knowledge and practice pattern towards diabetic retinopathy and its screening were performed using chi square test. A p-value cut off point of 0.05 at 95% CI was used to determine statistical significance. The correct answer of the questionnaire was awarded 1 mark while the incorrect answer with 0 mark. The mean of the marks was the cutoff point demarcating the good knowledge with poor knowledge. The score above the mean was considered as good knowledge. **Results:** A total of 293 subjects participated in this study. The mean age of the participants was 35.94 years. The majority of the participants were female (55.3%). Eighty seven percent (N=255) were married while 11.3% were unmarried and 1.7% were divorced. Almost forty five percent of the participants (44.7%) were family physician (resident) followed by those who were resident physician (33.8%) and those who were specialist in family medicine (13.7%). More than forty three percent (43.3%) of the participants had family history of diabetes. The mean knowledge score of the participants was 3.95. Almost sixty percent of the participants (59.7%) were having good knowledge about the diabetic retinopathy. The level of good knowledge was significantly higher among the female participants than those of males. As the qualification of the participants increased, Higher percentage of post graduate participants had good knowledge about the diabetic retinopathy as compared to those with bachelor degree and diploma holder (74.19% vs. 56.42% vs. 54.94%, $P=0.045$). Those participants who had family history of diabetes were having better knowledge about diabetic retinopathy as compared to those who did not have (59.05% vs. 54.21, $P=0.032$).

KEYWORDS

Primary Health Care Physician, Diabetic Retinopathy, Knowledge, Practice

INTRODUCTION:

Diabetic Retinopathy (DR), a leading cause of blindness among the working class of people is fast emerging as one of the major cause of overall blindness. According to one systematic review the overall global prevalence of diabetic retinopathy has been reported to be 22.27% In 2020, The number of adults worldwide with DR is estimated to be 103.12 million and by 2045 the number is projected to increase to 160.50 million [1]. Another systematic review suggests that the prevalence of diabetic retinopathy in Saudi Arabia ranged between 28.1% to 45.7% and sight threatening diabetic retinopathy was between 4.5% to 17.5% [2]. Diabetic retinopathy is a micro-

angiopathy caused by hyperglycaemia. Multiple metabolic pathways due to hyperglycemia are responsible for the pathogenesis of the DR. Persistent hyperglycemia activate the polyol pathway, advanced glycation end products (AGEs) accumulation, the protein kinase C (PKC) pathway and the hexosamine pathway which causes endothelial damage of the micro vessels of the retina[3]. These changes with the loss of pericytes results in the weakness of the micro vessel and thus microaneurism which is the early signs of Diabetic Retinopathy. The changes in the RBC also occur due to prolonged hyperglycemia which results in defamed RBC which becomes stickier. At the same time pronounced loss of pericytes and endothelial cells results in capillary

occlusion and ischemia. The ischemia triggers phospholipase A2's (PLA2) elevation and up regulation of VEGF which are believed to be the key factors in the progression of Non Proliferative Diabetic Retinopathy to the more dangerous proliferative diabetic retinopathy and diabetic macular edema resulting in blindness[4]. The duration of diabetes and higher level of HbA1c is strongly co related with the progression of diabetic retinopathy. Associated hypertension increases the risk of developing DR and its progression. Other risk factors have been documented to be nephropathy, smoking, dyslipidemia and higher BMI [5]. DR is the preventable cause of visual impairment which can be prevented by early diagnosis and proper treatment. Unfortunately most patients don't have any symptom until macular edema happens or the diabetic retinopathy reaches the stage of proliferative diabetic retinopathy. Therefore screening for diabetic retinopathy is very important for early detection. The updated guideline for diabetic retinopathy by International Council of Ophthalmology (ICO) and American Diabetes Association (ADA, 2018) suggest screening for diabetic retinopathy among type 2 diabetic patients to be upon diagnosis and for type 1 diabetic patients to be after 5 years of diagnosis. The minimal screening includes the visual acuity and detailed retinal examination [6]. The key to reducing blindness due to retinopathy is early detection and treatment. Proper screening of diabetic patients for retinopathy is a useful tool which meets all the criteria laid down by Wilson and Jungner [7]. Studies suggest low uptake of the diabetic retinopathy screening. According to one study 50% of the diabetic patients at the primary level, 40% at the secondary level and 2% at the tertiary level remain unscreened [8]. The success of screening process to detect diabetic retinopathy especially at the primary level depends on the level of knowledge and pattern of practice of the primary health care physicians on diabetic retinopathy and its screening. One study conducted in Saudi Arabia has found that 54% of the participants had good knowledge while their practice towards screening of diabetic retinopathy was good among 40% of the participants only [9]. In one qualitative study in which interview was taken on 15 general practitioners, the researchers have found that in spite of availability of the retinoscope, nobody was performing the diabetic retinopathy screening. Only 25% of the physicians knew the screening schedule for diabetic retinopathy and referred the case to ophthalmologist for screening [10]. The role of the physicians working at the primary health care centers is vital for this implementation. The present study was a primary health care centers based study in which the knowledge and practice of all the primary health care physicians was assessed regarding the knowledge and practice about diabetic retinopathy and its screening.

MATERIALS AND METHODS

It was a cross sectional survey conducted during November 2023 to January 2024 at the Primary Health Centers of Al Ahsa region of Saudi Arabia. The study population was all the physicians working at different Ministry Of Health operated Primary Health Care Centers (PHCC) of Al Ahsa region of Saudi Arabia which is around 600 in number according to the pay roll of the Al Ahsa Health directorate. The study sample was calculated by Epi info software assuming that 40% of the primary health care physicians will have the poor knowledge about diabetic retinopathy and its screening as reported by a similar study. To achieve this at the 95% of confidence interval with an acceptable error of 5%, at least 350 physicians were needed. The sampling was done by random sampling from the list of all the physicians working at the Primary Health care centers of Al Ahsa district. The selected participants were sent an e mail and were requested to fill the google form with the questionnaires to answer. The informed consent was taken from each participant on the google form. The inclusion criteria consisted of all the physicians working at the Primary health care centers of Al Ahsa region of Saudi Arabia. While those physicians who are not practicing and are on administrative post were excluded from this study. The data were collected on a pretested, pre designed questionnaires which were made available to the participants on google form (online). The data collection contained demographic characteristics of the participants and questionnaires on the knowledge and practice of the primary health care physicians on diabetic retinopathy and its screening. There were 10 questions in the knowledge section and 5 sections in the practice section. These questions were having a mixture of open ended with multiple choices and close ended answers. The collected data were cleared, coded, entered and analyzed by the SPSS version 26. Descriptive statistics were presented using counts, proportions (%), mean $\pm$ standard deviation whenever appropriate. The association of demographic characteristics of the participants with the knowledge and practice

pattern towards diabetic retinopathy and its screening were performed using chi square test. A p-value cut off point of 0.05 at 95% CI was used to determine statistical significance. The correct answer of the questionnaire was awarded 1 mark while the incorrect answer with 0 mark. The mean of the marks was the cutoff point demarcating the good knowledge with poor knowledge. The score above the mean was considered as good knowledge.

RESULTS:

A total of 293 subjects participated in this study making the response rate of 83%. The mean age of the participants was 35.94 years $\pm$ Std. Dev 9.09 years (Range 20-55 years). The majority of the participants were female (55.3%). Eighty seven percent (N=255) were married while 11.3% were unmarried and 1.7% were divorced. The participants with graduate degree constituted 47.6% of the study sample while 31.1% were diploma holder and 21.2% were post graduate. Almost forty five percent of the participants (44.7%) were family physician (resident) followed by those who were resident physician (33.8%) and those who were specialist in family medicine (13.7%). Almost eight percent (7.8%) were consultant in family medicine. Almost forty percent (39.6%) of the participants had working experience of 0-5 years followed by those (32.1%) that had experience of 6-10 years and those (26.3%) with 11-20 years. Only 2% had experience of more than 20 years. More than forty three percent (43.3%) of the participants had family history of diabetes. The details of the socio- demographic characteristics is shown in table 1.

Table 1: Showing the socio-demographic characteristics of the participants.

Variables	No.	Percentage
Age: 35.94 years $\pm$ Std. Dev 9.09 years (Range 20-55 years)		
Sex		
Male	131	44.7
Female	162	55.3
Marital Status		
Unmarried	33	11.3
Married	255	87.0
Divorced	5	1.7
Educational Qualification		
Diploma holder	91	31.1
Graduate	140	47.8
Postgraduate	62	21.2
Job position		
General resident	99	33.8
Resident family physician	131	44.7
Specialist family physician	40	13.7
Consultant family physician	23	7.8
Yrs of practice		
0-5 years	116	39.6
6-10 years	94	32.1
11-20 years	77	26.3
>20 years	6	2.1
Family history of diabetes		
Yes	127	43.3
No	166	56.7

Knowledge questionnaires

More than forty one percent (41.6%) of the participants answered that diabetic retinopathy is the Retinal macro vascular complication of diabetes mellitus while 32.1% of the participants correctly answered that Retinal micro vascular complication of diabetes mellitus and 18.8% picked the choice that its that Optic neuropathy due to diabetes mellitus. A minority of (7.5%) of the participants answered that the diabetic retinopathy is retinal degeneration due to diabetes mellitus. On the question of the prevalence of diabetic retinopathy, 43% of the participants answered that its between 15-25% followed by those (31.1%) who answered it to be 30-40% and those who selected it to be 10-20%. Only 4.8% of the participants ticked it to be more than 40%. On the statement that Diabetic retinopathy is the most common cause of blindness among the working age group, 47.4% of the participants agreed with this while 42.7% disagreed and 9.9% did not know about this. On the question of the risk factors of diabetic retinopathy 39.2% of the participants answered it to be duration of diabetes followed by those who answered it to be the uncontrolled diabetes and those who answered associated hypertension (20.1%). Only 20.6% of the

participants correctly answered that all these three factors are the risk factors of diabetic retinopathy. On the cause of visual disturbance among diabetes, 39.2% of the participants answered that its because of development of cataract while 41.3% of the participants correctly answered that when the macular area of the retina is involved and 12.3% of the participants were of the view that it happens when the pressure of eye increase due to diabetes .However 7.2% of the participants answered that it happens when the peripheral retina is involved. On the statement of the treatment that Argon laser photo coagulation is the treatment of choice in blinding diabetic retinopathy, 44.4% of the participants answered in affirmation while 38.9% did not agree with it and 16.7% of the participants did not know about it. On the question on the screening of the diabetic patients for the detection of diabetic retinopathy, the majority of the participants (48.1%) answered that it should be done yearly while 34, 8% and, 10.2% answered that it should be done every 6 months and every 2 years respectively. While 6.8% of the participants did not agree with any screening if eye sights are normal. Regarding the first detailed eye examination for the detection of diabetic retinopathy among the type 1 diabetes, 44.4% of the participants answered that it should be at the time of diagnosis while 32.4% of the participants answered that it should be at the adolescent i.e. 12 years of age. It should be done every five years and there is no need for any screening if eye sight is good was the reply of 16.0% and 7.2% of the participants respectively. For the question on recommended diabetic retinopathy screening among diabetic pregnant women, 44.4% of the participants were of the view that it should be done at the time of conception while 34.1% of the participants answered that it should be done at 24-26 week of pregnancy. It should be done at 12 weeks of pregnancy and no need of any screening if eye sight is normal were the opinion of 15.45 and 6.1% of the participants respectively. Almost thirty seven percent of the participants (36.9%) answered that All patients with diabetic nephropathy must be screened for proliferative diabetic retinopathy while 42.3% of the participants that it should be done after six months of diagnosis and 29.8% of the patients answered that it should be done yearly. The details of the response on the knowledge questionnaires are shown in table 2.

Table 2: Showing the participants' responses on the knowledge questionnaires on diabetic retinopathy.

Questionnaires on knowledge	No.	Percentage
Diabetic retinopathy is	122	41.6
Retinal macro vascular complication of diabetes mellitus	94	32.1
Retinal micro vascular complication of diabetes mellitus	55	18.8
Optic neuropathy due to diabetes mellitus		
Retinal degeneration due to diabetes mellitus	22	7.5
The prevalence of diabetic retinopathy is		
10%-20 %	62	21.2
15% -25%	126	43.0
30% -40%	91	31.1
More than 40%	14	4.8
Diabetic retinopathy is the most common cause of blindness among the working age group		
Yes	139	47.4
No	125	42.7
I don't know	29	9.9
The risk factors of diabetic retinopathy		
Duration of diabetes	115	39.2
Uncontrolled diabetes	59	20.1
Hypertension	59	20.1
All of the above	60	20.5
Visual disturbance due to diabetic retinopathy happens		
when cataract develops	115	39.2
when the macular area of the retina is involved	121	41.3
When the pressure of eye increase due to diabetes	36	12.3
when the peripheral retina is involved	21	7.2
Argon laser photo coagulation is the treatment of choice in blinding diabetic retinopathy		
Yes	130	44.4
No	114	38.9
I don't know	49	16.7

Recommended eye exam to detect retinopathy in type 2 Diabetes mellitus		
Every six month	102	34.8
Every year	141	48.1
Every 2 years	30	10.2
No need for any screening if eye sight is normal	20	6.8
Recommended eye examination in type 1 diabetes		
On diagnosis	130	44.4
After 12 years of age	95	32.4
Every 5 years	47	16.0
No need for any exam if eye sight is normal	21	7.2
Recommended diabetic retinopathy screening among diabetic pregnant women is		
At the time of being pregnant	131	44.4
24- 26 weeks of pregnancy	100	34.1
12 weeks of pregnancy	45	15.5
No requirement of screening if normal eye sight	17	6.0
All patients with diabetic nephropathy must be screened for proliferative diabetic retinopathy		
Immediately	108	36.9
After six months of diagnosis	124	42.3
Yearly	61	20.8

Practice towards screening

As far as practice is concerned only 9.6% of the participants performed regular eye sight measurement in their clinic for diabetic patient while 39.2% of the participants never did it and majority of them (51.2%) did it occasionally. Seventy one percent of the participants answered that they have ophthalmoscope in their clinic. The vast majority of the participants (81.2%) of the participants do not perform exam to detect retinopathy on diabetic patient. On the attendance of any hand on practice as how to perform ophthalmoscopy to detect diabetic retinopathy .75.1% of the participants answered that they never attended such hand on course. On the question that whether they inform the diabetic patients visiting their clinic regarding the benefit of diabetic retinopathy screening,80.2% rated that they do it, The details of the responses on the practice pattern questionnaires is shown in table 3.

Table 3: showing the responses of the participants on the practice towards diabetic patients towards diabetic retinopathy.

Practice questionnaires	No.	Percentage
Do you perform regular eye sight measurement in your clinic for diabetic patient		
Yes	28	9.6
No	115	39.2
Occasionally	150	51.2
Do you have direct ophthalmoscope in your clinic		
Yes	208	71.0
No	85	29.0
Do your perform fundus exam to detect retinopathy on your diabetic patient		
Yes	55	18.8
No	238	81.2
Did you attend any hands on practice as how to detect diabetic retinopathy		
Yes	73	24.9
No	220	75.1
Do you inform the patient visiting your clinic regarding the benefit of diabetic retinopathy screening		
Yes	235	80.2
No	58	19.8

The knowledge score of the participants.

The mean knowledge score of the participants was $3.95 \pm \text{Std. Dev. } 1.47$. Almost sixty percent of the participants (59.7%) were having good knowledge about the diabetic retinopathy. The level of good knowledge was significantly higher among the female participants than those of males. The good knowledge about diabetic retinopathy was higher among the divorced participants than those who were

married and unmarried (80% vs.60.0% Vs. 54.54%, $P=0.450$). As the qualification of the participants increased ,Higher percentage of post graduate participants had good knowledge about the diabetic retinopathy as compared to those with bachelor degree and diploma holder (74.19% vs.56.42% vs.54.94%, $P=0.045$). Those participants who had family history of diabetes were having better knowledge about diabetic retinopathy as compared to those who did not have (59.05% vs.54.21, $P=0.032$). The percentage of good knowledge about diabetic retinopathy was more among the participants with work experience of 5-10 years (65.96%) as compared to those with 11-20 years of experience (57.14%), 0-5 years of experience(56.89%) and those with experience of more than 20 years (50.0%). But the association was not statistically significant. The details of the association of socio demographic characteristics and the knowledge of diabetic retinopathy are shown in table 4.

Table 4: showing the association of socio demographic characteristics and the knowledge of diabetic retinopathy.

Variables	Good knowledge No.(%)	Poor knowledge No.(%)	P value
Mean knowledge score $3.95 \pm$ Std. Dev. 1.47	175(59.7)	118(40.3)	
Sex			0.032
Male	65 (49.61)	66(50.39)	
Female	110(67.90)	52(32.1)	
Marital status			0.540
Unmarried	18(54.54)	15(45.46)	
Married	153(60.0)	102(40.0)	
Divorced	4(80.0)	1(20.0)	
Educational qualification			0.013
Diploma holder	50(54.94)	41(45.06)	
Graduate	79(56.42)	61(43.58)	
Post graduate	46(74.19)	16(25.81)	
Yrs of practice			0.534
0-5 years	66(56.89)	50(43.11)	
6-10 years	62(65.96)	32(34.04)	
11-20 years	44(57.14)	33(42.86)	
>20 years	3(50.0)	3(50.0)	
Family history of diabetes			0.045
Yes	75(59.05)	42(40.95)	
No	90(54.21)	76(45.79)	

DISCUSSION:

The present study assessed the knowledge of primary health care physicians towards diabetic retinopathy and its implication on the eye sight and its prevention and screening. This study also tested the practice pattern of the physician towards the screening of the diabetic patients for the detection of diabetic retinopathy. This study has found that majority of the physician had good knowledge about the diabetic retinopathy. However in a multi centric study conducted in Saudi Arabia has found a low level of knowledge regarding diabetic retinopathy among the primary physician participants, but like the present study the female participants had better knowledge as compared to their male counterpart [11]. In a similar study conducted in Al Ahsa district of Saudi Arabia, the researchers have found that almost fifty six percent of the general physicians had good knowledge about the diabetic retinopathy. Likewise 57.4% of the participants in this study knew the correct interval of follow-up for type 1 diabetic patients and 80% of them followed the recent guidelines for the newly diagnosed type 2 diabetic patients [12]. However the present study found that only 16% knew the correct timing of first time retinal examination exam for type 1 diabetic patient and 48% of the participants followed the recent guidelines for the newly diagnosed type 2 diabetic patients. The Nigerian study has noted a good knowledge about the diabetic retinopathy among the physicians where more than seventy percent of the physicals were aware about the most effective way of delaying the diabetic retinopathy as well the frequency of eye examination [13]. One Indonesian study has reported substantially good knowledge among the 89.1% of the general physician However in this study they showed very poor practice towards screening of diabetic retinopathy. Only 4.35% of the physicians had good practice in this regard [14]. A Pakistani study has also reported low level of knowledge among the general practitioners (41.7%), family physicians (42.0%) and internist (46.6%).A lack of

knowledge regarding signs, symptoms screening testing , evaluation and referral of diabetic retinopathy screening was evident in this study. The present study has also shown a lack of knowledge among the majority participating physicians towards definition, symptoms and the referral timelines for the detection of diabetic retinopathy [15]. The present study has found that 70% of the primary health care physicians possessed the direct ophthalmoscope in their clinic but only 18% of them performed ophthalmoscopy to screen for the diabetic retinopathy. However in one Nepali study 56% of the primary physicians were found involved in routine retinal examination by direct ophthalmoscope for the detection of diabetic retinopathy [16]. In one Sudanese study the the medical graduate were asked regarding the risk factors ,complications and the screening process of .diabetic retinopathy .It showed a good knowledge among the majority of them as far as the site of the eye i.e retina (90.0%) ,risk factors such as poor glycemic control(68.0%) and duration of diabetes (65.0%) are concerned. However a lacking of knowledge on some of the major risk factors were noted in this study such as High blood pressure (32.4%) and blood lipid level (7.5%).Unlike Sudanese study, only 39.2% of the participants in the present study answered duration of diabetes as the risk factors and only 20.1% each of them considered low glycaemic control and hypertension as the risk factor. As for as the practice of screening is concerned a poor practice of fundus exam(18.8%) is revealed in the present study while the Sudanese study has found that 42% of the physicians were involved in routine visual acuity and 30% were doing routine retinal examination by direct ophthalmoscope for the detection of diabetic retinopathy [17]. In the present study only nine percent of the participants were doing routine vision test for the diabetic patients in their clinic.

CONCLUSION:

The present study has provided valuable information on the knowledge and practice of primary health care physicians towards diabetic retinopathy and its screening practice. In spite of good knowledge about the diabetic retinopathy and its screening process among majority of the physicians, the practice towards screening for diabetic retinopathy was lacking. Most of the physicians had retinoscope in their clinics but their use for diabetic retinopathy screening process was scanty. There is need of special training programme for the primary health care physician for the screening of diabetic retinopathy.

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