



Knowledge and Awareness of Diabetic Retinopathy among Diabetic Patients, in Sana'a City, Yemen

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Abstract

Background and Aims: One of the main causes of blindness is Diabetic Retinopathy (DR). A third or more of people with Diabetes (DM) might developed DR. As a result, the purpose of this study was to evaluate adult diabetic patients' knowledge about diabetes retinopathy and its complications in Sana'a, Yemen. On this foundation, we also suggest using a public health strategy to combat DR in the research area.

Methods: At the Al-Kuwait University Hospital and the National Center of Public Health Sana'a (NCPHL), a cross-sectional study was conducted. After receiving informed consent, responses from 885 people (men and women) with DM were gathered using a validated questionnaire. The goal of the questionnaire was to measure respondents' level of knowledge with DR, its detection, prevention, and treatment. The results of the questionnaire were then used to see whether there was a correlation between the individuals' characters and their level of DR awareness.

Results: About 59% of the respondents have heard about DR. 46% of them correctly defined DR as one of the complications of DM that could cause blindness, whereas 208 (23.5%) knew that DR is related to damage to retinal vessels and 186 (21%) to high blood sugar due to uncontrolled diabetes. 285 (32.2%) had a good level of knowledge, while 67.8% showed a poor level of knowledge of DR. There was a better level of knowledge with male patients (37.3% vs. 27.1% for females), younger age (18-30 years) (42.2%, OR=1.5, p=0.03), and college graduate patients (75.7%, OR=11.2, p=0.0001). Older than 50 years old, widowed, divorced, and illiterate and those who attained high school education or less, showed poor levels of knowledge equal to 73%, 79.3%, 83.3%, 93.7%, and 74%, respectively, with significant p=0.05.

Conclusion: In this study, most patients indicated insufficient levels of awareness regarding DR. This lack of proper understanding was connected with low levels of education, female sex, and older ages. Additionally, there was a lack of compliance with routine eye inspections. These findings are of major concern; hence, the implementation of efforts to enhance the knowledge of DR and the significance of early retinal screening among affected patients is very vital. Health education campaigns should engage schools, as a portion of the community may not be able to acquire a higher education. Additionally, a comprehensive strategy of mandated referrals to ophthalmologists should be introduced by general practitioners throughout Yemen. Eventually, screening methods for DR ought to be adopted.

Keywords: Blindness; Diabetic Retinopathy (DR); Diabetes Mellitus (DM); Knowledge

Introduction

Diabetes, often known as diabetes mellitus, is a set of common endocrine illnesses defined by sustained high blood sugar levels [1,2]. Diabetes is caused by either the pancreas not making enough insulin or the cells of the body not responding effectively to the insulin produced [3]. Diabetes, if left untreated, leads to several health issues, one of which is Diabetic Retinopathy (DR), which is a leading cause of blindness [4]. As of 2021, an estimated 537 million individuals worldwide have diabetes, accounting for over 10% of the adult population, and type 2 diabetes accounts for around 90% of all diabetes cases [5,6]. The prevalence of the disease continues to increase, most dramatically in low- and middle-income nations [7]. Yemen is one of the countries with a greater prevalence of diabetes [8]. Yemen's diabetes prevalence was 5.4% in 2021, and there were 2,852,000 documented cases of diabetes in 2021 [6]. Diabetic retinopathy is the primary microvascular consequence of

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diabetes mellitus; in addition, Diabetic Retinopathy (DR) is a priority disease in the Vision 2020 effort for the global elimination of avoidable blindness. The World Health Organization (WHO) has urged its member nations to integrate a program strategy for DR within their prevention of blindness programs [9,10].

In Yemen, the prevalence of DR was 55% (95% CI 49.6.60.1), while the proportions of Background Diabetic Retinopathy (BDR), Pre-Proliferative Diabetic Retinopathy (PPDR), Proliferative Diabetic Retinopathy (PDR), and diabetic macular edema were correspondingly 20%, 13%, 17%, and 22%. Blindness was 16% common among DM patients. Glaucoma and cataract incidence rates were respectively 34.3% and 8.6% [10]. In Yemen, diabetic individuals have relatively high rates of obesity, hypertension, and dyslipidemia [6], making them more prone to developing diabetic retinopathy. Therefore, our study seeks to evaluate the knowledge and awareness of the risk of diabetic retinopathy among adult diabetic patients in order to reduce the incidence of diabetic retinopathy and to improve the quality of life of diabetic patients.

Subjects and Methods

Study area: The proposed study was carried out in Sana'a, Yemen. The number of diabetics in the city of Sana'a is estimated at 212,000 [6]. Study conducted in September 2022.

Study design: A cross-sectional study was conducted at the National Center for Public Health Laboratories in Sana'a (NCPHL) and Kuwait Hospital in Sana'a City targeting adult diabetic patients from Sana'a city who were undergoing blood glucose tests at the two centers.

Sample size: Sample size was determined using epi info software version 7, according to a population survey. Taking into account later criteria, the population of Sana'a is 4,000,000 [12]. As previously reported in Yemen, the expected frequency of RP among DMs is equivalent to 50% [9], and the worst accepted accuracy is equal to 2.95% at a 95% confidence level. The sample size required to achieve meaningful results was 885 patients.

Data collection: The data was collected using an interviewer-administered questionnaire. The questionnaire contains 16 questions (8 questions related to demographic and clinical data, and 8 questions assessing the knowledge about diabetic retinopathy). In order to facilitate answering the questionnaire it has been translated to Arabic language.

Data analysis: Utilizing Statistical Epi-Info version 7, data were examined. The distribution of the sociodemographic characteristics and the diabetic patient's knowledge of DR were analyzed using descriptive statistics (frequency, percentages, and median). Each accurate response received one points toward the overall knowledge score, while incorrect or unknowing responses received zero. Scores over the median score (4) were thus seen as indicating a good level of knowledge. To further explore the connection between sociodemographic characteristics and the patient's knowledge of diabetic retinopathy, OR, 95% CI, and Chi-squared test were calculated. P values less than 0.05 were regarded as significant.

Ethical approval: On May 01st, 2022, with the reference number 2022-1, the Medical Ethics Committee of the Faculty of Medicine and Health Sciences of Sana'a University issued its official approval. A permission form was signed by each study subject. The confidentiality of all information, including clinical details and patient identification,

was maintained.

Result

A total of 885 adult diabetic study participants filled out the questionnaire. With an almost equal sex ratio, 50.8% of them were female. Nearly half (442/885, 49%) of the respondents were over 50, and about a third (36.9%) were between the ages of 31 and 50. The majority of respondents (654, or 73.9%) were married; 221 had never attended school; and 469, or 53%, had just completed high school. The majority (522, 59%) of those with Diabetes Mellitus (DM) were type II patients, whereas just 165, 18.6%, had type I. Additionally, only 180 (20.3%) of the respondents had diabetes for a longer period of time than 15 years, compared to 307 (34.7% of the patients) who had

Table 1: Baseline characteristics of the study participants (N=885).

Characters		
	No	%
Sex		
Female	450	50.8
Male	435	49.2
Age (years)		
18-30	116	13.1
31-50	327	36.9
>50	442	49.9
Marital state		
Married	654	73.9
Single	115	13
Widow	92	15.7
Divorced	54	6.1
Educational level		
Illiterate	221	25
High school or less	469	53
College graduate	185	20.9
Post graduate	10	1.1
Type of diabetes mellitus		
Type I	165	18.6
Type II	522	59
I don't know	198	22.4
Duration of diabetes (years)		
1-5	307	34.7
6-10	256	28.9
11-15	142	16.05
>15	180	20.3
Number of visits to an ophthalmologist		
None	283	32
Once every year	309	34.9
More than once time a year	168	19
Once every 2 years	89	10.1
Once every 5 years	36	4.4
History of eye disease		
No	716	80.9
Yes	169	19.1

Table 2: Knowledge of the study participants about diabetic retinopathy (N=885).

Questions	No	%
Have you heard about diabetic retinopathy?		
No	363	41
Yes	522	59
Can you define diabetic retinopathy as a complication of diabetes that leads to vision loss?		
No	478	54
Yes	397	46
Can you define diabetic retinopathy as a complication of diabetes due to damage to the retinal vessels?		
No	677	76.5
Yes	208	23.5
Can you define diabetic retinopathy as a simple eye disease caused by high blood sugar?		
No	699	79
Yes	186	21
Do you think the older you get, the more susceptible you are to DR?		
Don't know	435	49.2
No	90	10.2
Yes	360	40.7
What would you complain about if you had DR?		
Pain	49	5.5
Blurred vision	274	31
Loss of vision	159	18
Don't know	403	45.5
What do you think is the worst effect of DR?		
Redness	27	3.1
Pain	32	3.6
Blindness	363	41
Low vision	150	17
Don't know	313	35.4
Do you think DR is treatable?		
No	81	9.2
Yes	309	34.9
Don't know	495	55.9

DM: Diabetes Mellitus; DR: Diabetic Retinopathy

the diagnosis 1 to 5 years earlier. While 309 (34.9%) of the subjects have visited the ophthalmology clinic in a year, 283 (32%) have never done so. Only 169 of these patients (19.1%) provided a history of eye disease, mostly cataract procedures (Table 1).

Table 2 displays the study participants' understanding of Diabetic Retinopathy (DR). A little over 59% of those surveyed have heard of DR. 46% of them correctly identified Diabetic Retinopathy (DR) as one of the DM problems that can result in blindness, while 208 (23.5%) and 186 (21%) were aware that DR is linked to retinal vascular damage. Of the study's participants, 435 (49.2%) were unaware that aging raises DR risk, while 40.7% were aware that aging increases susceptibility to DR. When questioned about DR problems, 403 (45.5%) of the participants had no idea, compared to smaller percentages who correctly identified blurred vision (31%) and vision loss (18%). Less than half (41%) correctly recognized blindness as the worst complication of DR. About third (34.9%) correctly reported that DR is a treatable condition, while 55.9% did not know that.

The score for all of the knowledge was determined. It had a score range of 0 to 8, with a median of 4 (IQR=2-6). Good levels of knowledge were defined as values above the median. As a result, 285 (32.2%) had a good level of understanding, whereas 67.8% displayed a poor level (Table 3). Table 3 displays the correlation between knowledge level and sociodemographic information, diabetes type, duration, and number of ophthalmologist visits. Male patients had a higher level of knowledge, with a good level of 37.3% vs. 27.1% for female patients, and an odds ratio of 1.6, CI=1.2-2.1, p=0.0009. Additionally, respondents between the ages of 18 and 30 had a higher rate of good levels (42.2%), OR equal to 1.5, CI=1.03-2.3, and p=0.03. Patients who had graduated from college had higher levels of knowledge; the good level was 75.7%, and the odds ratio for having good knowledge was 11.2, with a confidence interval of 7.6 to 16 (p=0.0001). Additionally, postgraduate patients had a higher level of knowledge, with a good level of 90%, and a good level of knowledge was related with an odds ratio of 18.3, CI=2.3-14.5, p=0.0001. Additionally, type I diabetes patients had a higher level of knowledge, with a good level at 41.2%, and a good level was related with an odds ratio of 1.5, CI=1.1-2.1, p=0.01. Additionally, type II DM patients had a higher level of knowledge, with a good level of knowledge at 36.4%, and an odds ratio of 1.4, CI=1.1-1.8, p=0.02 was related with a good level of knowledge. Older than 50, widowed, divorced, illiterate, and those who had just completed high school shown poor level of knowledge equal to 73%, 79.3%, 83.3%, 93.7%, and 74% respectively with significant p<0.05. Additionally, individuals who were unsure of their diabetes type demonstrated a higher level of ignorance (86.4% with p<0.0001). Patients who did not see an ophthalmologist also had a lower degree of knowledge, which was 86.9% with a p value of 0.0001 (Table 3).

Discussion

Being aware of Diabetic Retinopathy (DR) is a critical first step in the early detection, diagnosis, and treatment of this condition. One of the leading causes of blindness and reduced vision both internationally and in Yemen is diabetic retinopathy [9,10]. Therefore, the current study's implications for community health planning are absolutely crucial [13,14].

This study showed that 32.2% of DM patients had a good level of knowledge, while the majority (67.8%) showed a poor level of knowledge. The level of awareness of DR reported in our study is much lower than the levels reported in Jordan, where approximately 80% of diabetic patients were aware of the nature and consequences of DR [15]. Also, our result (32.2%) was even lower than the reported levels in Al-Ahsa, Saudi Arabia, where 66.6% of diabetic patients knew the nature and outcome of their diabetes [13]. The existence of a well-established national eye health care program and referral standards related Diabetic Mellitus (DM) and DR management for primary care, according to the authors, is what accounts for the high awareness of DR in Jordan and Saudi Arabia. Patients are referred for an eye examination once a diagnosis of DM has been made, despite Yemen's lack of a national eye health care program. A similar improvement in DR awareness was noted in Jeddah, Saudi Arabia (82%) [16], and Malaya, Malaysia (86%) [17]. Additionally, this study's (23.5%) understanding of the possibility that DM may lead to ocular difficulties and blindness is significantly lower than that found in Al-Ahsa, Saudi Arabia (54.6%) [13] and India (27%-37.1%) [18,19]. There were deficiencies in the correct knowledge of the study patients regarding the risks of DR. These included the relationship

Table 3: The association of the level of knowledge with sociodemographic data, type of diabetes mellitus, duration of diabetes, and number of visits to an ophthalmologist.

Characters	No	Level of knowledge		OR	CI 95%	X ²	P
		Poor 600 (67.8%) N (%)	Good 285(32.2%) N (%)				
Sex							
Female	450	328 (72.9)	122 (27.1)	0.6	0.46-0.8	10.8	0.0009
Male	435	272 (62.5)	163 (37.5)	1.6	1.2-2.1	10.8	0.0009
Age (years)							
18-30	116	67 (57.8)	49 (42.2)	1.5	1.03-2.3	4.6	0.03
31-50	327	208 (63.6)	119 (36.4)	1.2	0.9-1.6	1.9	0.16
>50	442	325 (73)	117 (27)	0.5	0.3-0.62	20	0
Marital state							
Married	654	442 (67.6)	212 (32.4)	0.8	0.5-1.1	1.5	0.2
Single	115	70 (60.9)	45 (39.1)	1.3	0.8-1.9	1.8	0.17
Widow	92	73 (79.3)	19 (20.7)	0.48	0.2-0.8	7.6	0.005
Divorced	54	45 (83.3)	9 (16.7)	0.3	0.18-0.7	7.3	0.006
Educational level							
Illiterate	221	207 (93.7)	14 (6.3)	0.08	0.05-0.1	99	0
High school or less	469	347 (74)	122 (26)	0.4	0.3-0.6	26.5	0
College graduate	185	45 (24.3)	140 (75.7)	11.2	7.6-16	188	0
Post graduate	10	1 (10)	9 (90)	18.3	2.3-14.5	14	0
Type of diabetes mellitus							
Type I	165	97 (58.8)	68 (41.2)	1.5	1.1-2.1	5.4	0.01
Type II	522	332 (63.6)	190 (36.4)	1.4	1.1-1.8	4.9	0.02
I don't know	198	171 (86.4)	27 (13.6)	0.2	0.1-0.3	45.8	0
Duration of diabetes (years)							
1-5	307	186 (60.6)	121 (39.4)	1.5	1.1-2	7.4	0.006
6-10	256	185 (72.7)	71 (27.3)	0.6	0.4-0.9	5.5	0.01
11-15	142	103	39	0.7	0.4-1.2	2.8	0.09
>15	180	126	54	0.8	0.5-1.1	1.2	0.25
Number of visits to an ophthalmologist							
None	283	246 (86.9)	37 (13.1)	0.19	0.13-0.2	79.6	0
Once every year	309	190 (61.5)	119 (38.5)	1.4	1.1-1.9	5.4	0.02
More than once time a year	168	89 (53)	79 (47)	2.1	1.4-2.9	17.1	0
Once every 2 years	89	54 (60.7)	35 (39.3)	1.3	0.8-2	1.4	0.2
Once every 5 years	36	18 (50)	18 (50)	2	1.1-4	4.5	0.03

For calculation of the total knowledge score, each correct answer was given one, while wrong or don't know answers were given zero. Then, scores above the median score (4) were considered good level of knowledge

between poor glycemic control and aging for the development of DR. Similarly, 31% of participants in the current study recognized blurred vision as a symptom and only 18% of blindness as the worst complication of DR. Cetin et al. [20] conclusion that Turkey's lack of suitable knowledge and behavior for the management of DR is comparable to these findings. Furthermore, knowledge of ocular complications of uncontrolled DM and how to prevent them was very low among Saudi DM patients in Al-Ahsaa and Hispanic people, where only one-third of participants who had recently been diagnosed and half of those who had had their diabetes diagnosed more than a year prior were aware that uncontrolled diabetes could result in eye disease [13,21].

The biggest contributing factor to Yemeni DM patients' ignorance

about DR in the current study was their low levels of education. The understanding of the hazards and problems of DR was particularly lacking among illiterate subjects and those with secondary education or less. This is in line with a number of publications from various nations that demonstrate that patients with greater levels of education are more knowledgeable and conscious about DR developing as a complication of DM, as opposed to patients with low levels of education [13,20-23]. Other factors that were related to poor awareness included female sex, older ages and patients with not know type DM. These categories should be addressed with more concern to raise their knowledge for better quality of their lives.

Lack of awareness about DR is a major health problem that can interfere with proper management and prevention of potential visual

Table 4: DR sources of information in the study for participants with good knowledge of diabetic retinopathy (n=285).

Sources	No	%
Ophthalmologists	218	76.5
General practitioners	165	57.9
Social media and the internet	20	7
Radio, television	10	3.5
Schools or collage	30	10.5
Family	25	8.8
Friends	27	9.5
Health support groups	12	4.2

impairment. Longer periods of diabetes over 5 years were associated with better awareness in Turkey [20]. However, the current study did not reveal an association between the duration of diabetes and the level of consciousness (Table 3). The American Diabetes Association recommends annual eye exams for people with type 2 diabetes [24]. According to this report, just a small percentage of people actually go to an ophthalmologist for annual eye exams. Only 34.9% of the participants maintained annual attendance. Additionally, there was a strong correlation between the weaker knowledge levels and this poor attendance (Table 3). One of the predisposing elements that influences behavior, such as participation in screening, is suggested to be an individual's awareness [25]. Our members' lack of knowledge may be the cause of their irregular eye exams. However, despite having a high level of awareness regarding the value of getting an eye checkup, other research found that patients lacked the drive to do so. Patients with diabetes all around the world appear to exhibit a similar gap between awareness and compliance when it comes to regular eye exams. According to some reports, just half of the patients in Myanmar [22] and two thirds of the Japanese patients showed up for a routine eye checkup [26]. Additionally, a recent study in Turkey found that 77.3% of diabetes patients had previously undergone an eye exam, despite the fact that only 41.9% of these patients were aware that they should have annual eye exams [20]. The low level of visits to the ophthalmologist in Yemen may be due to the unavailability of this service and its cost, which can be barriers that must be taken into account in Yemen, especially at this time when the war is still going on, which has caused the cessation of government medical services.

This highlights the fact that Yemeni general practitioners are required to follow a broad referral policy to ophthalmologists. In this study, general practitioners and ophthalmologists were the primary sources of DR information, with social media, the internet, educational institutions, community health organizations, radio, television, and family and friends playing a much less role (Table 4). This is similar to patient reports from Saudi Arabia [13,16]. In order to convey information and emphasize the importance of routine eye screening, the participation of health professionals at primary care facilities is crucial. This was emphasized in a related Irish study [27]. Additionally, it is important to leverage and direct media and online resources toward raising public awareness.

Conclusion

Most patients in this study reported having little knowledge of DR. Poor educational attainment, feminine sex, and advanced ages were linked to this lack of proper understanding. The usual eye examination protocol was also not followed. As a result of these alarming findings, it is imperative that efforts be put in place to raise

affected patients' knowledge of DR and the value of early retinal screening. Schools should be the focus of health education initiatives because certain members of the community might not be able to attend college. Additionally, general practitioners in Yemen ought to implement a broad plan that mandates referrals to ophthalmologists. At some point, Yemen should implement DR screening programs.

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