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**Diabetic retinopathy screening barriers among Palestinian primary health care patients:**

**a qualitative study**

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**Abstract:**

**Background:** Screening for Diabetic Retinopathy (DR) is highly recommended to preserve vision. In Palestine, there is no data about the screening uptake.

**Aim**: In order to improve the care of our patient's, we explored the barriers that prevent DR screening through a cross sectional study.

**Methods:** An interviewer administered questionnaire was answered by 430 DM patients selected from five health directorates at Nablus, Tulkarm, Ramallah, Salfit, and Dora –Hebron. It included three sections: sociodemographic data, medical history and patient’s attitude towards Diabetic Retinopathy Screening (DRS). Descriptive analysis was used to summarize the characteristics of participating subjects. The Chi-square test was utilized to test the association between variables. Multivariate logistic regression was used to control confounders.

**Results:** A total of 430 participants (216[50.2%] males and 214[49.8%] females). Around a quarter (25.3% [109]) of them had never examined their retinas before. The prevalence of non-compliant to DRS at (PHC) in the West Bank was 47.9%. Lack of awareness was mentioned by most patients (40. 3%).Multivariate logistic regression analysis showed that Compliant to DRS was associated with: easy access to an ophthalmologist [OR:9.23, 95%CI :(9.23-17.07)], medical provider talks about the importance of eye exams [OR :2.09 ,95%CI :(1.17-3.71)] and belief of eye exam is pleasant [OR :1.92, 95%CI (1.10-3.35)] and one of top priorities [OR :3.86 ,95%CI:(2.01-7.39)].

**Conclusions:** lack of awareness was the number one reason for not attending early and/or annual screening, thus many strategies should be implanted to increase patient’s awareness, thus, increase the uptake of DRS.

**Word count:246**

**Keywords: Barriers; Diabetic Retinopathy Screening; West Bank.**

**1. Background**

Diabetes mellitus (DM) is a chronic serious disease[1]. In 2019, around 463 million adults had diabetes, more than 10% (55 million) of them were in the Middle East and North Africa (MENA) region with the prevalence of 12.8% and expected to reach 15.7 % in 2045[2]. In 2018, the incidence rate of DM in the Primary health care (PHC) diabetes clinics in the West Bank was 210.7 per 100,000 populations [3].

Diabetics are more prone to eye diseases[4] ,the most serious one is diabetic retinopathy (DR) which is the main cause of vision loss in adults aged 20–74 years[5]. Approximately one in three of diabetic patients have DR[6]. More than two thirds (84.5%) of diabetics who have had the disease for more than 20 years will develop DR[7]. In Palestine, a study done in Gaza strip in 2017 found that the prevalence of DR among male patients with type 2 DM was 24.7%[8].

Usually, there are no symptoms of DR in early stages, but later ,patient may complain of floaters and flashes, Fluctuating vision, and dark areas in the vision[9].

The majority (95%) of vision loss cases are preventable by early diagnosis and treatment[10]. Diabetic Retinopathy Screening (DRS) is highly recommended, adults with type 1 diabetes should have annual examinations for DR beginning five years after the onset of their illness. Patients with type 2 diabetes should have an initial dilated and comprehensive eye examination at the time of the diabetes diagnosis, followed by at least annual exams[11].

DRS uptake is not optimal in many countries even developed countries, it was around 55%–95%[12][13][14]. In Saudi Arabia; more than a third (36%) of diabetic patients were not compliant with DRS guidelines[15]. In the north of Palestine; more than fourth (29%) of DM patients had never undergone DRS[16].

There are many barriers to DRS at different levels; as patient and system levels[17].

Lack of awareness was the most common barrier to DRS, [18][19][20], many patients did not know how does DM affect their vision, why they should screen their retinas regularly if they did not complain of any symptoms, also they didn`t know if there is an effective treatment for DR.

Other patient level barriers; such as lack of time, cost, and fear from the test or discovering something bad, were identified in many studies[14][15][21].

System related barriers such as lack of access, medical provider not telling the patients about the importance of the screening, and long waiting time, were also mentioned by different studies[16][22][23].

As PHC physicians; we noticed that some patients do not comply with retinal screening periodically. There is no enough data about the screening uptake among diabetic patients visiting PHC clinics in Palestine.

**2.Objectives**

To measure the Prevalence of DRS uptakes at PHC in the West Bank, and to identify barriers to attendance among diabetic patients. The importance of this study raise from the fact that identifying screening barriers can help to overcome them, increase DRS attendance, and thus, will improve the health services provided to the diabetic patients in PHC centers of the ministry of health (MOH) in the West Bank.

**3. methods**

A Cross sectional study design was used in the five PHC directorates at Nablus, Tulkarm, Ramallah, Salfit, Dura-Hebron. These cities were chosen due to their accessibility and representiveness, from August 2019 to January 2020, inclusion criteria were all DM patients registered in these PHC directorates (Type 1 and Type 2 DM), on medications and age more than 18 years and DRS is recommended for them. Patients who were seriously ill, with Gestational Diabetes Mellitus, and those not able to give valid informed consent were excluded.

OpenEpi [24], was used to calculate the sample size for a confidence interval (CI) of 95% and a margin of error of 0.05. and since there is no previous studies in Palestine about this topic so we assume that the expected proportion in population (p) to be 0.5 in order to have the highest sample size. Sample size was 382 patients, we added other 48 (about 10%) for non-response, so the sample size was 430. The proportional method was used to select participants from each PHC directorates. The diabetic patients were chosen by convenience sampling. An interviewer administered questionnaire (Appendix 1) was used, it was in the Arabic language. interviewers trained to use the same wording of questions, nonverbal signals, and the tone of voice to avoid an interviewer bias.

The questionnaire consisted of three parts; first two parts were used to obtain demographic data and medical history of patient. These were based on the questionnaire used in the study on the Knowledge, Awareness, and Eye Care-Seeking Behavior in DR in Saudi Arabia[25]. The third part was used to address the six components of Health Belief Model (HBM) (susceptibility, severity, benefits, barriers, self-efficacy and cues to action). It was adapted from the questionnaire used in the study on Predicting Adherence to Diabetic Eye Examinations Development of the Compliance with Annual Diabetic Eye Exams Survey (CADEES) [14], the official permission to use it was obtained by email the original authors ,it had good content validity and reliability, the Cronbach s alpha was >0.60, it contains 45 statements.

The questionnaire was translated to Arabic by three experts, then back translated to English by a legal translator not involved in the translation stage then the two versions of English questionnaire were compared by experts group and adjustment as necessary. before using the questionnaire, it was pilot tested on 40 diabetic patients. Refinements were made on the basis of feedback ;6 statements were removed from the original questionnaire to achieve good reliability. Those who participated in the pilot test were excluded.

The result of Cronbach alpha for allover the questionnaire was 0.7 and according to the HBM components as following: susceptility=0.649, severity=0.621, barriers=0.607, benefits=0.703, efficacy=0.649, cues to action=0.513.

Every non-compliant patient, was given short notes about the importance of screening also was referred to do DRS by a governmental referral.

**3.1Ethical considerations**

Ethical approval from the Institutional Review Board (IRB) of AN Najah National University was obtained., also the official permission from the five PHC Directorates.

All participants gave their verbal Informed consent. They informed that their participation was voluntary and the privacy and confidentiality were assured.

**3.2 Analysis:**

The Statistical Package for Social Sciences (SPSS) version 20 was used for data entry and analysis. A descriptive analysis was used to summarize the characteristics of participants. The Chi-square test was utilized to test the association between dependent and independent variables. P values of <0.05 considered significant. To control confounders, logistic regression was used.

**4. Results**

The total interviewed participants were 430, around half of them were male (50.2%), sixty-three percent were less than 60 years old (63%), and around forty-four percent had an average monthly income of < 1500 NIS (44.2%).

The majority of participant (91.2%) reported having Type 2 diabetes, with the mean duration of Diabetes 10.0 ± 7.5 years, about fifty-five percent had HBA1C above 7.5 (55.3%) with mean of HBA1C was 8.1± 1.8 %.

Of the interviewed diabetic patients, 224[52.1 % (95%CI=0.473-0.569)] had received DRS examination within the last 18 months, thus assigned DRS compliant group. 206[ 47.9 % (95%CI=0.431-0.527)] were non-compliant with DRS. around a quarter (25.3%( 109)) 25.3%( 109) of them had never examined their retinas before. Table 1 shows the characteristics and the medical history of the participants.

Around two thirds of the participants (320), reported additional barriers to DRS, the most prevalent were: lack of awareness (40.3%), financial (26.3%), system issues (20%) as shown in figure 1.

Univariate analysis showed that compliance to DRS was not significantly associated with patients’ gender (*p*=0.769), age (*p*=0.067), marital status (*p*=0.606), residency place (*p*=0.434), educational level (*p*=0.451), employment (*p*=0.595) and shows significant association with monthly income, whose income below 1500 NIS were compliant to DRS more than whose income above 1500 NIS (*p*=0.045) OR (1.48) CI (1.0-2.1).

DM treatment type, Patients treated with Insulin were more likely to attend DRS compared to patients treated with oral hypoglycemic (p value =0. 023, OR=0.64, CI= 0.4-0.9).

wearing eye glasses and having eye diseases were found to be significant (p value=0.001, OR=2.1, CI= 1.3-3.3), (p value=**<**0.001, OR=4.0, CI=2.5-6.2,) respectively.

Additionally, patients with ≥ 10years duration of DM were found more likely to be compliant with DRS (p value=0.011, OR=0.59, CI=0.4-0.8). (Table 2).

According to the HBM statements, Table 3 shows the 15 statements that were significantly associated with compliance to DRS. Most of significant statements belong to barriers construct (8 statements).

Patients who feel that their eyes are unhealthy were found more likely to be compliant with DRS (p value= <0.001, OR=2.7, CI=1.7-4.0), eye exam is pleasant were found more likely to be compliant with DRS (p value= <0.001, OR=2.7, CI=1.8-4.1), Patients who were confident in their ability to make an appointment for an eye exam were found more likely to be compliant with DRS (p value= 0.026, OR=1.7, CI=1.0-2.7).

Binary logistic regression model was adjusted for age, gender, monthly income, treatment type, duration of treatment, wearing eye glasses, having eyes diseases, had chronic diseases and the significant HBM statements in order to find the factors influencing DRS compliance.

The results revealed that Four HBM statements were significant, Having an eye exam is pleasant [*P* =0.021 adjusted OR = 1.9 (95%CI= 1.2-3.8)], My medical provider (i.e., doctor, nurse, nurse practitioner) talks to me about the importance of eye exams [*P* =0.012 adjusted OR = 2.09 (95%CI= 1.1 -3.7)], Getting an eye exam every year is one of my top priorities[*P* <0.001 adjusted OR = 3.8(95%CI= 2.0-7.3)] and I have an eye doctor I can go to for diabeticeye exams[*P* <0.001 adjusted OR = 9.2(95%CI=9.2-17.0)] Table 4.

**5. Discussion**

In our study, DRS among Palestinian diabetic patients is not optimal, the compliance to DRS at (PHC) in the West Bank was 52.1%. A Syrian study found that around only one quarter (24.7%) of diabetics had regular DRS[20], this difference may be due to the Syrian crisis that forced patients not to receive screening services, also poor knowledge about DR. While in Saudi Arabia, and Hong Kong, the compliance to DRS was 61.4%, 85.5% respectively; which was higher than our result; this is due to adequate knowledge about DR among their patients[15][19]. Similarly, In Ireland, US, Turkey, UK, and the Netherlands; the uptake of DRS was around 55%–95%[14][12][22][13].

Lack of awareness was mentioned most frequently among our participants (40.3%), similar to other studies [19][22][26].

It included not understanding the importance of the DRS for diabetics, why should they screen their eyes if they have no symptoms, lack of education by the medical team who did the referral as to why it was important or what to expect, and if there is a viable treatment if they were diagnosed with DR, and no education during the DRS by the examiner about what was happening. Studies showed that adequate awareness of DR increase the compliance of DRS [15][27][28]. A Lebanese study found that DM patients with severe DR, have presented to the ophthalmology clinic too late [29], in our culture, many patients also do not seek medical care unless there are symptoms. Many researchers recommended to conduct awareness campaigns in various ways, including social media, sending messages to remind patients with the screening date, improving communication skills between patients and doctors, as well as training the medical staff to provide updated guidelines regarding diabetes care[20][13][29].

Public health education efforts such as: World Sight Day held annually on the second Thursday of October by the International Agency for the Prevention of Blindness in cooperation with the WHO, under the VISION 2020 Global Initiative raise awareness on vision impairment and blindness and how to remove all avoidable causes of blindness in the year 2020[30]. MOH efforts to tap into this campaign and spread the word of DR through Palestinian media and social media are imperative.

In Palestine, there is no free screening program for DR, so establishing like this program is very important in educating patients, and thus increasing the compliant to DRS. Such programs conducted in England [13]and Jordan[27].

The second important barrier was financial issue (26.3%), 44.2% of our study participants had an average monthly income less than 430 US dollars. Despite they had a governmental medical insurance, if DRS was not offered at their MOH clinic, they had to pay for private exams or transportation costs to another MOH clinic. A qualitative Palestinian study found that the cost was the most important reason for noncompliance with DRS, because they have a limited income and therefore, they prefer to spend the money on something more important than screening[16]. In Iran, a study found that the most common barrier to DRS was the cost, researchers recommended to spread a national screening program that provides eye care services that integrate into primary health care services[31].

Additionally, system related issues; which included difficulty getting appointments due to long wait times, overcrowded clinics with many hours spent in the waiting area, never receiving or not understanding the results, not seeing the same primary care doctor so continuity of care is impossible and results in poor follow up and inconsistent recommendations; as doctors do not consistently follow diabetic guidelines, and inadequate numbers of governmental ophthalmologists; so patients have to see private ophthalmologists, may be the most troublesome in Palestine.Yao Liu and his colleagues advised to offer screening services near patients live places, such as mobile service (Teleophthalmology)[23].

Fear was one of the reasons for non-attending the screening, it was reported by 7.2% of our participants, including fear of what they might find out and fear of the operation decision. Similarly, a Jordanian study showed that fear of discovering something bad was the fourth reasons for non-compliant to DRS, and authors recommended further investigations to encourage patients to screen their retinas regularly [27]. The fear factor in an American study had a less percentage (3.6%) compared to our results[14], this indicates the need to educate patients on the importance of screening.

In our study, other barriers such as lack of time, lack of accessibility, and forgetting, were mentioned with lower percentage (3.8%,1.9%,0.6%) respectively, similar to other studies conducted in USA, Jordan, and Taiwan [14][27][28].

HBM was used to assess barriers to DRS, this model is one of the health promotion theories which focuses on understanding the individual`s beliefs about a health condition, and thus, will determine the behavior towards it. This model is very helpful and can be used to guide health promotion and disease prevention programs.

Four statements categorized by two constructs of HBM were significantly associated with DRS compliance: barriers and cues to action similar to previous studies conducted in USA [14] and Taiwan[28].

Barrier statements were: having an eye exam is not pleasant [OR :1.92, 95%CI (1.10-3.35)],getting an eye exam every year is not one of top priorities [OR :3.86 ,95%CI:(2.01-7.39)], these results indicate the need to explain the importance of the screening to the patient; as early detection of DR will help in the treatment, also a detailed explanation of the methods of screening and how the patient should prepare for that; such as bringing an escort, and avoid driving due to blurred vision side effect of eye drops used in the exam. Diabetic Eye Screening Program (DESP) in England [13] is one of the successful programs that send letters to patients explaining to them the screening methods in details, and the time required to do it ,also the program offers brochures in several languages ​​to increase awareness among diabetic patients.

Cues to action statements were: My medical provider (i.e., doctor, nurse, nurse practitioner) talks to me about the importance of eye exams [OR :2.09 ,95%CI :(1.17-3.71)], this indicates the importance of educating the patient’s by medical staff, and directing them to the screening by conducting awareness lectures, or by combining the screening exam with other services; such as influenza vaccination, but the problem with PHC diabetes clinics is overcrowding, that makes it difficult to educate patients, and hence the MOH must provide adequate medical staff.

The most significant statement was: I have an eye doctor I can go to for diabetic eye exams [OR:9.23, 95%CI :(9.23-17.07)], with the highest odds ratio, the result indicates the importance of having free screening exam available in a place close to the patient, so not bear the burden of transportation to another clinic. Hence, the screening exam must be provided in each of the diabetic clinics, but currently the examination is only available in 3 clinics in the West Bank, and some patients are referred to government hospitals that report overcrowding, this forces some patients to visit a private doctor.

The compliance of DRS in our study was not associated with gender, education level and marital status likewise, an American study [14].

Up to our knowledge, this is the first Palestinian study conducted on DRS compliance and its barrier’s, the important of such study lies in helping to plan for a better health reality. The study however had some limitations; we only talked to DM patients, the doctors in PHC clinics or Ophthalmologists in hospitals were not included; they may have other barriers. Some patients complained from the length of the questionnaire, further studies should focus on making a brief survey to reach the same goal.

**5.1 Recommendations:**

1. Increase public health and health awareness campaigns; such as building on the World Sight Day.
2. Guidelines for DM should be used by all diabetic care providers, with standardized programs.
3. Organizational approach to the care of diabetes across Palestine. For example, MOH implements a Strategic plan to provide eye examinations in all PHC clinics, and works toward providing sufficient number of ophthalmologists.
4. Professional physician organizations might respond with efforts to educate physicians about evidence based approaches to diabetics.

**5.2 Conclusion:**

lack of awareness was the number one reason for not attending early and/or annual screening. It is hoped that the results of the study will help to provide evidence on the current service and taken into consideration by MOH to increase the uptake and quality of service.

**Declaration of interests**

None

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**\*supplementary Material – Appendix (1)**

Dear participant,

We are 4th year family medicine resident at An-Najah National University, we are doing a study about:

**Barriers to diabetic retinopathy screening among Primary Health Care diabetic patients in the West Bank**

Your participation in this study is voluntary. If you agree to participate in the study, I will ask you to answer a 45 items Questioner about DR screening. you may skip any question if you do not wish to answer or withdraw your consent at any time during the study. Your answer will be confidential and there are no costs associated with your participation in this study.

Your participation will allow to us to learn about DR screening barriers in the West Bank.

**Thank you**

**Dr. Tasneem Yahya**

**Dr. Abdul Rahman Abdul Hadi**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A0: Questionnaire number: ⭘⭘⭘** | | | | **coding** |
| **Part one: Demographic data** | | | | |
| **A1** | Age by years | |  |  |
| **A2** | Sex | | ❶ Male ❷ Female |  |
| **A3** | Marital status | | ❶ Single ❷ Married ❸Divorced ❹ Widowed ❺Separated |  |
| **A4** | Area of residence | | ❶ city  ❷ camp  ❸ village specify………………. |  |
| **A5** | Educational level | | ❶less than secondary school  ❷Secondary school  ❸ more than secondary school |  |
| **A6** | Are you work? | | ❶ Work, specify……………….  ❷ not work. |  |
| **A7** | What is an average monthly income of your family in Shekels? | | ❶ less than 1500  ❷ 1500-3000  ❸ more than 3000 |  |
| **A 8** | Name the primary health care center which you are followed up | | ………………………… |  |
| **Part two : Medical History** | | | | |
| **B1** | Type of diabetes | ❶Type 1 ❷Type 2 ❸Unknown | |  |
| **B2** | Duration of DM in years |  | |  |
| **B3** | Type of your diabetic medications | ❶oral ❷insulin ❸both | |  |
| **B4** | Last HBA1C level |  | |  |
| **B5** | Wear an eyeglass? | ❶Yes ❷No | |  |
| **B6** | Do you have any eye disease? | ❶Yes specify………………. ❷No | |  |
| **B7** | Do you have other diseases? | ❶Yes specify……  ❷No | |  |
| **B8** | When was the last time you had an eye exam for retinopathy? | ❶Within the past 6 months  ❷Within the past 12 months  ❸Within the past 18 months  ❹More than 18 months  ❺Never done | |  |

**Part three: For the next part of the survey, I am going to read many statements. Most of the statements are about your eye health, but there are a few about your general health. After I read each statement, please tell me your bests represents how you feel, by choosing yes or no answer**

|  | | **Strongly Disagree** | **Disagree** | **No Opinion/**  **Don’t Know** | **Agree** | **Strongly Agree** |
| --- | --- | --- | --- | --- | --- | --- |
| **C1** | My eyes are healthy. | **1** | **2** | **3** | **4** | **5** |
| **C2** | Early diabetic eye disease usually causes changes in vision. | **1** | **2** | **3** | **4** | **5** |
| **C3** | Having an eye exam is not pleasant. | **1** | **2** | **3** | **4** | **5** |
| **C4** | I am confident in my ability to make an appointment for an eye exam. | **1** | **2** | **3** | **4** | **5** |
| **C5** | I have trouble reading a book or newspaper, even if I use my glasses or contacts. | **1** | **2** | **3** | **4** | **5** |
| **C6** | Over the past 4 weeks I have felt blue, downhearted, or depressed. | **1** | **2** | **3** | **4** | **5** |
| **C7** | I know someone who has lost some or all of his/her eyesight because of problems from diabetes. | **1** | **2** | **3** | **4** | **5** |
| **C8** | I know a lot about diabetes and the effect it can have on health. | **1** | **2** | **3** | **4** | **5** |
| **C9** | Diabetes can result in a loss of visual function (e.g., difficulty reading, driving). | **1** | **2** | **3** | **4** | **5** |
| **C10** | I think I will lose some or all of my eyesight because of diabetes. | **1** | **2** | **3** | **4** | **5** |
| **C11** | I am confident I can keep a scheduled appointment with an eye doctor. | **1** | **2** | **3** | **4** | **5** |
| **C12** | I do not want to know if I have an eye disease. | **1** | **2** | **3** | **4** | **5** |
| **C13** | People who have good control of their diabetes are unlikely to have eye problems. | **1** | **2** | **3** | **4** | **5** |
| **C14** | Diabetes can cause severe eye problems. | **1** | **2** | **3** | **4** | **5** |
| **C15** | I would benefit from having an eye exam every year. | **1** | **2** | **3** | **4** | **5** |
| **C16** | My medical provider (i.e., doctor, nurse, nurse practitioner) talks to me about the importance of eye exams. | **1** | **2** | **3** | **4** | **5** |
| **C17** | There is no treatment for diabetic eye diseases. | **1** | **2** | **3** | **4** | **5** |
| **C18** | It is hard for me to travel to an eye doctor. | **1** | **2** | **3** | **4** | **5** |
| **C19** | There are many things that make it hard to get an eye exam every year. | **1** | **2** | **3** | **4** | **5** |
| **C20** | I do not like having my eyes dilated with eye drops that make my pupils large. | **1** | **2** | **3** | **4** | **5** |
| **C21** | I think it is important to have an eye exam every year. | **1** | **2** | **3** | **4** | **5** |
| **C22** | Diabetic eye disease can be seen with an eye exam. | **1** | **2** | **3** | **4** | **5** |
| **C23** | Diabetes can damage the blood vessels in the eye. | **1** | **2** | **3** | **4** | **5** |
| **C24** | There are many eye doctors where I live. | **1** | **2** | **3** | **4** | **5** |
| **C25** | My family members or friends help me make doctor appointments. | **1** | **2** | **3** | **4** | **5** |
| **C26** | Eye exams can find many different kinds of eye problems. | **1** | **2** | **3** | **4** | **5** |
| **C27** | Having a yearly eye exam will help me to save the eyesight I have now. | **1** | **2** | **3** | **4** | **5** |
| **C28** | People with diabetes are unlikely to get an eye disease. | **1** | **2** | **3** | **4** | **5** |
| **C29** | I cannot afford an eye exam. | **1** | **2** | **3** | **4** | **5** |
| **C30** | My insurance covers most of the cost of an eye exam. | **1** | **2** | **3** | **4** | **5** |
| **C31** | Diabetic eye diseases often cause blindness. | **1** | **2** | **3** | **4** | **5** |
| **C32** | I have medical problems from diabetes. | **1** | **2** | **3** | **4** | **5** |
| **C33** | I want to get an eye exam every year. | **1** | **2** | **3** | **4** | **5** |
| **C34** | I only seek eye care when I am having trouble with my vision. | **1** | **2** | **3** | **4** | **5** |
| **C35** | Getting an eye exam every year is not one of my top priorities. | **1** | **2** | **3** | **4** | **5** |
| **C36** | I have an eye doctor I can go to for diabetic eye exams.  \_\_\_\_\_ Yes **(Go to Q37)**  \_\_\_\_\_ No **(Go to Q40)**  If **YES** |  |  |  |  |  |
| **C37** | I receive a reminder from my eye doctor’s office when it is time to schedule an exam. | **1** | **2** | **3** | **4** | **5** |
| **C38** | I am happy with the care I get from my eye doctor. | **1** | **2** | **3** | **4** | **5** |
| **C39** | Visiting the eye doctor takes too much time. | **1** | **2** | **3** | **4** | **5** |
| **C40** | **We are interested in why some people do not have yearly eye exams. Can you think of any reasons we did not ask about in this survey?**  ------------------------------------------------------------------------------------------------  ------------------------------------------------------------------------------------------------  ------------------------------------------------------------------------------------------------  **With great thanks** | | | | | |

\*Adapted from CADEES questionnaire [14].

**Tables and figures**

**Table 1:** Distribution of sociodemographic and medical history characteristics of study participants (n =430)

|  |  |  |
| --- | --- | --- |
| Variables | Frequency | Percentage |
| Age |  |  |
| <60 Years  ≥60 Years | 271  159 | 63%  37% |
| Gender |  |  |
| Male  Female | 216  214 | 50.2%  49.8% |
| Marital Status |  |  |
| Single  Married  \*Others | 35  341  54 | 8.1%  79.3%  12.6 % |
| Residence |  |  |
| City  Refugee Camp  Village | 300  12  118 | 69.8%  2.8%  27.4% |
| Educational Level |  |  |
| < Secondary  ≥ Secondary | 175  255 | 40.7%  59.3% |
| Employed |  |  |
| Yes  No | 149  281 | 34.7%  65.3% |
| Monthly Income |  |  |
| <1500 NIS  1500-3000 NIS  >3000 NIS | 190  139  101 | 44.2%  32.3%  23.5% |

|  |  |  |
| --- | --- | --- |
| DM type |  |  |
| Type 1  Type 2 | 38  392 | 8.8%  91.2% |
| Treatment type |  |  |
| Oral  Insulin  Both | 203  83  144 | 47.2%  19.3%  33.5% |
| Last HbA1c |  |  |
| < 7.5%  ≥7.5% | 192  238 | 44.7%  55.3% |
| Wear Glasses |  |  |
| Yes  No | 116  314 | 27%  73% |
| Eye diseases |  |  |
| Yes  No | 136  294 | 31.6%  68.4% |
| Chronic Disease |  |  |
| Yes  No | 251  179 | 58.4%  41.6% |
| Last eye screen |  |  |
| Within 6 month  Within 12 month  Within 18 month  >18 month  Never | 126  75  23  97  109 | 29.3%  17.4%  5.3%  22.6%  25.3% |

\*Others=widow, divorce, separated

**Table 2:** Univariate analysis of DRS compliance in relation to sociodemographic and medical history characteristics. (n= 430)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **DRS Complaints**  **N (%)** | **DRS Non-Complaints**  **N (%)** | **P Value\*** | **OR (95%CI)** |
| **Age** |  |  |  |  |
| <60 years  ≥ 60 years | 132(48.7%)  92(57.9%) | 139(51.3%)  67(42.1%) | 0.067 | 0.692(0.466-1.026) |
| **Gender** |  |  |  |  |
| Male  Female | 111(51.4%)  113(52.8%) | 105(48.6%)  101(47.2%) | 0.769 | 0.945(0.647-1.380) |
| **Marital Status** |  |  |  |  |
| Married  Single # | 176(51.5%)  48(54.5%) | 166(48.5%)  40(45.5%) | 0.606 | 0.884(0.552-1.414) |
| **Residency place** |  |  |  |  |
| City  Village or camp | 160(53.3%)  64(49.2%) | 140(46.7%)  66(50.8%) | 0.434 | 1.179 (0.781-1.779) |
| **Educational level** |  |  |  |  |
| <secondary  ≥secondary | 95(54.3%)  129(50.6%) | 80(45.7%)  126(49.4%) | 0.451 | 1.160(0.789-1.706) |
| **Employed** |  |  |  |  |
| Yes  No | 75(50.3%)  149(53%) | 74(49.7%)  132(47%) | 0.595 | 0.898(0.603-1.336) |
| **Monthly income** |  |  |  |  |
| <1500 NIS  ≥1500 NIS | 109(57.7%)  115(47.9%) | 80(42.3%)  125(52.1%) | 0.045 | 1.481(1.009-2.174) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of DM** |  |  |  |  |
| Type 1  Type 2 | 22(57.9%)  202(51.5%) | 16(42.1%)  190(48.5%) | 0.453 | 1.293(0.659-2.537) |
| **Treatment type** |  |  |  |  |
| Oral  Insulin | 94(46.3%)  130(57.3%) | 109(53.7%)  97(42.7%) | 0.023 | 0.643(0.440-0.942) |
| **Wear eyeglasses** |  |  |  |  |
| Yes  No | 76(65.5%)  148(47.1%) | 40(34.5%)  166(52.9%) | 0.001 | 2.131(1.369-3.317) |
| **Eye diseases** |  |  |  |  |
| Yes  No | 101(74.3%)  123(41.8%) | 35(25.7%)  171(58.2%) | <0.001 | 4.012(2.561-6.285) |
| **Chronic diseases** |  |  |  |  |
| Yes  No | 142(56.6%)  82(45.8%) | 109(43.4%)  97(54.2%) | 0.028 | 1.541(1.048-2.266) |
| **Duration of DM** |  |  |  |  |
| <10years  ≥ 10years | 129(47.4%)  95(60.1%) | 143(52.6%)  63(39.9%) | 0.011 | 0.598(0.402-0.890) |
| **HBA1C** |  |  |  |  |
| <7.5  ≥7.5 | 96(50%)  128(53.8%) | 96(50%)  110(46.2%) | 0.435 | 0.859(0.587-1.258) |

\*Chi-square test # Include singles, widowed, divorced and separated OR= Odds Ratio *CI*= confidence interval\* P values<0.05 statistically significant.

**Table 3:** Univariate analysis of DRS compliance in relation to HBM statements which were significant. (n= 430)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Statements | DRS  Complaints Non-Complaints | | P value\* | OR (95%CI) |
| My eyes are healthy (Su) |  |  |  |  |
| Positive attitude  Negative attitude | 107(67.3%)  117(43.2%) | 52(32.7%)  154(56.8%) | <0.001 | 2.7(1.7-4.0) |
| Having an eye exam is not pleasant (Ba) |  |  |  |  |
| Positive attitude  Negative attitude | 150(63.3%)  74(38.3%) | 87(36.7%)  119(61.7%) | <0.001 | 2.7(1.8-4.1) |
| I am confident in my ability to make an appointment for an eye exam. (E) |  |  |  |  |
| Positive attitude  Negative attitude | 188(54.7%)  35(41.2%) | 156(45.3%)  50(58.8%) | 0.026 | 1.7(1.06-2.7) |
| I have trouble reading a book or newspaper, even if I use my glasses or contacts. (Ba) |  |  |  |  |
| Positive attitude  Negative attitude | 91(62.3%)  133(46.8%) | 55(37.7%)  151(53.2%) | 0.002 | 1.8(1.2-2.8) |
| I do not want to know if I have an eye disease. (Ba) |  |  |  |  |
| Positive attitude  Negative attitude | 207(56.4%)  17 (27%) | 160(43.6%)  46(73%) | <0.001 | 3.5(1.9-6.3) |
| My medical provider (i.e., doctor, nurse, nurse practitioner) talks to me about the importance of eye exams. (C) |  |  |  |  |
| Positive attitude  Negative attitude | 180(60.6%)  44(33.1%) | 117(39.4%)  89(66.9%) | <0.001 | 3.1(2.0-4.7) |
| There is no treatment for diabetic eye diseases. (Ba) |  |  |  |  |
| Positive attitude  Negative attitude | 86(61.4%)  137(47.4%) | 54(38.6%)  152(52.6%) | 0.006 | 1.7(1.17-2.6) |
| It is hard for me to travel to an eye doctor. (Ba) |  |  |  |  |
| Positive attitude  Negative attitude | 180(55.2%)  44 (42.3%) | 146(44.8%)  60(57.7%) | 0.022 | 1.6(1.07-2.6) |
| There are many things that make it hard to get an eye exam every year. (Ba) |  |  |  |  |
| Positive attitude  Negative attitude | 152(56.1%)  72(45.3%) | 119(43.9%)  87(54.7%) | 0.030 | 1.5(1.04-2.2) |
| I do not like having my eyes dilated with eye drops that make my pupils large. (Ba) |  |  |  |  |
| Positive attitude  Negative attitude | 77(66.4%)  147(46.6%) | 39(33.6%)  167(53.2%) | <0.001 | 2.2(1.4-3.4) |
| I think it is important to have an eye exam every year. (Be) |  |  |  |  |
| Positive attitude  Negative attitude | 218(53%)  5 (27.8%) | 193(47%)  13(72.2%) | 0.036 | 2.9(1.02-8.3) |
| My insurance covers most of the cost of an eye exam. (Ba) |  |  |  |  |
| Positive attitude  Negative attitude | 88(63.3%)  136(46.7%) | 51(36.7%)  155(53.3%) | 0.001 | 1.9(1.2-2.9) |
| I have medical problems from diabetes. (O) |  |  |  |  |
| Positive attitude  Negative attitude | 74(45.7%)  149(56%) | 88(54.3%)  117(44%) | 0.038 | 0.6(0.4-0.9) |
| Getting an eye exam every year is not one of my top priorities. (Ba) |  |  |  |  |
| Positive attitude  Negative attitude | 192(62.1%)  32(26.4%) | 117(37.9%)  89(73.6%) | <0.001 | 4.5(2.8-7.2) |
| I have an eye doctor I can go to for diabetic eye exams. (C) |  |  |  |  |
| Positive attitude  Negative attitude | 200(69.2%)  24(17%) | 89(30.8%)  117(83%) | <0.001 | 10.9(6.6-18.1) |

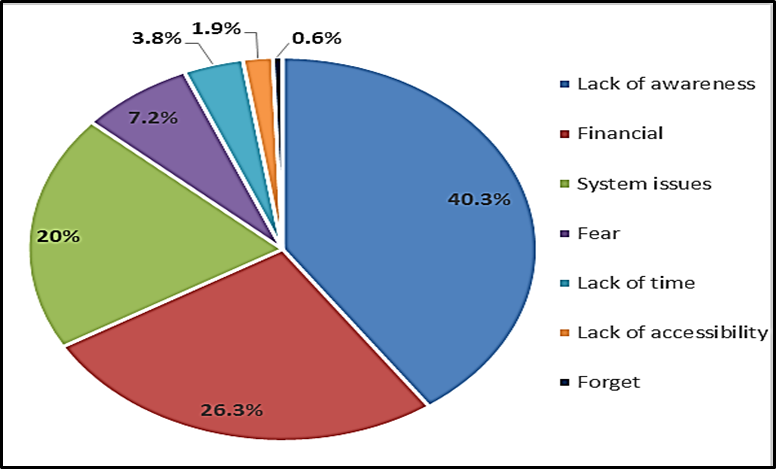
**\***Chi-square test *OR*= Odds Ratio *CI*= confidence interval

Su = susceptibility/Se = severity/O = others/E = self-efficacy/C = cues to action/Be = benefits/Ba= barriers

**Table 4:** Logistic regression analysis of DRS compliance in relation to HBM statements.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| HBM Construct | Variables | P Value\* | Adjusted OR | 95%CI | S.E |
| Barriers | **C3.Having an eye exam is not pleasant** | **0.021** | 1.922 | 1.102-3.354 | 0.284 |
| Cues to action | **C16.My medical provider (i.e., doctor, nurse, nurse practitioner) talks to me about the importance of eye exams.** | **0.012** | 2.092 | 1.178-3.714 | 0.293 |
| Barriers | **C35.Getting an eye exam every year is not one of my top priorities.** | **<0.001** | 3.86 | 2.015-7.395 | 0.332 |
| Cues to action | **C36.I have an eye doctor I can go to for diabetic eye exams.** | **<0.001** | 9.230 | 9.230-17.077 | 0.314 |

**\***Reference group *OR*= Odds Ratio *CI*= confidence interval



**Figure 1:** Patients related barriers to Diabetic Retinopathy Screening.

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Contributions

ZN conceived of the presented idea, all authors contributed to study design, data analysis, data interpretation, the writing and revision of the abstract, and developed the manuscript drafting. TY, AA and A AF contributed to data collection. All authors have seen and approved the final version of the abstract for submission.

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Conflict of interest

The authors declare that they have no conflict of interest.

Ethics approval

Ethics approval was obtained from the Institutional Review Board of An-Najah National University, Nablus, Palestine.

Consent to participate

Verbal informed consent was obtained from all participants after explaining the aims of the study, including the use of audio recording.

Consent for publication

Not applicable.

Code availability

Not applicable

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