Ann. For. Res. 65(1): 11369-11387, 2022
ISSN: 18448135, 20652445

ANNALS OF FOREST RESEARCH
https://www.e-afr.org/

AWARENESS AND PRACTICES REGARDING PREVENTION OF DIABETIC RETINOPATHY AMONG PATIENTS WITH TYPE II DIABETES: CROSS SECTIONAL STUDY

Azza Anwar Aly[1], Hanaa Ibrahim El Sayed[2], Amira Abu Elkhyer Mohammed[3], Linie Villorijo Arcibal[4], Hayam Hanafi Mahmoud[5], Safaa Tawfik Elmanzalawy[6]

[1]Assistant professor of Medical-Surgical Nursing, Faculty of Nursing, Damanhur University, Egypt.

[1]Associate Professor of Medical Surgical Nursing, Ibn Sina National College for medical studies, KSA.

[2]Assistant Professor of Pediatric Nursing, Faculty of Nursing, Menoufia University, Egypt.

[2]Associate Professor of Pediatric Nursing, Ibn Sina National College for medical studies, KSA.

[3]Assistant professor of Nursing administration and Management, Ibn Sina National College for medical studies, KSA.

[3]Lecturer of Nursing administration and Management, National Cancer institution, Cairo University, Egypt.

[4]Lecturer of Nursing administration, Ibn Sina National College for medical studies, KSA.

[5]Lecturer of medical education, Ibn Sina National College for medical studies, KSA.

[6]Lecturer of community health Nursing, Faculty of Nursing, Menoufia University, Egypt.

Background: Diabetic retinopathy (DR) is the major cause of vision loss in adults with diabetes mellitus (DM) and the most common micro vascular diabetic complication. Strict glycaemic control and early detection and appropriate management are key to halting disease progression. ***Aim:*** investigate the level of awareness and practices regarding the prevention of diabetic retinopathy among patients with type II diabetes. ***Methods:*** A cross-sectional study was performed on 394 patients with type II diabetes who agreed to participate and met the inclusion criteria at medical clinics in a private hospital in Jeddah city. The data was collected by using modified interview questionnaires. ***Results:*** There was a highly significant relationship between patients' level of awareness and practice regarding prevention of diabetic retinopathy with p value<0.001. Moreover, there is a highly significant positive correlation found between patients' awareness and practice level with sociodemographic characteristics mainly in items of age, level of education, glycemic control level, and the effect of visual acuity with p value<0.001. However, there is a highly significant correlation between the patient practice with the items of gender and family history of diabetes with p value<0.001. While there was no significant correlation between diabetic patients` awareness and sociodemographic characteristics in relation to the gender, duration of DM, and family history of DM with a p-value (0.505, 0.341, 0.044) respectively. And there is no significant correlation between diabetic patients` practice scores and duration of DM with a p-value = (0.714). ***Conclusions:*** Type II diabetic patients had a good level of awareness and poor level of practice regarding the prevention of diabetic retinopathy. The factors such as age, level of education, glycemic control level, and the effect of visual acuity affecting the patients' awareness

© ICAS December 2022

and practice while the patient practice is affected with gender and family history of diabetes. ***Recommendations:*** Create an educational platform to increase awareness and practices of patients with type II diabetes regarding the prevention of retinopathy.

Keywords*:* Awareness, Practices, Diabetic retinopathy, Type II diabetes

Introduction

Over the past three decades, the prevalence of type II diabetes has raised significantly across all income groups. The World Health Organization(WHO) predicts that diabetes will be 7th leading cause of death by 2030 **(Elkjaer et al., 2020, Chadayan, 2021; El-Kebbi et al, 2021).** DM complications are divided into microvascular complications and macrovascular complications. Diabetic retinopathy (DR) is the most common serious microvascular ocular complication, followed by nephropathy and neuropathy. **(Alharbi *et al.*, 2021; El-Kebbi IM, Bidikian NH, Hneiny L2021; Jani *et al.*, 2020; Safwat et al.,2018; Olokoba *et al.*, 2017)**

Although the mechanism of DR is not clear, it is most likely due to the generation of reactive oxygen species within the eye and activation of protein kinase C, resulting in retinal vascular hyperpermeability, impaired retinal blood flow, basement membrane thickening, ischemia, and cell-signalling vascular endothelial growth factor that causes ocular neovascularization that can lead to retinal detachment and vitreous haemorrhage. DR type includes no proliferative and proliferative diabetic retinopathy. Proliferative DR is the most common sight-threatening hardship of DM. **(Alharbi & Alhazmi 2020; and AlSawahli Et al.; 2021, Cheloni *et al.*, 2019**)

Current treatment options for diabetic retinopathy include intravitreal therapy, laser photocoagulation, and vitrectomy. However, treatment has only been shown in the sight-threatening stage of DR Treatment of DR depends on the severity of the disease. **(Elkjaer et al.; 2020)** Because early DR is asymptomatic the coordination of therapeutic strategies are necessary to prevent or control the progression of DR. Such strategies include routine screening for DR risk factors, rapid diagnosis of DR, and glycaemic control. **(Pande & Tidake 2022, Shukla & Tripathy 2022, and Venugopal et al., 2020)**

Preventive management should include an extended ocular comprehensive evaluation, additional examinations, and patient education. Guideline recommendations for frequent screening and education program for the patient are widespread. Many people with diabetes do not receive eye care that can prevent visual impairment and blindness. **(Hosseini *et al.*, 2021, Venugopal et al.2020; Elkjaer et al.2020; Jani *et al.*, 2020; WHO, 2020).**

Awareness is the state or capability to perceive, feel, or recognize objects, events, or sensory patterns. At this level of awareness, the observer can perceive sensory data, which does not necessarily imply understanding. The owner of knowledge must include consciousness, but mere consciousness does not contain any kind of knowledge. More generally, it`s the condition or quality of being aware of something Prevention of DR also needs an understanding of community awareness and practices and the development of locally and culturally relevant resources **(Aly & Omairan 2023, Alamri et al., 2021, and Al Dawish & Robert 2020)**

© ICAS December 2022

Nurses play a vital role in prevention and treatment of DR. One of the most important goals of nursing management for type II diabetic patients is to increase awareness, improve practice, and preventing of complications. Nurses can obviously help encourage diabetic patients to actively participate in health check-ups. It also plays a very important role in patient education. (**Safwat et al.,2018)** Progression to more advanced retinopathy is associated with diabetes management, and diabetes risk can be reduced by intensive glycaemic and blood pressure management. **(Alharbi et al., 2021)** Therefore, they work with patients to simplify diabetes management and make it more comprehensive. Health guidelines deal comprehensively with issues such as weight, diet, and exercise. Diabetics with a vision threat may need counselling and clarification of treatment choices for probable vision loss.**(Safwat et al.,2018, Aly et al., 2022)**

Significance of the study

Saudi Arabia have the highest incidence of diabetes estimated at 24%, in the Middle East and North Africa (MENA) region. Saudi Arabia ranks 7th among the 10 countries with the highest population between the ages of 20 and 79 years old. (**Aly et al., 2022, El-Kebbi et al., 2022, AlSawahli et al., 2021, Alharbi et al., 2021, WHO 2020, Alzahrani et al., 2018**)

Diabetic retinopathy is one of the most common and severe complications of diabetes, the 5th most common cause of visual impairment in the world, and the 4th most common cause of blindness. **(Spurr. et al. 2018)** As a result of retinopathy, productivity may decline, quality of life may deteriorate, and social and economic burdens may increase **(Aly et al., 2022, Khalaf et al. 2019,Said & Hamed 2021).**

The worldwide prevalence of diabetic retinopathy for the period 2015-2019 was 27%.**(Thomas et al., 2018)** At the same time within Saudi Arabia, the prevalence of diabetes was visible at 28% to 36% among diabetic patients from several regions of the kingdom (**Bajaber &. Alshareef 2021, Alharbi et al., 2021; , Alamri et al., 2021, Al-Esawi & Amer 2019).**

Few studies have been done on awareness of DR practice among patients with diabetes. **(Jani et al.,2022, Srinivasan et al.,2017)** Therefore, it is necessary to assess and educate the awareness and practice level of diabetes patients. **(Aly et al.,2022; Alharbi1 *et al.*, 2021, Jani *et al.*, 2020)** Accordingly, our main objective in conducting this study was to assess the level of awareness and practice in patients with type II diabetes regarding the prevention of diabetic retinopathy.

Subject & methods

Aim of the study:

The aim of this study was to evaluate type II diabetes patient's awareness and practice regarding prevention of diabetic retinopathy.

Research objectives

1. To evaluate type II diabetic patients' level of awareness regarding the prevention of diabetic retinopathy
2. To assess type II diabetic patients' level of practice regarding the prevention of diabetic retinopathy

3. To determine factors affecting the awareness and practice of type II diabetic patients regarding the prevention of diabetic retinopathy

Research questions

• What is the level of type II diabetic patients' awareness regarding the prevention of diabetic retinopathy?

• What is the level of type II diabetic patients' practice regarding the prevention of diabetic retinopathy?

• What are the factors affecting the awareness and practice of type II diabetic patients regarding the prevention of diabetic retinopathy?

Research Design:

A cross-sectional study design was used to conduct the current study.

Subjects & Method

The current study was carried out at a private hospitals' diabetes clinic in Jeddah, K.S.A. all type II Diabetic patients who attended a diabetes clinic at the above-mentioned setting from January to July 2022, were included in the study. Exclusion criteria were patients who frequently visited a diabetes clinic during the study period, or who refused or failed to sign an informed consent form, who had previously been diagnosed with retinal disease, or who had eye disease not attributable to diabetes, and patients with cognitive impairment that does so will impair their ability to complete the questionnaire. The study sample consisted of 394 patients who met the inclusion criteria of the study setting within 7 months. Data were collected using an interview questionnaire.

The tool of data collection

A structured interview questionnaire adapted from **(Farooq and Bapar, 2021), (Alharbi1 *et al.*, 2021),**and **(Jani *et al.*, 2020)** and modified by the researchers after consideration of the current relevant literature. The questionnaire was written in English and a back-translation method was used by language experts to produce the final Arabic version of the tool. Written in plain Arabic, the following questionnaire is consisting of three parts.

P**art I:** Socio-demographic data of the studied sample, such as the age of patients, gender, educational level, duration of DM, family history, and glycemic control (HbA1c) test.

Part II: Focus on questions about patient awareness of diabetic retinopathy. This part consists of 8 questions, 5 these questions divided into two options yes /no it regarding (the impact of DM on patient's eye, effect of DM on the retina, Glycemic control can stop the development of DR, DR leads to blindness, treatment of DR, and the impact of DM on the patient's vison acuity) and three questions regarding frequency of fundus examination, and the primary source of patient information.

Part III: This part consists of 8 questions for patient practice to prevention of diabetic retinopathy. 6 of these questions were answered yes/no each correct answer was awarded 1 mark while a wrong answer was given 0 mark Good practice was counted if the total practice score was more than 75% 75% to 60% was considered average practice, and <60% of the total score was poor practice. These questions were about regular follow-up visits to the ophthalmologist, exercise schedule to control

diabetes, regular blood test to monitor blood glucose, diet to control diabetes, regular medication intake, weight control, and carbohydrate reduction. In addition to two questions related to the last time the patient underwent a fundus examination, and who refer patient to ophthalmologist.

Tool validity and reliability:

The validation of study tool was conducted by 5 medical and surgical nursing experts and 2 ophthalmologists. Reliability of awareness and practice questionnaire were confirmed by Cronbach's alpha factor test = 0.94.

Pilot Study

A pilot study was performed on 40 patients (10% of the study sample) for test the clarity and applicability of the tool and to assess the mean time required to fill out the questionnaire. No changes were required, so a pilot sample was added to the sample studied.

Ethical considerations:

The ethical approval was granted by Institutional Research Review Board (IRRB) of Ibn Sina National College of Health Studies. Formal written consent to data collection was obtained once the purpose and objectives of the study were fully clarified. The researcher introduced himself to the patient and explained the purpose of the study. Finally, it was ensured that each patient had the right to discontinue the study without penalty or to participate anonymously while ensuring the confidentiality of the data collected.

Data collection procedure

Officially approved by relevant authorities' personnel. Patients who consented to participate in the study were interviewed individually according to available time. The researcher introduced himself to the patient and explained the purpose of the study. Patients were selected according to pre-established inclusion criteria. Patients who met the inclusion criteria were invited to participate in the study. Patients were asked to complete questionnaires it took about 10-15 minutes to fill out the questionnaire. Data were collected three days a week from 5:00 p.m. to 9:00 p.m. Accomplish required data collection phase conducted in five months.

Data processing and analysis:

Data were collected, entered, analyzed and presented to achieve the research objectives. Data were analyzed using a licensed version of IBM Statistical Package for the Social Sciences (SPSS) version 26. (Armonk, NY: IBM Corp). The qualitative data were assigned by using percentages and numbers. The Kolmogorov-Smirnov test is used to check for normal distribution. Quantitative data were determined using a combination of mean (minimum and maximum), standard deviation, and chi- square test was used for qualitative analysis done to generate results. Pearson's correlation was used to find correlation between different variables. The level of significance was adjusted to p -value < 0.05, while the level of high significance was adjusted to p-value < 0.001.

Results

Table (1): Socio-demographic Data of type II diabetic patients:

Variables	N	%
Age		
<30	59	15.0
30-40	138	35.0
40-50	158	40.1
>50	39	9.9
Mean ± SD	45.360 ± 15.288	
Gender		
Female	173	43.9
Male	221	56.1
Level of education		
None educated	51	12.9
Primary school	47	11.9
Secondary School	166	42.1
Bachelor's degree	87	22.1
Higher education	43	10.9
Duration of DM		
Less than 5 years	165	41.9
6 to 10 years	123	31.2
More than 10 years	106	26.9
Family history of DM		
Yes	322	81.7
No	72	18.3
Glycemic control (HbA1C)		
Good control	316	80.2
Poor control	78	19.8
Is your visual acuity affected by DM?		
Yes	203	51.5
No	191	48.5

Table (1) Shows that (56.1%) of the studied sample was male and (40.1%) belong to the 50-60-year-old group. Additionally, (42.1%) were graduated from secondary school, (41.9%) had diabetes <5 years, (81.7%) had a family history of DM, and (80.2%) control their blood glucose levels (HbA1C test), and (51.5%) had vision acuity problems.

Table (2): Distribution of type II patient's awareness regarding prevention of diabetic retinopathy:

Variables	N	%
Do you know that diabetes can effect on patient's eyes?		
Yes	352	89.3
No	42	10.7
Do you know that diabetes can effect on patient's retina?		
Yes	244	61.9
No	150	38.1
Do you think controlling blood sugar can stop the development of DR?		
Yes	173	43.9
No	221	56.1
Do you think DR leads to blindness?		
Yes	341	86.5
No	53	13.5
Do you think there is a cure for DR to restore vision?		
Yes	344	87.3
No	50	12.7
Do you know a treatment for diabetic retinopathy?		
Medicines	165	41.9
Laser- photocoagulation	123	31.2
Injection	106	26.9
How frequency should diabetics undergo eye examinations?		
Every 6 months	22	6.4
Every year	139	40.4
Every two years	56	16.3
Only when vision is affected	127	36.9
What is the primary source of your information regarding DR?		
Doctor	172	43.7
Nurse	72	18.2
Internet /social media	95	24.1
Friends and relatives	35	8.9
Not received any information	20	5.1

Table (2) revealed that 89.3% of the sample studied had known that diabetes could affect the patient's eyes while 61.9% knew that DM could affect the retina. 56.1% of them did not aware of controlling blood sugar could stop the development of DR, and 86.5% knew that DR leads to blindness. 87.3% of the studded sample believe that there is a cure for DR to restore eyesight, while 41.9% indicated that drugs are the cure for DR. Only 6% of the studied sample reported that diabetics should have an eye exam every 6 months, 43.7% had their primary source of information about DR being their doctor with 24.1% being a nurse.

Table (3): Distribution of type II patient's practices regarding prevention of diabetic retinopathy:

Table (3) clarified that 47.7% of the studied sample had a fundus examination during the past year,

Variables	N	%
Does your treatment plan have regular follow up visits to an ophthalmologist?		
Yes	153	38.8
No	241	61.2
When was the last time you have undergone a fundus examination?		
I never check my vision	86	21.8
During the past 6 months	120	30.5
During the past year	188	47.7
Who refer you to ophthalmologist?		
General practitioner	167	42.4
Patient himself	77	19.5
Have no referral yet	150	38.1
Do you follow an exercise schedule to control diabetes and prevent DR?		
Yes	96	24.4
No	298	75.6
Do you check your blood regularly to monitor your blood glucose level?		
Yes	198	50.3
No	196	49.7
Do you follow a diet regimen to control diabetes and prevent DR?		
Yes	143	36.3
No	251	63.7
Do you take your medication regularly to control diabetes and prevent DR?		
Yes	282	71.6
No	112	28.4
Do you control your weight and reduce carbs to control diabetes and prevent DR?		
Yes	130	33
No	264	67

42.4% of them were referred to an ophthalmologist through their general practitioner, and 71.6% took their medication regularly, and 50.3% of the studied sample regularly monitored their blood glucose levels. While 61.2% of the studied sample did not consider regular follow-up visits to an ophthalmologist in their treatment plan, did not follow a diet regimen, did not control their weight and reduced carbohydrates, in addition to 75.6% of them did not follow an exercise schedule to control diabetes and prevent diabetes mellitus.

Table (4): Correlation between type II diabetic patient's socio-demographic Characteristics and awareness regarding prevention of diabetic retinopathy

Variables		Awareness			ANOVA or t-test
		Mean	±	SD	*p*-value
Age	<30	3.565	±	0.907	<0.001*
	30-40	5.149	±	1.34	
	40-50	3.068	±	1.015	
	>50	4.545	±	2.07	
Gender	Female	4.688	±	1.637	0.505
	Male	4.606	±	1.777	
Level of education	None educated	3.804	±	1.789	<0.001*
	Primary school	4.17	±	1.749	
	Secondary School	5.38	±	1.258	
	Bachelor's degree	4.552	±	1.568	
	Higher education	3.488	±	2.12	
Duration of DM	Less than 5 years	4.721	±	1.793	0.341
	6 to 10 years	2.954	±	1.053	
	More than 10 years	3.045	±	1.123	
Family history of DM	Yes	4.708	±	1.688	0.044
	No	4.347	±	1.817	
Glycemic control HbA1C levels	Good control	4.794	±	1.595	<0.001*
	Poor control	4.026	±	2.032	
Is your visual acuity affected by DM	Yes	2.519	±	1.019	<0.001*
	No	3.728	±	1.219	
	Low	2.954	±	1.053	

* Significant at $p \leq 0.05$

Table (4): Reflected a highly significant positive correlation was found between the studied sample awareness regarding the prevention of retinopathy and the sociodemographic characteristics mainly in items of age, level of education, glycemic control level, and the effect of visual acuity at p = (0.001). While there was no significant correlation between diabetic patients` awareness and sociodemographic characteristics in relation to the gender, duration of DM, and family history of DM with a p-value (0.505, 0.341, 0.044) respectively.

Table (5): Correlation between type II diabetic patient's socio-demographic Characteristics and practice regarding prevention of diabetic retinopathy

Variables		Practice			ANOVA or t-test
		Mean	±	SD	*p*-value
	<30	6.140	±	1.562	
	30-40	4.211	±	1.508	
	40-50	5.283	±	1.748	
	>50	5.115	±	2.330	
Gender	Female	6.122	±	1.842	<0.001*
	Male	5.184	±	2.000	
Level of education	None educated	4.281	±	2.013	<0.001*
	Primary school	4.693	±	1.968	
	Secondary School	6.750	±	1.416	
	Bachelor's degree	6.217	±	1.765	
	Higher education	5.334	±	2.386	
Duration of DM	Less than 5 years	5.313	±	2.018	0.714
	6 to 10 years	5.087	±	1.813	
	More than 10 years	5.244	±	1.933	
Family history of DM	Yes	6.244	±	1.900	<0.001*
	No	4.892	±	2.045	
Glycemic control HbA1C levels	Good control	5.395	±	1.795	<0.001*
	Poor control	4.531	±	2.287	
Is your visual acuity affected by DM	Yes	4.338	±	1.754	<0.001*
	No	6.420	±	2.100	
Awareness	Good	5.512	±	1.480	<0.001*
	Low	6.533	±	1.096	

Table (5): Shows a highly significant correlation between the studied sample practices regarding the prevention of retinopathy and the sociodemographic characteristics mainly in items of age, gender, level of education, family history of diabetes, glycemic control level, and the effect of visual acuity at p = (0.001). While there was no significant correlation between diabetic patients` practice scores and sociodemographic characteristics of diabetic patients with respect to the duration of DM with a p-value = (0.714). There is also a highly significant correlation between the studied sample practices regarding the prevention of retinopathy and the level of patients' awareness with a p value <0.001

Discussion:

Diabetic Retinopathy is the leading cause of blindness in working-age adults worldwide. **(Al-Esawi & Amer 2019**) It is the most common microvascular complication of diabetes with damage to retinal capillaries (**Alzahrani et al., 2018**) DR leads to additional socioeconomic burdens through reduced productivity and quality of life (**Aly et al, 2021, Cheloni *et al.*, 2019, Olokoba *et al.*, 2017**). DR can be prevented by proper screening and treatment of diabetes. (**Jani *et al.*, 2020**) Tight glycaemic control, early detection, and appropriate treatment are the keys to halting disease progression.(**Chadayan 2021, Said & Hamed 2021, Alzahrani et al., 2018, Srinivasan et al.,2017**) Therefore, the current study aimed to assess type II diabetes patient's awareness and practice regarding prevention of diabetic retinopathy.(**Aly et al.,2022)**

Concerning the sociodemographic characteristics of type II diabetic patients, the current study found that more than half of the sample studied were males, and almost half of them were in the group between the ages of 50-60 years, and they graduated from secondary school, which indicates that they had diabetes. Diabetics were less than five years old and had problems with visual acuity. While most of the patients studied had a family history of diabetes, and control blood sugar levels (HbA1C test). This finding is consistent with **Abel et al., 2021,** and **Aly et al 2022.** While this finding in contrast to **Salaheen et al., 2020**, who which revealed that more than half of the participants were female, the participants had a mean age of 39.13 years and had a primary school certificate. More than a third of the participants had a disease period of 3 to 5 years, the majority developed complications of diabetes, and more than half had a family history of diabetes.

The current study showed that most of the participants had a high level of awareness regarding the prevention of diabetic retinopathy, and this finding concurs with **Al-Harbi et al., 2021** who found a high level of awareness of diabetes and retinopathy while they disagreed with **Elshammaa et al.,2021** who reported that awareness was lower in patients with diabetes.

The present study demonstrated that participants had significantly higher awareness regarding the effects of DM on their eyes and retina, the treatment of diabetic retinopathy to restore normal vision, and the relationship between DR and blindness. These results are attributed, from our point of view to the availability of a lot of materials for health education for all patients in hospitals and the campaigns of the Saudi Ministry of Health or medical universities. These findings consist of **Al-Harbi et al., 2021** who demonstrated a high level of self-awareness reported among diabetic patients with DM affecting the eye, with more than two-thirds realizing that DR can lead to blindness and almost all aware that DR. It can affect the retina.

This finding is also supported by **Gupta et al., 2018**, who show that most of the diabetic participants were aware that DM causes eye problems, about half were aware of the relationship between diabetes to retinopathy, and less than two-thirds were aware that diabetic retinopathy causes blindness. Moreover, **Khojah et al.2020**, and several researchers stated that a large percentage of patients were aware that retinopathy was a consequence of diabetes(**Alharbi et al., 2021; , Alamri et al., 2021, Alharbi & Alhazmi 2020, Konstantinidis 2017,** and **Zarea 2016**).

With regard to patients' awareness of glycemic control, more than half of the participants in the current study were not aware that glycemic control could stop the development of DR. Consistent with our findings, a study by **Aly et al.2021, Venugopal et al.,2020, Assem et al., 2020,** and **Konstantinidis et al., 2017** revealed that diabetic patients were not aware of the treatment options for DR despite sufficient knowledge. Moreover, in a study by **Gupta et al., 2018,** and **Assem et al., 2020** who stated that the participants were unaware that eye problems could be controlled or prevented by controlling blood sugar. On the contrary, the results of several other researches confirmed that poor glycemic control is associated with exacerbation of their diabetic retinopathy **Alharbi et al.,2021, Alharbi et al.,2021, Khojah et al.2020,** and **Venugopal et al.2020**.

The results of the current study revealed that less than a tenth of the sample studied reported that repeat eye exams for diabetic patients should be performed every 6 months. While almost half of them reported that eye examinations should be every two years. This results agreed with by **Arej et al.,2019** who reported that the majority of participants reported that diabetic patients should perform vision examination within two year. On the contrary, **Khoja et al 2020** revealed that the majority of the patients studied stated that regular eye examinations are necessary for managing their diabetes.

Regarding the primary source of patients' information about prevention of DR was physicians, followed by nurses. This result is consistent with **Aly & Omairan 2023, Aly et al., 2021, Mersha et al.,2021** and **Alharbi et al., 2021** who clarified that physicians and ophthalmologists described as the most common sources of information about patient awareness regarding prevention of diabetic retinopathy. This result is comparable with other three studies **Alharganet al., 2019,** and **Bakkar al., 2017** who found that physicians were the primary source of information on DR in more than half of diabetics, followed by family and friends. This also reinforced by various studies **Alamri et al., 2021, Venugopal et al.2020, Manu *et al.*, 2019, Srinivasan et al.,2017,** and **Hussain et al.,2016,** reporting similar results and stated that doctors can be the best source of information about risk factors for diabetes and how to prevent the development of DR.

Regarding the patients' practices about prevention of diabetic retinopathy the current study findings clarified that almost half of the studied sample had a fundus examination during the past year, referred to an ophthalmologist through their general practitioner, and most of them took their medication regularly, and half of the participants regularly monitored their blood glucose levels. While two-thirds of the studied sample did not consider regular follow-up visits to an ophthalmologist in their treatment plan, did not follow a diet regimen, did not control their weight and reduced carbohydrates, in addition to the majority of them did not follow an exercise schedule to control diabetes and prevent diabetes mellitus.

These result is consistent with **Aly & Omairan 2023, Aly et al.,2021, Albaiuomy et al., 2019, and Konstantinidis et al., 2017** who found that less than two-thirds of the participants reported that patients with diabetes should have a vision test every two years or less, and most had a vision test within the past year which is consistent with the lower level of practice reported by **El-Kebbi et al., 2021, Arej et al.,2019** and **Khan et al.,2017**.

On the contrary **Farooq & Bapar 2021** stated that more than half of the diabetic patients they studied had regular follow-up visits to their physician and were following a dietary schedule to control their diabetes. However, his finding agree with the current study is that the majority of patients do not follow the exercise schedule to control their diabetes. **Jani et al.,2021** who also disagree with the findings of the current study, stated that more than half of diabetic patients had never had a fundus exam before, but a third were going for a regular exam. Diabetics use measures to control blood sugar through regular exercise, weight control, and reduced carbohydrate control, which is consistent with the current study only to use regular blood tests to control DM and prevent DR.**(Jani *et al.*, 2021)**

The current study found a highly statistically significant relationship between patient awareness and practice related to the prevention of DR. This is in the same line with **Srinivasan et al.,2017** who indicates that awareness of diabetic retinopathy is significantly associated with good practice. Moreover, the present results are consistent with **Elshammaa et al., 2022** who reported a highly significant correlation between the patients' awareness and practice.

The present study reflected a highly significant positive correlation was found between patient' awareness regarding the prevention of retinopathy and the sociodemographic characteristics mainly in items of age, level of education, glycemic control level, and the effect of visual acuity. While there was no significant correlation between diabetic patients` awareness and sociodemographic characteristics in relation to the gender, duration of DM, and family history of DM. These results are consistent with **Manu et al., 2019** found no significant associations between diabetics awareness and sociodemographic characteristics related to gender and duration of diabetes. This is supported by **Venugopal et al.2020** who found that sex and duration of diabetes were not associated with patients' awareness of diabetic retinopathy. Whereas in the same research, there was a contradiction with our findings regarding the lack of a significant relationship between age and patients' awareness.

Contrary to the results of the current study, **Al-Harbi et al., 2021** revealed that the level of awareness is associated with and affected by the gender of the patient while it is not affected by age. While in the same research, there was an agreement with our findings regarding a significant relationship between awareness and patient education. **(Alharbi *et al.*, 2021)**

Finally, the finding of the current study shows a highly significant correlation between patients' practices regarding the prevention of retinopathy and the sociodemographic characteristics mainly in items of age, gender, level of education, family history of diabetes, glycemic control level, and the effect of visual acuity. While there was no significant correlation between diabetic patients` practice scores and sociodemographic characteristics of diabetic patients with respect to the duration of D.M. The current finding also agrees with **Elshammaa et al., 2022** who reported a significant association between sociodemographic variables and practice, and **Qi et al.2022,** who found a significant relationship between educational level and level of

practice. In addition to positive effect of high educational levels on practice was reported by **Jani et al.,2022, Venugopal et al.,2020, Bakkar et al., 2017, Srinivasan et al.,2017, Mosa al., 2019, Fallatah 2018,**and **Hussain et al.,2016.**.

Moreover, younger age relation with good practice was supported by **Zarea 2016**. Positive significant relation between the level of education and patients' practice about DR concurred with Mersha et al **Alharganet al., 2019,and Khojah et al., 2020**. This also is consistent with **Aly et al., 2021** who found a highly significant association between sociodemographic data with practice in relation to age, gender, family history of diabetes, educational level, and the effect of DM on patients' vision. This finding is also supported by **Konstantinidis et al. 2017** who stated that the practice was associated with age, gender, and patient level of education.

Limitation of the study

The preparation of this research did not include several settings or multiple regions, therefore, the results of the study cannot be generalized. Future research should cover multiple areas. Additional research is required to highlight factors other than those investigated in this study. Despite these limitations, the study provides new information that sheds light on the major and common microvascular complications of type II diabetes and the importance of improving patient awareness and practice regarding diabetes and DR prevention.

Conclusion:

In the light of the present study, type II diabetic patients had a good level of awareness and poor level of practice regarding the prevention of diabetic retinopathy. There is a highly significant positive correlation found between the studied sample level of awareness and practice regarding prevention of DR. The factors such as age, level of education, glycemic control level, and the effect of visual acuity affecting the awareness and practice of type II diabetic patients regarding the prevention of diabetic retinopathy while there is a highly significant correlation between the patient practice with the items of gender and family history of diabetes.

Recommendation:

Based on the findings of the present study, the following recommendations were suggested:

- Strengthening the study to implement educational programs to improve the awareness and practice of patients with type II diabetes about diabetic retinopathy.
- Establish health education units within hospitals to improve patient awareness and practice
- Continuing education regarding diabetic retinopathy for newly diagnosed patients with type II diabetes.
- Establishing an educational platform to increase awareness and practices of patients with type II diabetes regarding the prevention of retinopathy.
- Repeat the study on a larger probability sample in different region and settings to generalize the results.

Acknowledgment

The researchers would like to thank the patients who volunteered to participate in this study. Finally, we would like to express our sincere gratitude to the hospital directors and senior nurses of hospital for their cooperation in conducting research in diabetes clinics.

Conflict of interest

The researchers sustain that the publishing of the current study does not include any conflicts of interest.

Funding

None

References

Abel, A. C. R., Issifou, A. B. A., & Zabdi, S. (2021). Knowledges, Attitudes and Practices of Diabetic Patients Face to Diabetic Retinopathy in Parakou in 2019. Ophthalmol Res, 4(1), 1-6.

Al Dawish A., and Robert A., (2020) "Diabetes Mellitus in Saudi Arabia Challenges and Possible Solutions," no. January, https://www.researchgate.net/deref/https%3A%2F%2Fdoi.org%2F10.1007%2F978-3-319-74365-3_45-1

Al Zarea B. K. (216) "Knowledge , Attitude and Practice of Diabetic Retinopathy amongst the Diabetic Patients of AlJouf and Hail Province of Saudi Arabia," no. Appendix 1, pp. 5–8, doi: 10.7860/JCDR/2016/19568.7862.

Alamri A., Al-Jahash N., Alsultan M., AlQahtani S. , Saeed Y., & Alhamlan R. (2021) "Awareness, knowledge, and practice regarding to diabetic retinopathy among KKU students besides medical students in Abha, Saudi Arabia," J. Fam. Med. Prim. Care, vol. 6, no. 2, pp. 169–170, doi: 10.4103/jfmpc.jfmpc.

Albaiuomy M., Bedier N., and El Hafeez N.(2019) Self Care Practices among Patients with Diabetic Retinopathy, IOSR-JNHS, V:8, No. 5 Ser. X. (Sep-Oct .2019), PP 33-43 DOI: 10.9790/1959-0805103343

Al-Esawi H. A., and Amer S. A. (2019)"Prevalence of Complications among Saudi Males type 2 diabetic Patients in Riyadh Primary Health Care Centers, 2019," Diabetes Updat., vol. 7, pp. 1–11, 2021, doi: 10.15761/DU.1000158.

Alharbi M., Al-Barry M., Alshawawreh M., Almatrafi O. , Algethami T., Almatrafi M., Alqelaiti Y., Alsehli M.(2021) 'Awareness, knowledge, and attitude of diabetic retinopathy among diabetic patients in Madinah, Saudi Arabia', International Journal of Medicine in Developing Countries, pp. 1370–1378. doi: 10.24911/ijmdc.51-1613759319.

Alharbi, A. M. D. and Alhazmi, A. M. S. (2020) 'Prevalence, Risk Factors, and Patient Awareness

of Diabetic Retinopathy in Saudi Arabia: A Review of the Literature', Cureus. doi: 10.7759/cureus.11991.

Alhargan M. H., Albaker K. M., Alfadhel A. A., Alghamdi M. A., Almuammar S. M., and Aldawood H. A., (2019)"Awareness , knowledge , and practices related to diabetic retinopathy among diabetic patients in primary healthcare centers at Riyadh , Saudi Arabia," pp. 373–377, doi: 10.4103/jfmpc.jfmpc.

AlSawahli H., Mpyet C., Ezzelarab G., I. Hassanin, Shalaby M., Safa O., Almansour A. (2021) 'Population- - based cross- - sectional prevalence survey of diabetes and diabetic retinopathy in Sohag', BMJ Open, pp. 1–7. doi: 10.1136/bmjopen-2020-047757.

Aly A. A., Gaballah S., Elmanzalawy S., ElGammal W. E. S., & Hafez G. E. (2021). Type 2 diabetes patient's awareness and KAP regarding diabetic retinopathy: Cross-sectional multinational study from the Middle East. International Journal of Health Sciences, 6(S8), 2936–2956. https://doi.org/10.53730/ijhs.v6nS8.12630

Aly A. A., Qalawa, S. A. and Shrief S. E. (2022) 'Impact Of Diabetic Retinopathy Prevention Instructional Scheme On Patient ' s Performance', Journal of Positive School Psychology. Vol: 6(8), pp. 1481–1497.

Aly A., and Omairan A. (2023) Efficacy of Instructional Platform Regarding Prevention of Retinopathy on Type II Diabetic Patient's Knowledge, Attitude, and Practice, History of Medicine, 2023, 8(2): 1–11, DOI: 10.17720/2409-5834.v8.2.2023.001

Alzahrani s, Bakarman M., Alqahtani S. , Alqahtani M., Butt N., Salawati E., Alkatheri A., Malik A., and Saad K. "Awareness of diabetic retinopathy among people with diabetes in Jeddah, Saudi Arabia," Ther. Adv. Vaccines, vol. 9, no. 4, pp. 103–112, doi: 10.1177/2042018818758621

Arej N., Antoun J., Waked R., Saab C., Saleh M., and Waked N.(2019) "Screening for diabetic retinopathy by non-mydriatic fundus photography: First national campaign in Lebanon," *J. Fr. Ophtalmol.*, vol. 42, no. 3, pp. 288–294, doi: 10.1016/j.jfo.2018.12.005.

Assem A., Tegegne M., Alemu D., Woredekal A. and Tefera T.(2020) Knowledge about diabetic retinopathy, eye check-up practice and associated factors among adult patients with diabetes mellitus attending at debark hospital, Northwest Ethiopia, BMC Ophthalmology. 20:453 pp. 2-11. https://doi.org/10.1186/s12886-020-01730-4

Bajaber B. A. and Alshareef M. A. (2021) "Correlates of diabetic retinopathy in type 2 diabetes mellitus patients in Makkah Al-Mukarramah, Saudi Arabia," J. Fam. Community Med., vol. 28, no. 1, pp. 8–16, , doi: 10.4103/jfcm.JFCM-334-20.

Bakkar M. M., Haddad M. F., and Gammoh Y. S.(2017) "Awareness of diabetic retinopathy

among patients with type 2 diabetes mellitus in Jordan," *Diabetes, Metab. Syndr. Obes. Targets Ther.*, vol. 10, pp. 435–441, doi: 10.2147/DMSO.S140841.

Chadayan C. (2021) 'Effect of Nurse Led – Educational Intervention on Knowledge among Diabetes Mellitus Patients', International Journal of Scientific Research, 10(January), pp. 1–2. doi: 10.36106/ijsr/0111053.

Cheloni R. ,Gandolfi S., Signorelli C. Odone A. (2019) 'Global prevalence of diabetic retinopathy : protocol for a systematic review and meta-analysis', BMJ Open; 9(3):e022188. doi: 10.1136/bmjopen-2018-022188.

El-Kebbi IM, Bidikian NH, Hneiny L, N. M. (2021) 'Epidemiology of type 2 diabetes in the Middle East and North Africa: Challenges and call for action', World J Diabetes, 12(9), pp. 1363–1586. doi: https://dx.doi.org/10.4239/wjd.v12.i9.1401.

Elkjaer, A. S., Lynge, S. K. and Grauslund, J. (2020) 'Evidence and indications for systemic treatment in diabetic retinopathy: a systematic review', Acta Ophthalmologica, pp. 329–336. doi: 10.1111/aos.14377.

Elshammaa K., Hamza N., Elkholy E., Mahrous A., Hassan M., and Elrggal M. E. (2022) "Knowledge , attitude, and perception of public about participation in COVID-19 clinical trials : A study from Egypt and Saudi Arabia," *Saudi Pharm. J.*, vol. 30, no. 3, pp. 283–290, doi: 10.1016/j.jsps.2022.01.008.

Fallatah M. O. (2018) "Knowledge , Awareness , and Eye Care-Seeking Behavior in Diabetic Retinopathy : A Cross-Sectional Study in Jeddah , Kingdom of Saudi Arabia," *Ophthalmol. Ther.*, vol. 7, no. 2, pp. 377–385, doi: 10.1007/s40123-018-0147-5.

Farooq F. & Bapar S. H. (2021). Knowledge, Attitude and Practices of Diabetic Retinopathy in Diagnosed Diabetic Patients: A Descriptive Study. Saudi J Med Pharm Sci, 7(1), 7-14. DOI: 10.36348/sjmps.2021.v07i01.003.

Gupta, S., Gupta, I. and Kalra, S. (2018) 'Study of awareness of diabetic retinopathy among the patients of type 2 diabetes mellitus : A prospective study', 4(4), pp. 483–486. doi: 10.18231/2395-1451.2018.0108.

Hosseini, S., Shamsi M. , Khorsandi M. , Moradzadeh R. (2021) 'The effect of educational program based on theory of planned behavior on promoting retinopathy preventive behaviors in patients with type 2 diabetes ' Endocrine Disorders:, pp. 17–21. DOI: 10.1186/s12902-021-00680-2

Hussain R., Rajesh B., Giridhar A., Gopalakrishnan M., and Sadasivan S. (2016)"Original Article Knowledge and awareness about diabetes mellitus and diabetic retinopathy in suburban population

of a South Indian state and its practice among the patients with diabetes mellitus : A population - based study," 2016, doi: 10.4103/0301-4738.182937.

Jani C., Desai T., Kapadia F., Dave H., Shah A., Patel V., Patel A., Jani R., Shah D., and Pandya J.(2021) 'Knowledge attitude practice study of diabetic retinopathy', Int Surg J.;8(1), pp. 54–62. DOI: https://dx.doi.org/10.18203/2349-2902.isj20205422

Khalaf F. R.,. Fahmy H. M, Ibrahim A. K., Mohamed G. A, Ez eldeen M. E., Elkady A., & Hetta H.F. (2019)Does a diabetic retinopathy educational program raise awareness among elderly diabetic patients ?, Diabetes Metab Syndr Obes 12: 1867–1875 doi: 10.2147/DMSO.S208072.

Khan A., Petropoulos I. N., Ponirakis G., and Malik R. A. (2017) "Visual complications in diabetes mellitus: beyond retinopathy," *Diabet. Med.*, vol. 34, no. 4, pp. 478–484, doi: 10.1111/dme.13296.

Khojah M. S.., L. Bashamakh, F. Aljawi, A. Al-ghamdi, I. Oudah, M. Saeed, S. Jabril, A. Kamal, and A. Ahmed (2020) "Awareness Of Diabetic Eye Diseases Among Diabetic In-Patients At King," vol. 8, no. 02, pp. 471–476, doi: 10.21474/IJAR01/10483.

Konstantinidis L., Ancos d., Chinet E., Traub L. H., Zuercher I., Bridevaux E. P. (2017)"Awareness and practices regarding eye diseases among patients with diabetes: A cross sectional analysis of the CoDiab-VD cohort," *BMC Endocr. Disord.*, vol. 17, no. 1, 2017, doi: 10.1186/s12902-017-0206-2.

Mersha G. A., Alimaw Y. A., Woredekal A. T., Assaye A. K., and Zeleke T. C. (2021) "Awareness and knowledge of diabetic retinopathy in diabetic patients at a General Hospital in Northwest Ethiopia," *SAGE Open Med.*, vol. 9, p. 205031212110549, doi: 10.1177/20503121211054994.

Mosa H. E. , Omar A. M., Salih S. A. , and. El Azab E. F (2019) "Diabetes Mellitus Risk Assessment Among Egyptians Versus Saudi Arabians Nursing Employees: Comparative Study," *J. Heal. Med. Nurs.*, vol. 59, no. January, pp. 19–29, doi: 10.7176/JHM.

Olokoba L. B., Mahmud O. A., Adepoju F. G., Olokoba A. B. (2017) 'Awareness of Diabetic Retinopathy among patients with Diabetes Mellitus in Ilorin, Nigeria', Sudan Journal of Medical Sciences, 12(2), p. 89. doi: 10.18502/sjms.v12i2.919.

Pande G S, Tidake P (2022) Laser Treatment Modalities for Diabetic Retinopathy. Cureus 14(10): e30024. DOI 10.7759/cureus.30024

Qi, J.-Y., Zhai G. , Wang Y. 1, Liang Y., Li D. , Wen L. , Zang D. , Feng K. , Zang B. , Xie C. (2022) 'Assessment of Knowledge , Attitude , and Practice Regauan-Bo Liang2 , Dong Li 1, Liang Wen11, Jin-Yan Qirding Diabetic Retinopathy in an Urban Population in Northeast China', 10(March), pp. 1–7. doi: 10.3389/fpubh.2022.808988.

Safwat A. Mohamed R. Abdullah, I. and Abdulmutalib, M. (2018) 'Effect of Nursing Guidelines on Improving Knowledge and Relieve Anxiety of Diabetic Patients with Retinopathy'. International Journal of Novel Research in Healthcare and NursingVol. 5, Issue 2, pp: (147-157), Month: May - August 2018.

Said H. S. & Hamed M. S.(2021) "Effect of an Interventional Program on Diabetic Patients' Awareness Regarding Diabetic Retinopathy ," *Egypt. Fam. Med. J.* , vol. 5, no. 1, pp. 82–94.

Salahen, S. A., Abd Alla, M., Kanna, S. A. A. A., & Nour, S. M. (2020). Effect of Instructional Educational Programme on Diabetic Patients' Awareness Regarding Diabetes and Diabetic Retinopathy.

Shukla V.; and Tripathy K.., (2022) *Diabetic retinopathy*. StatPearls Publishing LLC.,. Treasure Island (FL): Stat Pearls Publishing. PMID: 32809640.

Spurr S. , Bullin C., Bally J., Trinder K., and Khan S., (2018) 'Nurse-led diabetic retinopathy screening: a pilot study to evaluate a new approach to vision care for Canadian Aboriginal peoples', *International Journal of Circumpolar Health*, 77(1). doi: 10.1080/22423982.2017.1422670.

Srinivasan N. K., John D., Rebekah G., Kujur E. S., Paul P., and John S. S., (2017) "Diabetes and diabetic retinopathy: Knowledge, Attitude, Practice (KAP) among diabetic patients in a tertiary eye care centre," J. Clin. Diagnostic Res., vol. 11, no. 7, pp. NC01–NC07, doi: 10.7860/JCDR/2017/27027.10174.

Thomas R. L., Halim S., Gurudas S., Sivaprasad S., and Owens D. R. (2018) "IDF Diabetes Atlas: A review of studies utilising retinal photography on the global prevalence of diabetes related retinopathy between 2015 and 2018," *Diabetes Res. Clin. Pract.*, vol. 157, p. 107840, 2019, doi: 10.1016/j.diabres.2019.107840.

Venugopal D., Lal B., Fernandes S. (2020) 'Awareness and knowledge of diabetic retinopathy and associated factors in Goa: A hospital-based cross-sectional study', BMC Ophthalmology, 17(1), p. 1. doi: 10.4103/ijo.IJO.

WHO Regional Office for Europe (2020) Diabetic retinopathy screening: a short guide. Increase effectiveness, maximize benefits and minimize harm. Available at: https://apps.who.int/iris/bitstream/handle/10665/336660/9789289055321-eng.pdf.

© ICAS December 2022