Original Article

Effect of Prevention Instructions Regarding Diabetic Retinopathy on Patients' Knowledge, Practices and Attitude

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ABSTRACT

Background: Diabetic retinopathy is the greatest and major micro-vascular diabetic complication, which can lead to preventable blindness and visual impairment among patients. Sufficient knowledge, practices and attitude for Diabetic Retinopathy can prevent serious threatening complications. **Aim** of the current study was to evaluate the effect of prevention instructions regarding diabetic retinopathy on patients' knowledge, practices and attitude. **Study design:** A Quasi-experimental research design was utilized to accomplish this study. **Setting:** The study was carried out at the diabetes clinic at Al-Hussein University Hospital, Cairo, Egypt. **Subjects:** A purposive sample of 140 patients was recruited in the current study. **Tools:** four tools were used for data collection, a structured interview questionnaire was the first tool. The second tool was a patients' knowledge questionnaire. The third tool was patients' self- reported practices questionnaire. The fourth tool was the patient's attitude questionnaire. **Results:** This study showed a significant difference between patients' levels of knowledge, practices and attitude regarding diabetic retinopathy in the pre and post phases of preventive instructions implementation with p=(0.001) and a statistically significant correlation were found between total knowledge and practices (p < 0.001). Moreover, a statistically significant correlation was observed between total practices and attitude post preventive instructions implementation (p < 0.05). Furthermore, there was no statistically significant correlation between total knowledge and attitude post preventive instructions implementation. **Conclusion:** Implementation of the diabetic retinopathy prevention instructions showed a significant improvement in patients' acquisition of knowledge and positive practice, with notable positive improvements in patient attitude. **Recommendations:** Ongoing patient education with the development of specific evidence-based guidelines for the prevention, detection, and management of diabetic retinopathy and endorse in the patients' prevention programs.

Keywords: Prevention instructions, Diabetic retinopathy, Knowledge, Practices, Attitude.

Introduction

Globally, diabetes mellitus (DM) is considered a major medical issue. Diabetes impairs people at their peak years of productivity, which causes a number of long-term problems that have a significant negative impact on the patient, family and society. One of the most ocular complications of diabetes mellitus is diabetic retinopathy with a high risk of severe vision impairment among 10% of patients, which increases with the duration of diabetes. Therefore, 20 years after diagnosis, most patients will have some degree of DR. These complications can cause severe adverse effects, including loss of vision which means physical disability, depression, high financial burden and low quality of life **(Elshemy et al., 2018; Rodriguez et al., 2020).**

The most prevalent and serious micro-vascular consequence of diabetes is diabetic retinopathy, which has a devastating impact on patients' vision and can result in blindness **(Aly et al., 2022)**. The severity and progression of DR are strongly associated with prolonged duration of DM, poor glycemic control, hypertension and hyperlipidemia **(Baumal & Duker, 2018)**. The main stages of DR are three (early and severe nonproliferative, proliferative DR and diabetic macular edema). From a public health perspective, early detection and secondary intervention are essential because vision loss resulting from DR can usually be prevented with timely and effective treatment **(Azeze et al., 2018)**.

The essential elements in management of DR depend on patients' ability to self-care in the daily lives. Knowledge, attitude and practices are effective in providing information for evaluating intervention guidelines, while; strict glycemic control and early detection of diabetic retinopathy are essential to preventing vision loss. Effective screening programs and efforts to control risk factors for DR are critical to delaying disease onset and slowing disease progression, as are highly effective and inexpensive treatments. Using a multidisciplinary approach, primary care physicians and ophthalmologists should follow evidence-based recommendations for screening and monitoring diabetic patients while working to improve glycemic index and blood pressure **(Gale et al., 2021)**.

Patients are the most important decision makers and should be well-instructed to make informed decisions about prevention and treatment. Education is more effective when it is delivered according to the patient's knowledge, practices, and attitude. Diabetes management practices need to disseminate positive and comprehensive awareness models to educate on the importance of diet and exercise for prevention of DR **(Farooq & Bapar, 2021)**.

To win the war on diabetic retinopathy, a paradigm shift in strategic focus and resources must be made from such tertiary treatment to primary and secondary prevention, which are more impactful, and cost-effective for the larger population and include improving patient education and awareness of the risk of DR and its complications, promoting behavioral changes such as physical activity and medication compliance, and blood pressure control **(Wong & Sabanayagam, 2019)**.

Raising awareness about DR enhances the compliance of the patients regarding periodic and ongoing clinical examination, early diagnosis and treatment. Appropriate patient health education is necessary to encourage vulnerable patients to seek correct and timely care **(Geethadevi et al, 2018)**.

The patient must be diagnosed, managed, and followed up on at regular intervals depending on the stage of presentation and should be given accurate information about the prognosis of diabetic retinopathy. Diabetes dysregulation can lead to an exponential worsening of diabetic retinopathy. Lifestyle modifications should be combined with appropriate systemic and topical medications to slow the progression of diabetic retinopathy. Nursing is the first department to contact patients for follow-up. A nurse can monitor treatment, assess compliance with medication and lifestyle changes, and report any problems to the primary care physician. This collaborative, interprofessional therapeutic approach can ensure the best possible outcome for patients **(Shukla & Tripathy, 2022).** So, ophthalmic nurse educator plays an important role to ensure DR patient attain competency and adherence to long-term self-care practice management **(Shaban et al., 2021).**

Significance of the study:

Diabetes is a global public health problem that is expected to affect 642 million adults by 2040, with approximately 75% of those affected living in low- and middle-income countries. Diabetic

retinopathy affects one out of every three diabetics and is the leading cause of blindness in working-age adults **(Wong & Sabanayagam, 2020).** In 2019, Egypt was ranked as the ninth among countries with the highest numbers of adults (aged 20–79) with DM, this is expected to shift up to eighth in 2030 and seventh in 2045, moreover, Egypt was ranked as the third among the countries of the Eastern Mediterranean Region (EMR) with a prevalence of DM reaches up to 17.2% **(International Diabetes Federation, 2019).** DR is the most common diabetic microvascular complication and the leading cause of visual impairment and blindness in those patients. Furthermore, there has been little research into the factors that contribute to the DR **(Seid et al., 2021; Hosseini et al., 2021).**

Since effective long-term treatment of DR is difficult, time-consuming and costly; their prevention is very important. Therefore, it is vital to establish an educational intervention for patients with diabetes regarding self-care practices to encourage them to improve their knowledge and practices toward DR and prevention of further complications **(Shaban et al., 2021).** So, the present study is conducted to evaluate the effects of the prevention instructions on patients' knowledge, practices and attitude regarding diabetic retinopathy. Hopefully, these prevention instructions will help in minimizing the complications of DR.

Aim of the Study

This study aimed to evaluate the effect of prevention instructions regarding diabetic retinopathy on patients' knowledge, practices and attitude through:

1- Assessing patients' knowledge, practices and attitude regarding prevention of diabetic retinopathy.

2- Planning and implementing prevention instructions regarding diabetic retinopathy.

3- Evaluating the effect of prevention instructions regarding diabetic retinopathy on patients' knowledge, practices and attitude.

Hypotheses:

H1: Patients' knowledge regarding prevention of diabetic retinopathy will be improved post prevention instructions implementation compared to pre prevention instructions implementation.

H2: Patients' practices regarding prevention of diabetic retinopathy will be improved post prevention instructions implementation compared to pre prevention instructions implementation.

H3: Patients' attitude regarding prevention of diabetic retinopathy will be improved post prevention instructions implementation compared to pre prevention instructions implementation.

Subjects and methods

I. Technical design:

Research design: A quasi-experimental research design was used in this study.

Setting:

The study was carried out in the diabetes clinic at Ain Shams university hospital, Cairo, Egypt. Diabetes clinic is located on the first floor of the hospital.

Sample:

A purposive sample of 140 patients, from total 220 patients attended at the above mentioned setting,

they were selected according to the following **inclusion criteria:**

- Adult patients diagnosed with diabetes not diagnosed with diabetic retinopathy.

- Willing to participate in the study.

Sample size calculation:

The sample size was calculated by adjusting the power of the test to 80%, and the confidence interval to 95% with a margin of error accepted adjusted to 5% using the following equation:

Type I error (α) = 0.05%
Type II error (B) = 0.20%
With power of test 0.80%

$$n = \frac{N \times p(1-p)}{[[N-1 \times (d^2 \div z^2)] + p(1-p)]}$$

Nxp (1-p) =(220*(0.5*(1-0.5)
N-1   =(220-1)*
d^2/z^2 =0.0025 / 3.8416+
p (1-p)   =0.5*(1-0.5)
N   = 140.1= 140

N= Community size

z= Class standard corresponding to the level of significance equal to 0.95 and 1.96

d= The error rate is equal to 0.05

P= Ratio provides a neutral property = 0.50 (**Suresh & Chandrashekara, 2012**).

Tools for data collection:

Four tools were used to collect data during the pre and post stages to assess the effect of prevention instructions implementation on diabetic retinopathy patients' knowledge, practices and attitude:

Tool I: Structured interview questionnaire:

It was developed based on recent literature (**Hinkle & Cheever, 2017**) and filled in by the researchers. It was written in simple Arabic and was used to evaluate the demographic data and medical history of the studied sample. It included two parts:

Part I: Patients' demographic characteristics as: Age, gender, educational level, marital status and monthly income.

Part II: Patients' medical history, such as: history and type of chronic diseases, type and duration of diabetes mellitus, type of complications of diabetes.

Tool II: Patients' knowledge questionnaire:

This questionnaire was adapted from **Mohammed et al. (2021).** It was written in simple Arabic to assess patients' level of knowledge regarding diabetes and diabetic retinopathy. It included 32 multiple choice questions with main 3 domains: patients' knowledge about diabetes mellitus (12 items), knowledge about diabetes management and complications (9 items) and knowledge about diabetic retinopathy (11 items).

Scoring system of patients' knowledge questionnaire:

Each correct answer had score 1 and the incorrect answer had score zero. Total score of knowledge ranged from 0 to 32 degrees and were categorized as:

- Satisfactory if the total score is 75% or more.

- Unsatisfactory if the total score less than

   75 %   (**Aly et al, 2021**)

Tool III: Patients' self- reported practices questionnaire

This questionnaire adapted from **(Srinivasan et al., 2017)** to assess patients' practices regarding prevention of diabetic retinopathy. It included 6 questions regarding self-monitoring of blood glucose level, taking medication for diabetes as doctor order, following appropriate dietary intake, following regular exercise schedule, going for regular follow up and going for a periodic regular eye checkup.

A scoring system of patients' self- reported practices questionnaire:

Each done step had score 1 and not done step had score zero. Total score of practices ranged from 0 to 6 degrees and were categorized as:

- Satisfactory if the total score is 80% or more.
- Unsatisfactory if the total score less than 80 %   **(Said & Hamed, 2021)**

Tool IV: Patients' attitude questionnaire

This questionnaire adapted from **(Almalki et al. 2018)** to assess patients' attitude regarding prevention of diabetic retinopathy. It included 7 items regarding practicing enough exercise, eating sweets, forgetting medicines sometimes, regular checkup is necessary, regular eye checkup is important, prevention of diabetic retinopathy if diabetes is treated appropriately and prevention of blindness in diabetic retinopathy by treatment.

This questionnaire contained 2 negatively worded statements which were reversely scored (eating sweets and forgetting medicines sometimes).

Scoring system of patients' attitude questionnaire:

Each item was scored on point Likert scale from (0=disagree) and (1=agree). Total score ranged from 0 to 7 degrees and were categorized as:

- Positive attitude if the total score is 75% or more.
- Negative attitude if the total scores less than 75%.   **(Said & Hamed, 2021)**

II. Operational design:

a- Preparatory phase:

It includes reviewing the available literatures and diverse studies related to diabetes and diabetic retinopathy using books, articles and internet to develop the study tools for data collection.

Content Validity

The study tools were tested for validity by a panel of 3 experts from the Faculty of Nursing (Medical Surgical Nursing) for judgment of clarity, comprehensiveness, relevance of sentences and appropriateness of content.

Reliability of the tools

All tools used in the present study showed good reliability. It's calculated as follows: patients' knowledge questionnaire Cronbach's Alpha = **0.86,** patients' self-reported practices questionnaire = **0.84** and patient attitude questionnaire Cronbach's Alpha = **0.76**

Ethical Considerations

Prior to collecting the data an informed oral consent was obtained. Patients also received the information on this study, including the purpose,

benefits of this study and data collection procedures. Patients were informed about their rights to refuse or withdraw at any time. Also, they were assured that the information given will be remained confidential and used for the research purpose only.

b- Pilot Study

A pilot study was conducted on 10 % (14) of the patients to test the applicability and the clarity of the tools and estimate the time needed to fill in the tools, necessary modifications were done with the tools and those who participated in the pilot study weren't excluded from the main study sample.

c- Field Work

Data collection was completed within 6 months from the beginning of January 2022 to end of June 2022 and done through the following steps:

- The researchers interviewed the patients then introduced themselves to them. They were available at the clinic two days /week from 9 a.m. to 1.00 p.m. and interview about 17- 18 patients each day.

- The data were collected pre and post prevention instructions implementation. The time needed for collecting the study tools was about 35-45 minutes for each patient.

The prevention instructions regarding diabetic retinopathy were constructed in four phases as the following:

1. **Assessment phase:**

The initial stage was done by using pretest to assess patients' knowledge, practices and attitude regarding diabetic retinopathy and determine the baseline data and prepare for sessions of prevention instructions. It takes two months.

2. **Planning phase:**

• Based on the outcome of the assessment phase, the prevention instruction sessions were designed after reviewing of the related literature. Detected needs and deficiencies were changed into aim of the study.

• The booklet included knowledge about diabetes mellitus and diabetes complications as diabetic retinopathy and knowledge about diabetic retinopathy as meaning, risk factors, signs and symptoms, diagnosis, prevention and treatment. The teaching methods were lectures, and group discussions and teaching media were booklet and pictures.

3. **Implementation phase:**

• It takes about two months. At this phase, the patients were divided randomly into 8 groups, each one consisted of 17-18 patients, and the instructions were applied through three sessions for each group (2 of them were theoretical and 1 practical session). The duration of each session was about 30-45 minutes.

In this phase, the implementation of prevention instructions included two parts:

• The theoretical part was given through 2 sessions for each group. These teaching sessions

were done in groups. The researchers used the booklet which was printed and disseminated to patients. As well, lectures (power point presentation) and group discussion were used.

- The first theoretical session included knowledge about diabetes mellitus, management of diabetes, diabetic complications, DR definition, causes and risk factors, symptoms, prevention, complications of untreated DR and methods for treatment.

- The second theoretical session included instructions about prevention of diabetic retinopathy as appropriate eye care, glycemic control, adherence to medication schedule, adherence to proper nutrition, appropriate physical activity, regular follow up, regular eye examinations and visits to ophthalmologists, as well, taking antihypertensive medications and smoking cessation.

- The practical part was given through 1 session for each group. The researchers used demonstration and redemonstration as a teaching method. It focused on improving patients' practices to prevent DR as self-monitoring of blood glucose level and performing proper eye care.

4. Evaluation phase:

- This phase was done through using the same tools of pre-test. After completing all sessions, a post-test was done to evaluate the effect of the prevention instructions regarding diabetic retinopathy on patients' knowledge, practices and attitude.

III. Administrative design

The official permission was obtained from the administrator of Al-Hussein University Hospital, Cairo to conduct the study in diabetic outpatient clinic. This by letters of request delivered to them from Faculty of Nursing, Helwan University, with an explanation of the aim and expected outcome of the study.

Results

Data were analyzed using statistical package for the social sciences (SPSS Windows, Institute of Statistics, Cairo University, Egypt), version 20. Numerical data were expressed as mean±SD and range. Relations between different numerical variables were tested using Pearson's correlation. P value less than 0.05 was considered significant and less than 0.001 was considered as highly significant.

Table (1): Shows that (57.1%) of patients' age ranged from 50 to 65 years, with a mean of $48.91\pm$ 10.93 years. It was clear from this study finding that 67.9% of the patients were females. As regards to educational level (39.3%) didn't read or write. Moreover, 64.3% of the patients were married.

Fig. (1): Display that (65.7%) of study patients had insufficient income for diabetic treatment expenses.

Table (2): Reveals that (60%) of the studied patients were suffering from hypertension. As regards to type of diabetes mellitus (92.9%) had type 2 diabetes. Moreover, (77.1%) of the patients were suffering from diabetes mellitus for more 10

years ago and (85.7%) of them had complications of diabetes mellitus.

Fig. (2): Reveals that (72.8%) of the studied patients had neuropathy complications, while, (23.5%) of them had vision problems.

Table (3): Elaborates that, before implementation of the prevention instructions, the mean scores of total knowledge showed low level of knowledge (17.48 + 4.11), However, after implementation of the prevention instructions, the mean difference score for total knowledge was (26.16 + 2.82) and it was higher than the score before implementation with a high statistically significant difference (P≤ 0.001).

Fig. (3): Shows that (90.0%) of the studied patients had an unsatisfactory level of knowledge pre implementation of prevention instructions, while, (72.9 %) of them had a satisfactory level of knowledge post implementation of prevention instructions.

Table (4): Shows that, there was a high statistically significant difference between total practices mean scores of the studied patients pre and post implementation of prevention instructions for diabetic retinopathy as regard self-monitoring of blood glucose level, taking diabetes medical treatment, practicing exercise, regular checkups, having the diabetic diet, appropriate, follow up to monitor blood glucose and preforming a periodic eye examination with (p ≤ 0.001).

Fig. (4): Reveals that, (68.6%) of the studied patients had Unsatisfactory practices and (31.4%) of them had satisfactory practices regarding diabetic retinopathy pre implementing the prevention instructions. While, (82.1%) of the studied patients had competent practices and (17.9%) of them had incompetent practices regarding diabetic retinopathy post implementing the prevention instructions.

Table (5): Shows that, there was a highly statistically significant difference between the total attitude mean scores of the studied patients pre and post implementation diabetic retinopathy prevention instructions with (p ≤ 0.001).

Fig. (5): Reveals that (93.5%) of the studied patients had positive attitude post prevention instructions implementation compared to (61.4%) of them had positive attitude pre prevention instructions implementation.

Table (6): Shows that, there were a statistically significant correlation between total knowledge and practices scores and between total practices and attitude scores post prevention instructions implementation (**p ≤ 0.05**). Whereas, there was no statistically significant correlation between total knowledge and attitude scores post prevention instructions implementation.

Table (1): Frequency and percentage distribution of the studied patients according to their demographic characteristics (N=140).

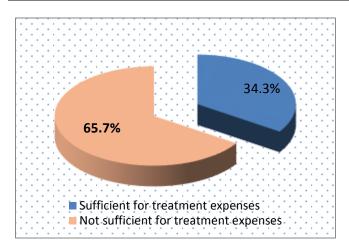| Patients' characteristics		No	%
Age	18 < 30	6	4.3
	30 < 40	19	13.6
	40 < 50	35	25.0
	50 ≤ 65	80	**57.1**
Mean ± SD	49.21 ± 9.75		
Gender	Male	45	32.1
	Female	95	**67.9**
Educational level	Don't read or write	55	**39.3**
	Primary education	14	10.0
	Secondary education	40	28.6
	University education	28	20.0
	Postgraduate	3	2.1
Marital status	Single	6	4.3
	Married	90	**64.3**
	Divorced	10	7.1
	Widow	34	24.3

Figure (1): Percentage distribution of the studied patients according to their income (N=140).

Table (2): Frequency and percentage distribution of the studied patients according to their medical history (N=140).

Patients ' characteristics	No	%
History of chronic diseases *		
Hypertension	84	**60.0**
Kidney disease	21	15.0
Heart disease	23	16.4
Chronic obstructive pulmonary diseases	5	3.5
Type of diabetes mellitus		
Type 1 DM	9	6.4
Type 2 DM	130	**92.9**
Gestational DM	1	0.7
Duration of the disease		
≤ 10 years	108	**77.1**
11-20 years	28	20.0
21-30 years	4	2.9
Complications of DM		
Yes	120	**85.7**
No	20	14.3

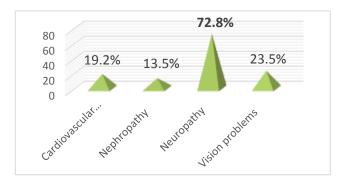*** This variable isn't mutually exclusive**

Figure (2): Percentage distribution of the studied patients, according to type of diabetes mellitus complications (N=140).

Table (3): Comparison of mean scores of knowledge of the studied patients pre & post prevention instructions implementation (N=140).

Items	Pre	Post	T test	P value
	Mean ± SD	Mean ± SD		
Patients' knowledge about diabetes mellitus (12 items)	7.60 ± 1.501	8.98 ± 1.20	9.55	0.000**
Patients' knowledge about diabetes complications (9 items)	5.93 ± 1.46	7.17 ± 1.44	8.64	0.000 **
Patients' knowledge about diabetic retinopathy (11 items)	3.94 ± 2.28	8.26 ± 1.71	19.98	0.000 **
Total mean scores	17.48 ± 4.11	26.16 ± 2.82	23.12	0.000 **

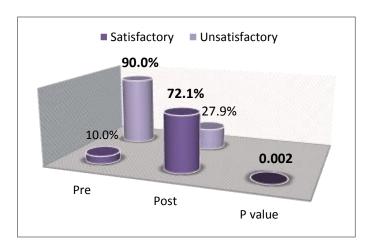*** * Highly significant (S)   p ≤ 0.001**

Figure (3): Comparison of total satisfactory & unsatisfactory level of patients' knowledge pre and post prevention instructions implementation (N=140).

Table (4): Comparison of practices scores of the studied patients pre & post prevention instructions implementation (N=140).

Items	Done			
	Pre		Post	
	No	%	No	%
- Self-monitoring of blood glucose level	75	53.5	123	87.8
- Take diabetes medical treatment as doctor order.	85	60.7	119	85.0
- Practice exercises to control diabetes.	77	55.0	127	90.6
- Have the diabetic diet as doctor order.	90	64.2	132	94.2
- Follow up to monitor blood glucose level as doctor order.	95	67.8	135	96.4
- Preform a periodic eye examination	44	31.4	88	62.8
Total practices mean scores	2.76 ± 1.32		3.61 ± 1.12	
	T test 7.80 P value 0.000**			

** Highly significant   (S)   p ≤ 0.001**

Figure (4): Comparison of total satisfactory & Unsatisfactory practices of the studied patients pre and post prevention instructions implementation (N=140).

Table (5): Comparison of attitude scores of the studied patients pre & post prevention instructions implementation (N=140).

Items	Agree			
	Pre		Post	
	No	%	No	%
- Practicing enough exercise is important.	108	77.1	133	95.0
- Having sweets occasionally is correct. *	30	21.4	0	0.0
- Forgetting taking medicines sometimes is alright. *	42	30.0	0	0.0
- Even if blood glucose is controlled, a regular checkup is necessary	105	75.0	122	87.1
- Even if there's no problem in eyes, regular eye checkup is important,	90	64.2	113	80.7
- Diabetic retinopathy can be prevented if the diabetes is treated appropriately.	110	78.5	137	97.8
- Blindness in diabetic retinopathy can be prevented by treatment	85	60.7	119	85.0
Total attitude mean score	2.38 ± 2.036		4.07 ± 1.86	
	T test 4.371 P value 0.001**			

**   Negatively scored items**

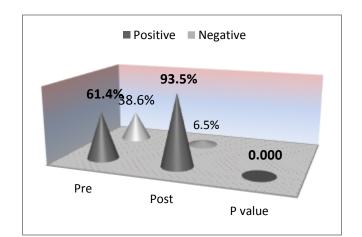** Highly significant   (S)   p ≤ 0.001**

Figure (5): Comparison of total positive & negative attitude scores of the studied patients pre and post prevention instructions implementation (N=140).

Table (6): Correlation between total satisfactory knowledge of the studied patients, competent practices and their attitude post prevention instructions implementation (N=140).

Items	Correlation coefficient	P value
Knowledge and practices scores	0.285	0.002*
Knowledge and attitude scores	0.087	0.408
Practices and attitude scores	0.301	0.012*

* Significant (S)   p $\leq$ 0.05

Discussion

Visual impairment secondary to diabetic retinopathy is a major public health problem, so, attention must be focused on primary and secondary prevention strategies rather than tertiary treatment that patients can use more frequently. These include raising patients' awareness of the risk factors for DR and its complications, educating them, encouraging practice changes like exercise, physical activity, and medication compliance, controlling blood pressure and blood sugar levels, and implementing systemic screening programs for DR detection.

Regarding the demographic characteristics among the studied patients, more than half of the studied patients' ages ranged from 50 to 65 years and less than half of them didn't read or write. These findings are inconsistent with **Singh et al. (2022),** in their recent study titled "Awareness of diabetic retinopathy among diabetes mellitus patients visiting a hospital of North India" who stated that more than half of patients were in the age ranged from 40 to 59 years.

In the same context, it was clear from this study finding that about two thirds of the patients were females and married. This is supported by **Alsawahli et al. (2021),** whose study entitled "Population-based cross-sectional prevalence survey of diabetes and diabetic retinopathy in Sohag - Egypt" and reported that the prevalence of DM in females was significantly higher than in males.

Additionally, about two thirds of the studied patients had insufficient income for diabetic treatment expenses. This could be due to more than half of the studied patients' age ranged from 50 to 65 years during which patients didn't usually work. This result is in the same line with **Mohammed et al. (2022),** who assessed eye care behavior among non-insulin dependent diabetic patients and

illustrated that more than half of patients had low income.

As regards to diabetes mellitus, the most of the studied patients had type 2 diabetes mellitus and the majority of them were suffering from diabetes for more than 10 years ago. These findings are consistent with **Alhamoud et al. (2022)**, in their recent study about "Awareness of diabetic retinopathy among diabetic patients in King Khalid eye specialist hospital, Riyadh, Saudi Arabia" and revealed that the most of the patients were diagnosed with DM2 with a history of DM that exceeds 10 years.

As related to complications of diabetes, the majority of the studied patients had neuropathy complications, while, about quarter of them had vision problems. This may be related to the history of diabetes of more than 10 years in the majority of the patients. This result agrees with **Aly et al. (2022),** who evaluated the impact of diabetic retinopathy prevention instructional scheme on the patient's performance and mentioned that half of the patients had vision affection. While, this result is incongruent with **Al Taisan et al. (2022),** who assessed diabetic patients' adherence to diabetic retinopathy screening and the influencing factors in Al-Ahsa, Saudi Arabia and informed that the majority of the respondents didn't have any diabetic complications.

Concerning knowledge of the studied patients, this study result elaborated that the total mean score after implementation was higher than the score before implementation with a highly statistically significant difference. This could be due to prevention instructions had improved patients' knowledge regarding the effect of glycemic control and regular eye checkup on the prevention of diabetic eye complications. This finding is in the same line with **Hosseini et al. (2021),** whose study titled "The effect of educational program based on theory of planned behavior on promoting retinopathy preventive behaviors in patients with type 2 diabetes" and their results of the pre-test showed that the patients' information about retinopathy was very weak. While, after intervention the majority of patients had improved information.

The current study results illustrated that the lowest mean score of patients' knowledge pre implementation of instructions was patients' knowledge about diabetic retinopathy. This emphasized the significance of this study and these patients' need for understanding the diabetes effects on the eyes. This finding agrees with **Shi et al. (2022)**, who studied the experiences of patients with diabetic retinopathy and found that patients were unaware of the complications of diabetes, diabetes effects on eyes and were unaware of the causes and risk factors of DR.

Considering satisfactory knowledge of the studied patients, the most of the studied patients had an unsatisfactory level of knowledge before implementation of prevention instructions, while, the majority of them had a satisfactory level of knowledge after implementation. This result is in harmony with **Mohammed et al. (2021),** whose study entitled "Impact of BASNEF model

educational program for eye care among non-insulin dependent diabetic patients" and indicated that the majority of the study group had a satisfactory level of knowledge after application of the educational program.

When assessing patients' self-reported practices, there was a highly statistically significant difference between total practices mean scores of the studied patients pre and post implementation of prevention instructions and the majority of the studied patients had competent practices after implementation. This improvement may be due to the continuous reinforcement of the critical importance of patients' practices in preventing or reducing diabetic retinopathy during implementation of prevention instructions has motivated patients to demonstrate these practices.

These findings are consistent with **Shaban et al. (2021)**, who evaluated the effect of an educational intervention on self-care practices among patients with diabetic retinopathy and reported that the study group showed marked improvement of self-care practices post-educational intervention application, where, all of the study group had better overall self-care practices. Also, there was a statistically significant difference of self-care practices pre and post educational intervention application.

In relation to attitude scores of the studied patients, there was a highly statistically significant difference between the total attitude mean scores of the studied patients pre and post implementation of prevention instructions. As well, the most of the studied patients had positive attitude post implementation of the instructions compared to more than half of them pre implementation. This finding is similar to **Said & Hamed, (2021)**, who studied the effect of an interventional program on diabetic patients' awareness regarding diabetic retinopathy and found a significant increase in the positive attitude after intervention.

These finding in accordance with **Pearce & Sivaprasad, (2020)** in a study titled" A review of advancements and evidence gaps in diabetic retinopathy screening models " who emphasized on the importance of attention to patients' attitude which protection needs early detection for patients at risk of DR. It is likely that DR-related visual disabilities will increase in the future; consequently, an organized public health style must be assumed.

With respect to correlations between total knowledge, attitude and practices scores of the studied patients, there were highly statistically significant correlation between total knowledge and practices scores and between total practices and attitude scores post prevention instructions implementation. This correlation could be due to when improving patients' knowledge about diabetes effects on the eyes, they demonstrated more practices which could improve their health outcomes. This finding goes in the same line with **Abid et al. (2022)**, who evaluated the effect of an educational intervention on knowledge and self-care practices of patients with diabetic retinopathy and their results showed that there were statistically

significant correlations between patients' total knowledge and total self-care practices.

Conclusion:

It can be concluded that, Implementation of the prevention instructions regarding diabetic retinopathy showed a remarkable improvement of the patients' level of knowledge and acquiring a positive practices with noticeable improvement in the patient's attitude towards prevention of diabetic retinopathy

Recommendations

In the light of the findings of the present study, the following recommendations were suggested:

- Regular diabetic patient education focusing on early screening of DR and increasing compliance to follow-up and regular eye examination.
- A collaboration between DM follow-up clinics and ophthalmic clinics in screening for DR was strongly recommended for early detection of DR.
- Development of specific evidence-based guidelines for the prevention, detection, and management of DR due to increasing threat of diabetes-related blindness
- Endorse prevention instructions of diabetic retinopathy in the patients' prevention programs.

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