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Impact Of Diabetic Retinopathy Prevention Instructional Scheme On Patient's Performance

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Abstract

Background: Diabetic retinopathy (DR) is the greatest common micro-vascular complication of diabetes which has a tremendous visual effects and leading to blindness among patients.
The study aim: Evaluate the impact of applying an instructional scheme regarding the prevention of diabetic retinopathy on patients' performance.
Study design: A Quasi-experimental design (pre-post and follow-up test) was utilized to accomplish this study. The study was carried out at the medical outpatient clinics of Damanhur University Hospital.
Sample: A purposive sample of 150 type II diabetic patients were included.
Data collection tools: Two tools were used to collect the data, the first tool was a structured interview questionnaire to assess the socio-demographic data. The second tool was a three-part structured interview questionnaire to assess a patient's knowledge, attitudes, and practices regarding diabetic retinopathy. After that, the instructional scheme was implemented in three educational sessions. Three months later, the data collection was repeated, and HbA1C was retested, then the data was analyzed.
Results: This study revealed that there is a significant difference between overall performance levels among diabetic patients regarding preventive measures of diabetic retinopathy in the post and follow-up instructional scheme implementation phases compared to pre-instructional scheme implementation phases with p= (0.001). In addition, there was a significant positive correlation founded between diabetic patients' knowledge, practice, and attitude scores regarding preventive measures of diabetic retinopathy in pre, post, and follow-up instructional scheme implementation phases mainly between practice & attitude with p= (0.001).
Conclusion & Recommendations: implementation of the instructional scheme for diabetic patients regarding the prevention of retinopathy showed a remarkable improvement of the patient's level of knowledge and acquiring the ultimate positive and noticeable improvement in the patient's corrective actions towards preventive strategies of retinopathy and self-care. Endorse instructional scheme for prevention of diabetic retinopathy in the patients' prevention programs plus continuous patients' education

Key words: Impact, instructional scheme, prevention, diabetic retinopathy, patient's performance

Introduction

Worldwide, diabetes mellitus (DM) is considering a main medical problem. Diabetes causes a group of long-term complications that have a tremendous impact on the patient, family, and society, as the disease disturbs individuals in their most productive years **(Elshemy et al., 2018).** DM will affects 642 million adults by 2040, with about 75% residing in low- and middle-income countries. However, diabetic retinopathy (DR) affects 1 in 3 clients with diabetes and remains the principal reason for blindness in adults **(Wong & Sabanayagam, 2020).**

According to the **WHO (2021)**, the number persons exposed to DM was increased from 108 million in 1980 to 422 million in 2014. The prevalence has been increasing more quickly in low- and middle-income countries than in high-income countries. In recent years, the successful application of public health programs in developed countries has been supposed to improve and modify the present state

of public health methods including risk factor control, screening and care for DR **(Lin et al., 2016)**

DR is the greatest common micro vascular complication of DM and endures the leading reason for visual deficiency and blindness among those patients. Nevertheless, there is limited research on the factors leading to DR **(Seid et al., 2021; Hosseini et al., 2021)**. In addition, discovering the obstacle in different country income settings may accelerate the development of a successful DR screening program **(Piyasena et al., 2019)**

Nevertheless of diabetes types, all individuals diagnosed with DM require regular retinal screening for early detection and treatment of diabetic retinopathy (DR). Adventurously, retinopathy screening is done by fundus examination by ophthalmologists or with the help of color fundus photography using conventional fundus cameras (mydriatic or non-mydriatic) by qualified eye technicians or optometrists **(Padhy et al., 2019)**

According to the reported by Diabetes Country Profiles estimated by **WHO (2016)**, there was a significant increase in the incidence of diabetes among Egyptian females and males which attributed to overweight, physical inactivity, and obesity respectively. There was availability retinal photocoagulation but there is no availability of dilated fundus examination to early detection and prevention of DR.

Self-care remain an important element of dealing with chronic disease. To combat DR, a paradigm shift in strategic attention and resources must be made from tertiary prevention as primary and secondary, which are wider, more impactful, and cost-effective for the larger population. **(Wong & Sabanayagam, 2019)**. Finally, to advance and recognized challenges with DR, reinforcement with the facilitators is an important issue. Besides, program administrators could model new screening programs after the successful ones of local individualities **(Egunsola et al., 2021)**

Significance of the study:

DR is a principal cause of blindness, but it has a detrimental effects that are preventable with early detection and treatment. Screening for DR has the possibility to increase the number of cases received early treatment, particularly in populations with limited access to care **(Walton et al., 2016)** The public health achievement of DR screening programs depends on patients' adherence to the schedule of follow-up eye care by the screening program. Both African Americans are among those at maximum risk for DR and have one of the lowest rates of eye care use **(Keenum et al., 2016)**.

Furthermore, training of medical staff and community nurses in screening patients with diabetes and referral to ophthalmology centers, helping in delivering information for diabetic patients, and conducting or facilitating training or continuing medical education to community workers and paramedical staff, should be stressed to decrease the disease morbidity and occurrence of blindness associated with diabetes **(Shetty & Swapnika ., 2017).**

Aim of the Study:

The aim of current study was to evaluate the impact of applying an instructional scheme regarding the prevention of diabetic retinopathy on patient's performance

Research Hypothesis:

H 1: Diabetic patient's retinopathy prevention knowledge will improved post- instructional scheme implementation when compared to pre-instructional scheme implementation
H 2: Diabetic patient's retinopathy prevention practice will improved post- instructional scheme implementation when compared to pre-instructional scheme implementation
H3: Diabetic patient's retinopathy prevention attitude will be more positive post- instructional scheme implementation when compared to pre-instructional scheme implementation

Research Design:

A quasi-experimental using pre-post and follow up design was utilized to conduct the study. This design estimated the causal impact of an intervention (instructional scheme) on the dependent variables (patients' level of knowledge and practices and attitudes)

Setting:

The current study was carried out in carried out at Medical Outpatient Clinics at Damanhur University Hospital, Damanhur City, Egypt.

Sampling

A purposive sample of 150 type II diabetic patients (male and female). The inclusion criteria for sampling were type II diabetic patients with a history of diabetes for more than one year, without eye complications aged 30-70 years who voluntarily agree to participate in the study. Exclusion criteria included patients who were diagnosed with diabetic retinopathy or who developed eye complications during the study and required special treatment and education, the patient's reluctance, and refusal to participate in the study, or who did not attend all sessions or did not complete the questionnaire after completing the instructional scheme, and patients who participated before in an educational program related to diabetic retinopathy

The tool of data collection

Two tools were used to collect data during the pre, post, and follow-up stages to assess the impact of the instructional scheme regarding the prevention of DR on patient performance:

Tool (I):

A Structured interviews questionnaire was adopted **(Manu et al., 2019)** and **(Alharbi et al., 2021)** modified by the researchers after reviewing the relevant literature. It was written in simple Arabic and was used to evaluate the socio-demographic data of the studied sample. The tool consisted of nine items including patients' age, gender, education level, duration of DM, family history with DM, and results of glycemic control by the Hb-A1c test, the main source of information about DM and DR. Referral to the ophthalmologist, and affection of vision by DM.

Tool (II):

A structured interview questionnaire was adopted from **(Khalaf et al., 2019)** and **(Jani et al., 2020)** and modified by the researchers after reviewing the relevant literature. It is written in plain Arabic and is used to assess a patients' knowledge, attitude and practice (KAP), and it consisted of three parts as follows:

Part I: This section consists of 11 (yes/no) questions about patients knowledge related to DR. Correct answers had score 1 and incorrect scored with 0 with possible total scores ranged from 0 to 11. Good knowledge accounts for more than 75% of the total score, 75% to 60% is considered average knowledge, and < 60% of the total score is poor knowledge.

Part II: This section includes 12 statements expressing patient attitudes regarding DR. The scoring system is a three-point Likert scale of (agree = 1), (unlikely = 2), (disagree = 3) reversed points for negative statements. The total score for attitude is calculated by aggregating the responses of each respondent. An overall score of ≥ 3 is considered a positive attitude, while < 3 is considered a negative attitude.

Part III: This section includes 8 (yes/no) questions related to eye care practices reported by diabetic patients. Correct answers had score 1 and incorrect scored with 0, good practice is counted if the total practice score is above 75%, 75% to 60% is considered as average practice, and if < 60% of the total score is poor practice.

Validity and Reliability of the Tool:

Validation was performed by 5 Medical-Surgical Nursing experts and 2 consultant ophthalmologists. The reliability of the questionnaire on patients' KAP was confirmed by Cronbach's alpha = 0.094-factor test. Pilot study: A pilot study was conducted on 15 patients with type II diabetes (10% of the study sample) to test the instrument's clarity and applicability and the mean time required to fulfill the questionnaire has been evaluated. No changes were made to the research tools, so that, the pilot sample was added to the study sample

Ethical Considerations

Ethical approval was guaranteed from the Institutional Review Board- Faculty of Nursing, Port-Said University. Official permission to conduct the study was obtained from hospital administrators. The aim and significance of the current research were explained for each patient. Patients were informed that they have the right to refuse participation or withdraw from the study whenever they want without any harm. Anonymity and confidentiality were assured by data coding. Moreover, patients were informed that these data will not be reused in another study without their permissions. Finally, written informed consent was obtained from the patients who agreed to participate.

Procedures

The study was conducted through the following three phases; pre-instructional scheme phase, instructional scheme development and implementation phase, and post- instructional scheme phase. The data collection was conducted

within eleven months from the beginning of Sep. 2021 to the end July 2022.

1- Pre-instructional scheme phase:

Official permission from appropriate authoritative personnel was granted. Patients fulfill the research criteria and agreed to participate in the study were individually interviewed to explain the nature and the benefit of the current study then written consent was granted. Each selected patient was invited to fill out a questionnaire tools to assess patients' KAP using tool (I, II, and III). The patients were tested for HbA1C. This phase continued until the number of patients required in study was complete (150 patients), it conducted in three months.

2- Instructional scheme development and implementation phase:

The instructional scheme was developed based on the identified needs and problems assessed in the previous phase and after reviewing the related literature. The instructional scheme was developed over 3 sessions for each group (10 patients). Each session lasted about 30-45 minutes. The 1st session focused on improving patients' knowledge about DR definition, causes and risk factors, symptoms, prevention, when the patient should contact the doctor, complications of untreated DR, and methods for treatment.

The 2nd session focused on improving patients' attitudes through explain the benefits of appropriate eye care, proper management, glycemic control follow up, regular visits to ophthalmologists, periodical eye examinations, adhere to a medication schedule, adherence to proper nutrition, and appropriate physical activity. The 3rd session focused on improving patients' practice to prevent DR as measures to familiarize patients with barriers to retinopathy, improve patient intent to stay on track care for their eyes including frequency of patient's follow-up, proper check for glucose level with glucometer, proper fundus examination time table, methods for achieving or maintaining a moderate weight with engagement in activity, follow the doctor's recommended measures with antihypertensive medications, and smoking cessation.

The researchers present the material throughout these sessions in a straightforward manner using lectures, illustrative images, and videos for DR-related practical skills. Each session ends with researchers summarizing the key points and reviewing the session's content with time for patients' inquiries. Each patient received DR prevention self-care booklet including theoretical and practical session.

4-Evaluation phase:

After each group completed the three sessions over three weeks, knowledge, attitudes, and practice were reassessed using tool I and tool II immediately after implementation of the instructional scheme. Reassessment for retention was carried out three months later (follow-up test) and blood glucose (HbA1C) test re-measured.

Data processing and analysis:

Data were collected, entered, analyzed, and tabulated. The data was analyzed using the IBM Statistics Package for the Social Sciences (SPSS) version 26. (Armonk, NY: IBM Corp) Qualitative data were assigned using percentages and numbers. The Kolmogorov-Smirnov test is used to check the normal distribution. Quantitative data were determined using a combination of (minimum and maximum), mean, standard deviation, and chi-square tests, and categorical variable inference statistics were used to compare different groups and find relationships. The Pearson Correlation Coefficient (R) value is used to measure the relationships and relationships between variables in chi-square correction. ANOVA or t-test to compare two study groups. The significance level was set at a p-value < 0.05, while the high level of significance was set at a p-value < 0.001.

Results:

Table (1): Revealed that (56%) were male, and (40%) of them were in the age group 50-60 years. Also, (42%) had a high level of education, (42%) have DM from below 5 years, and (82%) of them have a family history of DM, (80%) controlled their blood glucose level (HbA1C test), while (48.7%) clarified that doctor is the main source of information regarding diabetes & DR to them with (42.7%) of them have a referral to an ophthalmologist by a general practitioner and (52%) of them had have vision affection.

Table (2) : Showed that there is a significant difference between the mean of diabetic patients' knowledge regarding preventive measures of retinopathy in the post and follow-up instructional scheme implementation phases compared to pre-instructional scheme implementation phases with p= (0.001)

Table (3): shows that there is a significant difference between the mean of diabetic patients' practice regarding preventive measures of retinopathy in the post and follow-up instructional scheme implementation phases compared to pre-instructional scheme implementation phases with p= (0.001)

Figure (1): revealed that there is a significant difference between overall performance levels among diabetic patients regarding preventive measures of diabetic retinopathy in the post and follow-up instructional scheme implementation phases compared to pre-instructional scheme implementation phases with p= (0.001)

Table (4): Illustrated that there was a significant positive correlation was found between diabetic patient's knowledge, practice, and attitude scores regarding preventive measures of diabetic retinopathy in pre, post, and follow-up instructional scheme implementation phases mainly between Practice & attitude with p= (0.001)

Table (5): revealed that there was a significant positive correlation was found between diabetic patient's knowledge scores regarding the prevention of retinopathy and all items of their socio-demographic characteristics with p= (0.001)

Table (6): shows that there was a highly significant positive correlation was found between diabetic patient's practice scores regarding prevention of retinopathy and all items of their socio-demographic characteristics with p= (0.001) while there is a significant positive correlation was found between diabetic patient's practice scores regarding prevention of retinopathy and their socio-demographic characteristics only in the item related to controlled blood glucose level with p= (0.003)

Table (7): shows that there is a highly significant positive correlation was found between diabetic patient's attitude scores regarding prevention of retinopathy and all items of their socio-demographic characteristics with p= (0.001) while there is a significant positive correlation was found between diabetic patient's practice scores regarding prevention of retinopathy and their socio-demographic characteristics only in the item related to controlled blood glucose level with p= (0.006)

Table (1): Socio-demographic characteristics of the Diabetic patients

Variables	N	%
Age		
30 - <40	22	14.6
40 -<50	33	22
50 -<60	60	40
60 -70	35	23.4
Mean ± SD	38.201±10.324	
Gender		
Female	66	44
Male	84	56
Level of education		
None	19	12.6
Elementary	18	12
High School	33	22
Intermediate education	17	11.3
Higher education	63	42
Duration of DM		
Less than 5 years	63	42
6 to 10 years	47	31.3
More than 11 years	40	26.4
Family history of DM		
Yes	123	82
No	27	18
Blood glucose level (HbC1A)		

Controlled	120	80
Uncontrolled	30	20
main source of information about DM and DR		
Doctor	73	48.7
Internet /social media	42	28
Friends and relatives	28	18.7
Not received any information	7	4.6
Referral to ophthalmologist		
General practitioner	64	42.7
Patient himself	29	19.3
Have no referral yet	57	38
Is your vision is affected by DM?		
Yes	78	52
No	72	48

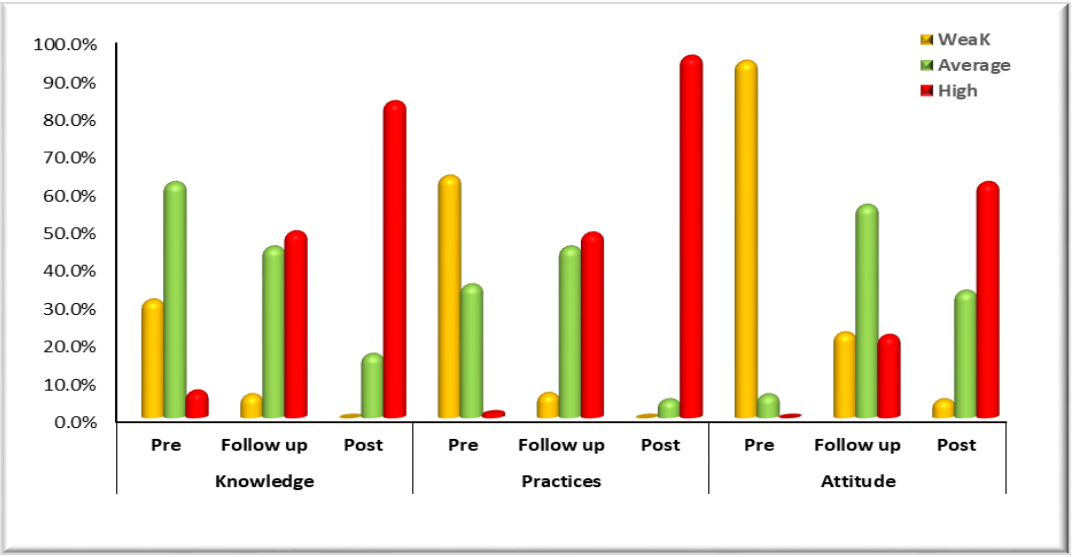
Table (2): Mean of diabetic patients knowledge regarding preventive measures of retinopathy in pre, post and follow-up instructional scheme implementation phases

Time	Knowledge	Comp.	Differences		Paired T-test	
	Mean ± SD		Mean	SD	t	P-value
Pre	27.677 ± 6.450	**Pre-Follow up**	-9.010	4.284	-36.430	<0.001*
Follow up	36.687 ± 7.091	**Pre-Post**	-14.167	3.849	-63.750	<0.001*
Post	41.843 ± 4.272	**Follow up-Post**	-5.157	4.248	-21.025	<0.001*

Table (3): Mean of diabetic patient's practice regarding preventive measures of retinopathy in pre, post and follow-up instructional scheme implementation phases

Time	Practices	Comp.	Differences		Paired T-test	
	Mean ± SD		Mean	SD	t	P-value
Pre	21.653 ± 6.866	**Pre-Follow up**	-15.200	4.224	-62.321	<0.001*
Follow up	36.853 ± 6.993	**Pre-Post**	-22.583	4.496	-86.994	<0.001*
Post	44.237 ± 3.740	**Follow up-Post**	-7.383	4.758	-26.878	<0.001*

Figure (1): Distribution of performance levels among diabetic patients regarding preventive measures of diabetic retinopathy in pre, post and follow-up instructional scheme implementation phases



Sig: P-value for Marginal Homogeneity test ***significant at P≤0.05**

Table (4): Correlation between diabetic patient's knowledge, practice and attitude scores regarding preventive measures of diabetic retinopathy in pre, post and follow-up instructional scheme implementation phases

Correlation		Knowledge	Practices
Practices	**r**	0.797	
	P-value	<0.001*	
Attitude	**r**	0.778	0.782
	P-value	<0.001*	<0.001*

r: Pearson Correlation Coefficient ***significant at P≤0.05**

Table (5): Correlation between diabetic patient's knowledge scores regarding prevention of retinopathy and their socio-demographic characteristics in pre, post and follow-up instructional scheme implementation phases

socio-demographic characteristics		N	Knowledge			F or T	ANOVA or T-test	
			Mean	±	SD		Test value	P-value
Age	**30 - <40**	45	19.222	±	4.128	F	141.260	<0.001*
	40 -<50	66	24.318	±	3.583			
	50 -<60	120	28.767	±	4.727			
	60 -70	69	34.507	±	3.579			
Gender	**Female**	131	30.084	±	5.418	T	6.018	<0.001*
	Male	169	25.811	±	6.580			
	None	39	18.231	±	3.199	F	113.993	<0.001*

Level of education	**Elementary**	35	20.857 ± 0.912			
	High School	67	27.552 ± 4.290			
	Intermediate education	33	30.333 ± 6.158			
	Higher education	126	31.865 ± 4.041			
Duration of DM	**Less than 5 years**	126	22.556 ± 4.090	F	146.738	<0.001*
	6 to 10 years	93	29.828 ± 4.962			
	More than 11 years	81	33.173 ± 4.873			
Family history of DM	**Yes**	245	28.816 ± 5.498	T	6.952	<0.001*
	No	55	22.600 ± 7.850			
Blood glucose level (HbC1A)	**Controlled**	241	28.577 ± 6.215	T	5.084	<0.001*
	Uncontrolled	59	24.000 ± 6.125			

Table (6): Correlation between diabetic patient's practice scores regarding prevention of retinopathy and their socio-demographic characteristics in pre, post and follow-up instructional scheme implementation phases

Demographic data		**N**	**Practices**	**F or T**	**ANOVA or T-test**	
			Mean ± SD		**Test value**	**P-value**
Age	**30 - <40**	45	15.156 ± 6.183	F	63.474	<0.001*
	40 -<50	66	18.091 ± 5.128			
	50 -<60	120	22.450 ± 5.483			
	60 -70	69	27.913 ± 4.862			
Gender	**Female**	131	23.389 ± 6.160	T	3.949	<0.001*
	Male	169	20.308 ± 7.096			
Level of education	**None**	39	14.744 ± 6.377	F	52.977	<0.001*
	Elementary	35	13.800 ± 2.260			
	High School	67	21.642 ± 5.424			
	Intermediate education	33	24.848 ± 6.690			
	Higher education	126	25.143 ± 4.988			
Duration of DM	**Less than 5 years**	126	17.238 ± 5.282	F	69.995	<0.001*
	6 to 10 years	93	23.667 ± 5.951			
	More than 11 years	81	26.210 ± 5.951			
Family history of DM	**Yes**	245	22.665 ± 6.315	T	5.661	<0.001*
	No	55	17.145 ± 7.447			
Blood glucose level (HbC1A)	**Controlled**	241	22.224 ± 7.001	T	2.947	0.003*
	Uncontrolled	59	19.322 ± 5.770			

t,p: t, p-value for **Paired t-test** for comparing between pre , post and follow-up

*: Statistically significant at $p \leq 0.05$

Table (7): Correlation between diabetic patient's attitude scores regarding prevention of retinopathy and their socio-demographic Characteristics in pre, post and follow-up instructional scheme implementation phases

Demographic data		N	Attitude	F or T	ANOVA or T-test	
			Mean ± SD		Test value	P-value
Age	30 - <40	45	14.178 ± 3.242	F	56.723	<0.001*
	40 -<50	66	14.455 ± 3.452			
	50 -<60	120	17.267 ± 3.743			
	60 -70	69	21.290 ± 3.163			
Gender	Female	131	18.206 ± 3.766	T	3.939	<0.001*
	Male	169	16.260 ± 4.579			
Level of education	None	39	14.103 ± 3.315	F	38.343	<0.001*
	Elementary	35	11.857 ± 1.881			
	High School	67	16.955 ± 3.751			
	Intermediate education	33	18.939 ± 4.937			
	Higher education	126	19.103 ± 3.427			
Duration of DM	Less than 5 years	126	14.468 ± 2.952	F	63.314	<0.001*
	6 to 10 years	93	18.097 ± 4.073			
	More than 11 years	81	20.086 ± 4.096			
Family history of DM	Yes	245	17.596 ± 4.063	T	4.200	<0.001*
	No	55	14.945 ± 4.912			
Blood glucoses levels (HbC1A)	Controlled	241	17.448 ± 4.552	T	2.754	0.006*
	Uncontrolled	59	15.729 ± 3.028			

t,p: t, p-value for **Paired t-test** for comparing between pre , post and follow-up
*: Statistically significant at $p \leq 0.05$

Discussion

DR is a severe complication of diabetes that bases on irreversible blindness and is one of the leading reasons for vision impairment and vision loss. Appropriate intervention and self-care performs measures can interrupt or stop consequent loss of vision **(Khalaf et al., 2019 & Baiuomy et al., 2021)**

Regarding socio-demographic characteristics of studied patients, the present study showed that slightly more than half of them were male, nearly half in the age group 50-60 years, had a high level of education, and have DM less than 5 years while the majority of have a family history of DM and control their blood glucose level, while, less than half clarified that doctor is the main source of information regarding diabetes & DR with a referral to ophthalmologist and half of them have vision affection. These findings go in dissimilarity with **Salahen et al., 2020** who revealed that more than half of the participants were females and the mean age was 39.13 of the participants had a primary level of education. The duration of illness was 3-5 years in more than one third of the participants and the majority developed diabetes complications and more than half had a family history of DM. Moreover, Valikodath et al., 2017 discovered that demographic aspects were not associated with the consequences, patients had decreased unusual readiness if there are patient-physician relationship (adjusted abnormal ratio [OR] = 0.08, confidence

interval [CI] = 0.02–0.35, p = 0.001) or had a longer duration of diabetes (adjusted OR = 0.93, CI = 0.88–0.99, p = 0.02).

Current study findings in relation to patients' knowledge revealed a significant improvement in the knowledge mean score regarding preventive measures of retinopathy in the post and follow-up instructional scheme implementation phases compared to pre-instructional scheme implementation phases. These findings is on the same track as **Wong & Sabanayagam., 2019** who highlighted on successful self-care management including adherence to mentioned diet, suitable exercise, anti-diabetic, antihypertensive medications, and self-checking of blood glucose are critical for educating diabetes care.

Moreover, **Salahen et al., 2020** concluded from their study a positive change in diabetic patients' knowledge and attitude regarding diabetes and DR for a short duration following instructional educational program conduction and emphasized that worldwide educational programs and strategies could insure better outcome for long period. In the same context, **Raman, 2021** stressed on raising the community awareness and the need to work with diabetologists to prevent and control of complications, consequently having a long-term effect on the prevention of diabetes blindness.

Regarding diabetic patients' practice in relation to preventive measures of retinopathy, there was a significant difference between the mean patients' practice in the post and follow-up instructional scheme implementation phases compared to pre-instructional scheme implementation phases, this results also suggested by **Baiuomy et al., 202**1 who founded that self-care knowledge and practice had significantly improved among patients received educational program more than those who did not.

Regarding patient's preventive measures of DR performance levels, the current study results showed a significant difference in post and follow-up instructional scheme implementation phases compared to pre instructional scheme implementation phases. **Askari et al., 2018** demonstrated the benefit of a patient education based on BASNEF model program on diabetic patients' self-care behaviors which very effective and advantageous in control, checking, and follow-up.

These finding supported with **Pearce & Sivaprasad, 2020** highlighted on importance of attention to patients' attitude which protection needs early detection for patients at risk of DR with respect to funding creative strategies such as healthcare kiosks and smartphone telescreening or healthcare experts. It is likely that DR-related visual disabilities will increase in the future; consequently, an organized public health style must be assumed.

Otherwise, **Salahen et al., 2020** founded a significantly negative improvement of patients' attitude regarding eye examination after implement the educational program and justified this results that behavioral adjustments require knowledge regarding the urgency of the condition and enthusiasm to make changes, which needs education and support. Moreover, **Wong & Sabanayagam, 2019** suggested that patient authorization is a significant element and individual goals to deliberate with the patient obstacles and advance diabetes consequences. Interventions to advance self-care behavior in management of diabetes, awareness of DR among patients and providers, and provision of DR screening services should be added focus than tertiary prevention.

Concerning relationship between diabetic patient's knowledge, practice and attitude scores regarding preventive measures of DR revealed significant positive correlation in pre, post and follow-up instructional scheme implementation phases mainly between Practice & attitude. This finding is on the same track as **Mohamed et al.,2019** who found positive and highly significant correlations in post program between total knowledge and total compliance and there were highly significant statistically improvement in all items of knowledge and compliance post preprogram regarding DR and recommended the need for increasing awareness and screening services to diabetic patient, critical requirement to develop approaches to teach diabetic patients regarding probable occurrence of retinopathy .

In Ibadan, **Ibrahim et al., 2015** imposed on that lack of knowledge related to irreversible blindness was recognized as a chief obstacle by both patients and providers. Cost of treatment of diabetes and treatment of retinopathy was also a significant obstacle. staff attitudes to patients and appointment scheduling problems discouraged patients from using the service and concluded that more diabetic patients can be stimulated to use eye service by

given that more detailed knowledge and creation clinic attendance less costly and more appropriate.

Concerning relationship between diabetic patients' knowledge scores regarding prevention of DR and their socio-demographic characteristics. The current study revealed a significant positive correlation was found between diabetic patient's knowledge scores regarding prevention of DR and all items of their socio-demographic characteristics. This findings goes in the same line with the findings of **Khalaf et al., 2019** who reported statistically significant relationship between educational level and mean knowledge score and highlighted on the role of diabetic education program which led to advance awareness of patients with respect to DR.

In the study conducted by **Abel et al., 2021**, the participants were in their 50 years of age and the predominant sex was male. Most of the patients had minimal education, the majority was shopkeepers. The patients did not have a good knowledge of the risk factors, prevention strategies, screening and modalities of treatment of diabetic retinopathy.

In United States **Willis et al., 2017** revealed that approximately half of the diabetic patients with severe DR had difficulty with at least one visual job. Furthermore, the vision-related functional problem was meaningfully bigger among those with severe DR than among those with no retinopathy and recommended Upcoming studies regarding evaluating the association of deteriorating retinopathy with accurately measured functional consequences.

While, **Gulshan et al., 2016** recommended retinal fundus photographs based on deep machine learning had high sensitivity and specificity for discovering referable diabetic retinopathy. An advance study is needed to decide the possibility of applying this algorithm in the clinical venue and to regulate the use of the algorithm in advanced care and the consequences associated with present ophthalmologic valuation.

In Pakistan, **Nizamani et al .,2017** suggested that applying a diabetic screening program is useful for the perceived high prevalence of retinopathy among diabetic patients living in Hyderabad District. The greatest public reason for childhood visual impairment was a refractive error (42%), which was successfully treated because of timely diagnosis. A large number of patients are advantaged by community-based screening programs.

In China, **Chen et al., 2021** concluded that a novel telemedicine paradigm uses multiple instruments and techniques, including navigated retinal laser photocoagulation, videoconferencing, and concurrent monitoring to treat DR via laser photocoagulation therapy. In addition to, instructing patient-physician relationships, educating on traditional telemedicine by improving adherence. This strategy may help overwhelm health care contact and medical disparity in nation-states. As ordinal technologies remain to advance, obstacles to health care contact will be overcome and attain quality care.

In the La Libertad region, **Peru, Salamanca et al.,2018** concluded that Active and dated management for diabetic retinopathy is likely when patient education, screening, and care are fully incorporated into the general healthcare system crossways primary, secondary and tertiary prevention levels. This needs the incorporation of professionals at wholly levels and in all appropriate areas.

In Ethiopia , **Seid et al.,2021** point out that patients who had a glucometer at home, exercise adherence, diabetes duration below 10 years, health literacy on diabetic complications, and recurrent follow-up had a preventive character. Nevertheless, poor glycemic control, systolic hypertension, and nephropathy growth the risk of diabetic retinopathy. A strenuous struggle should be made to advance Diabetic patients' health conditions, with specific stress on lifestyle modifications training to avoid diabetic retinopathy.

In Karnataka , **Shetty & Swapnika ., 2017** spotlight the Proper Knowledge, Attitude, and practice of the paramedic staff can link the gap between the ophthalmologists and the patients. Likewise, it will help in early detection in families having DM and thus could go a long way in taking concealed cases of DM. All chances of contact with the high-risk cases for DR at any health facility should be developed to recognize patients with Diabetic Retinopathy.

In New York , **Ramchandran et al.,2022** stressed on Considerate the obstacles to and facilitators of applying for teleophthalmology programs from those actively embracing and supporting such programs is significant for extensive taking on. Rearrangement processes and workflows, training and assigning sufficient staff, efficiently

coordinating care between primary care and eye care to recover follow-up.

In Texas , **Walton et al.,2016** found in their study in a large urban setting, The IRIS algorithm which illustrates aptitude as a screening program, but algorithm alterations are required to attain improved act. Advance studies of patient safety, cost-effectiveness, and extensive applications of this type of algorithm should be followed to improve the role of teleretinal imaging and automated analysis in the global health care scheme.

In North Carolina, **Jani et al.,2017** highlighted on vision loss from DR is a public health authority. Telemedicine screening can rise rates of surveillance, reduce socioeconomic disparities, and increase access to treatment, in the long run preventing vision-threatening DR and enhancing visual consequences and quality of life for diabetic patients.

Regarding the relationship between diabetic patient's practice scores regarding prevention of retinopathy and their socio-demographic characteristics, the present study revealed that there is a highly significant positive correlation found between diabetic patient's practice scores regarding prevention of retinopathy and all items of their socio-demographic characteristics while there is a significant positive correlation were found between diabetic patient's practice scores regarding prevention of retinopathy and their socio-demographic characteristics only in the item related to controlled blood glucose level. These findings go in the same way as the findings of **Mohamed et al.,2019** from Egypt who revealed in their study that the mean score of age was age 42.067 ± 9.716 also 56.7% are male, (78.3%) are married. Regarding medical history 70.0% use insulin. , 78.3% of them post hyperglycemia exposure caused by Sugary nutrition. Regarding total knowledge pre-program, 93.3 % of patients had unsatisfactory while 80.0% had satisfactory knowledge post-program. As regards, total compliance 95.0 % of patients were not devotee preprogram while 96.7% had devotee post-program.

In Republic of **Benin , Abel et al.,2021** highlighted on Knowledge level are linked with female gender and level of education. Patients had good attitudes when ocular symptoms occurred, but less good about the need for eye fundus examination in the absence of ocular symptoms. The patients did not have good practice regarding regular eye fundus examinations, even checking of blood sugar, blood pressure, and lipid profile. This is due to the lack of awareness regarding eye fundus examination and the financial difficulties limiting access to eye health care facilities. The practice was associated with knowledge level, education level, and monthly income.

In Alabama , **Keenum et al ., 2016** suggested that DR screening programs are unlikely to encounter their public health aims without the integration of eye health education in order to initiative successfully adhere to suggested widespread eye care for avoiding vision loss.

In Australia, **Watson et al.,2021** recognized vital parts to encouraging the wider implementation of DR screening, specifically improving GPs' competency and subsidies costs of the retinal cameras for small and rural general practices

In the region of Andalusia, Spain, **Rodriguez-Acuña et al.,** 2020 imposed on Implementation of a long-term population-based screening program for early detection of DR. Thus, after 15 years of existence, the program has allowed the screening of the massive majority of the target population letting the optimization of healthcare assets and the identification of asymptomatic DR.

In England , **Kashim et al.,2018** Verdicts showed that socio-economic deprivation was the main risk factor for non-attendance, about 11.5–13.4% of the screened population had sight-threatening retinopathy (STDR), and repeated nonattendance was linked to sight-threatening diabetic retinopathy, and that certain factors, could be obstacles for screening application.

Regarding the relationship between diabetic patient's attitude scores regarding prevention of retinopathy and their socio-demographic characteristics, the present study revealed that there shown that there is a highly significant positive correlation were found between diabetic patient's attitude scores regarding prevention of retinopathy and all items of their socio-demographic characteristics while there is a significant positive correlation were found between diabetic patient's practice scores regarding prevention of retinopathy and their socio-demographic characteristics only in the item related to controlled blood glucose level. This finding goes in the same way as **Zhu etal.2020** who stressed the negativity of knowledge-related

and attitude-related factors that might be more noticeable than logistic obstacles in forecasting incomplete referral. Consequently, new approaches to progress the compliance with referral support in enhancing the referral availability, and continuing educational care to progress the literacy of disease and raise the efficacy of physician-patient communication.

In Iran , **Kamran et al.,2017** drew attention to the quality of life of diabetic patients, it was low with diabetes retinopathy which is preventable and curable, appropriate training, and improving knowledge about the disease and its complications other than essential screening with early discovery of diabetes. In addition to, intervention- based on the social cognitive model, has a positive consequence on diabetic patients' self-care. Emotional status, self-efficacy to overwhelmed obstacles, and self-directive have a major influence on diabetes self-care (Ghoreishi et al.,2019)

In Serbia , **Stojanović et al.,2018** further that both socioeconomic and chronic complications are significant factors of HRQOL in type 1 and 2 diabetes mellitus patients. Age, rural lifestyle, retirement, lower level of education, and low socioeconomic status, besides long-term complications of DM, were created to be self-regulating risk factors for the element scores of SF-36. Thus, health providers should be aware not only of the clinical parameters of patients with DM but also of their educational level and working conditions.

Based on **Valikodath et al.,2017** decided that Patients' attitudes are predisposed by their health and awareness, but not by their demographics. Interested patients focus on accessibility; whereas unreceptive patients strongly value their patient-physician relationships or have long-standing DM. Telemedicine checking should be intended for people who are required telemedicine.

In KwaZulu-Natal , **Abdool et al.,2016** recognized that there are main trials in referral, training, and practice in the management of DR. These require to be addressed with the purpose of progress a wide-ranging method for the prevention and management of visual deficiency resulting from DM. In Ireland , Riordan et al.,2020 underlined on Diabetic retinopathy screening (DRS) lead to the earlier detection of retinopathy and management that can delay the development of diabetes-related blindness.

Finally, Diabetic retinopathy is an endlessly-increasing problem. Early screening and timely treatment of the same can diminish the problem of impending retinopathy. Any instrument which can assist in the fast screening of this disorder and reduce trained human supply for both patients and ophthalmologists **(Padhy et al.,2019).** Efforts should be directed toward healthcare advancement in the community, different learning media must be accessible to all physicians. Numerous teaching techniques should be implemented. More significantly, further seminars for primary-care physicians should stress on the appropriate ophthalmological screening and care of diabetic patients. **(Al Rasheed & Al Adel ., 2017).**

Conclusion &Recommendations:

From the foregoing discussion, it can be seen that the implementation of the instructional scheme for diabetic patients regarding the prevention of retinopathy showed a remarkable increase and improvement of the patient's level of knowledge and acquiring the ultimate positive and noticeable improvement in the patient's corrective actions towards preventive strategies of retinopathy and self-care, which has a direct effect on their performance, especially attitude, also, there are obvious needs for standardized guidelines offered on simple media to those patients to minimize long term complications of Diabetes Mellitus, especially retinopathy and increased patient's coping and adherence with their treatment modalities and self-care. Efforts should be carried out to design and implement interventions that suit diabetic centers and institutes with field evidence and increased facilities, patient's education approach, and documentation of noncompliance diabetic patients withier disease, treatment, and follow-up appointments

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References

1. Hosseini, S. 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: RCT. BMC endocrine disorders, 21(1), 1-7.

2. Low, L., Law, J. P., Hodson, J., McAlpine, R., O'Colmain, U., & MacEwen, C. (2015). Impact of socioeconomic deprivation on the development of diabetic retinopathy: a population-based, cross-sectional and longitudinal study over 12 years. BMJ open, 5(4), e007290.

3. Raman, R., Ramasamy, K., Rajalakshmi, R., Sivaprasad, S., & Natarajan, S. (2021). Diabetic retinopathy screening guidelines in India: all India Ophthalmological Society diabetic retinopathy Task force and vitreoretinal Society of India consensus statement. Indian Journal of Ophthalmology, 69(3), 678.

4. Wong, T. Y., & Sabanayagam, C. (2020). Strategies to tackle the global burden of diabetic retinopathy: from epidemiology to artificial
intelligence. Ophthalmologica, 243(1), 9-20.

5. Jani, P. D., Forbes, L., Choudhury, A., Preisser, J. S., Viera, A. J., & Garg, S. (2017). Evaluation of diabetic retinal screening and factors for ophthalmology referral in a telemedicine network. JAMA ophthalmology, 135(7), 706-714.

6. Piyasena, M. M. P. N., Murthy, G. V. S., Yip, J. L., Gilbert, C., Zuurmond, M., Peto, T., ... & Kamalakannan, S. (2019). Systematic review on barriers and enablers for access to diabetic retinopathy screening services in different income settings. PloS one, 14(4), e0198979.

7. Elshemy, M., Ibrahim, R. A. S., & Elkazeh, I. A. L. E. (2018). The Effect of an Educational Program for Nurses and the Family Caregivers about the Care of Diabetic Retinopathy Patients with Laser Photocoagulation Surgeries. International Journal of Novel Research in Healthcare and Nursing, 5(2), 470-483.

8. Al Rasheed, R., & Al Adel, F. (2017). Diabetic retinopathy: Knowledge, awareness and practices of physicians in primary-care centers in Riyadh, Saudi Arabia. Saudi Journal of Ophthalmology, 31(1), 2-6.

9. Willis, J. R., Doan, Q. V., Gleeson, M., Haskova, Z., Ramulu, P., Morse, L., & Cantrell, R. A. (2017). Vision-related functional burden of diabetic retinopathy across severity levels in the United States. JAMA ophthalmology, 135(9), 926-932.

10. Pearce, E., & Sivaprasad, S. (2020). A review of advancements and evidence gaps in diabetic retinopathy screening models. Clinical Ophthalmology (Auckland, NZ), 14, 3285.

11. Gulshan, V., Peng, L., Coram, M., Stumpe, M. C., Wu, D., Narayanaswamy, A., ... & Webster, D. R. (2016). Development and validation of a deep learning algorithm for detection of diabetic retinopathy in retinal fundus photographs. Jama, 316(22), 2402-2410.

12. Askari, A., Jeihooni, A. K., Kashfi, S. M., Marzban, A., & Khiyali, Z. (2018). The effect of educational program based on belief, attitude, subjective norm, and enabling factors model on changing the metabolic

indices in elderly patients with type II diabetes. International journal of preventive medicine, 9.

13. Chen, H., Pan, X., Yang, J., Fan, J., Qin, M., Sun, H., ... & Chen, Y. (2021). Application of 5G technology to conduct real-time teleretinal laser photocoagulation for the treatment of diabetic retinopathy. JAMA ophthalmology, 139(9), 975-982.

14. Soleimani Kamran, J., Jafroudi, S., KazemNejad Leili, E., Sedighi Chafjiri, A., & Paryad, E. (2017). Quality of life in patients with diabetic retinopathy. Journal of Holistic Nursing And Midwifery, 27(1), 69-77.

15. Riordan, F., Racine, E., Phillip, E. T., Bradley, C., Lorencatto, F., Murphy, M., ... & McHugh, S. M. (2020). Development of an intervention to facilitate implementation and uptake of diabetic retinopathy screening. Implementation Science, 15(1), 1-17.

16. Salamanca, O., Geary, A., Suárez, N., Benavent, S., & Gonzalez, M. (2018). Implementation of a diabetic retinopathy referral network, Peru. Bulletin of the World Health Organization, 96(10), 674.

17. 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.

18. Nizamani, N. B., Talpur, K. I., Awan, F., Khanzada, M. A., & Memon, M. N. (2017). Results of a community-based screening programme for diabetic retinopathy and childhood blindness in district Hyderabad, Pakistan. BMJ open ophthalmology, 2(1), e000099.

19. Ghoreishi, M. S., Vahedian-Shahroodi, M., Jafari, A., & Tehranid, H. (2019). Self-care behaviors in patients with type 2 diabetes: Education intervention base on social cognitive theory. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 13(3), 2049-2056.

20. Rodriguez-Acuña, R., Mayoral, E., Aguilar-Diosdado, M., Rave, R., Oyarzabal, B., Lama, C., ... & Martinez-Brocca, M. A. (2020). Andalusian program for early detection of diabetic retinopathy: implementation and 15-year follow-up of a population-based screening program in Andalusia, Southern Spain. BMJ Open Diabetes Research and Care, 8(1), e001622.

21. Stojanović, M., Cvetanović, G., Anđelković Apostolović, M., Stojanović, D., & Rančić, N. (2018). Impact of socio-demographic characteristics and long-term complications on quality of life in patients with diabetes mellitus. Central European journal of public health, 26(2), 104-110.

22. Riordan, F., Racine, E., Smith, S. M., Murphy, A., Browne, J., Kearney, P. M., ... & McHugh, S. M. (2020). Feasibility of an implementation intervention to increase attendance at diabetic retinopathy screening: protocol for a cluster randomised pilot trial. Pilot and feasibility studies, 6(1), 1-18.

23. Keenum, Z., McGwin, G., Witherspoon, C. D., Haller, J. A., Clark, M. E., & Owsley, C. (2016). Patients' adherence to recommended follow-up eye care after diabetic retinopathy

screening in a publicly funded county clinic and factors associated with follow-up eye care use. JAMA ophthalmology, 134(11), 1221-1228.

24. Walton, O. B., Garoon, R. B., Weng, C. Y., Gross, J., Young, A. K., Camero, K. A., ... & Chu, Y. I. (2016). Evaluation of automated teleretinal screening program for diabetic retinopathy. JAMA ophthalmology, 134(2), 204-209.

25. Wong, T. Y., & Sabanayagam, C. (2019). The war on diabetic retinopathy: where are we now?. Asia-pacific Journal of Ophthalmology (Philadelphia, Pa.), 8(6), 448.

26. Zhu, X., Xu, Y., Lu, L., & Zou, H. (2020). Patients' perspectives on the barriers to referral after telescreening for diabetic retinopathy in communities. BMJ Open Diabetes Research and Care, 8(1), e000970

27. Lin, S., Ramulu, P., Lamoureux, E. L., & Sabanayagam, C. (2016). Addressing risk factors, screening, and preventative treatment for diabetic retinopathy in developing countries: a review. Clinical & experimental ophthalmology, 44(4), 300-320.

28. Padhy, S. K., Takkar, B., Chawla, R., & Kumar, A. (2019). Artificial intelligence in diabetic retinopathy: A natural step to the future. Indian journal of ophthalmology, 67(7), 1004.

29. Shetty, N. K., & Swapnika, S. (2017). KAP study on diabetic retinopathy amongst the paramedic nursing students. Indian J Clin Exp Ophthalmol, 3(1), 85-90.

30. Alharbi M. T, Al-Barry M. A, Alshawawreh M. Y, Almatrafi O, M, Algethami T. F, Almatrafi M. M. , Alqelaiti Y. A., Alsehli M. N.(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.

31. Jani C., Desai T., Kapadia F., Dave H., Shah A., Patel V., Patel A., Jani R., Shah D., Pandya J.(2020) 'Knowledge attitude practice study of diabetic retinopathy', International Surgery Journal, 8(1), p. 54. doi: 10.18203/2349-2902.isj20205422.

32. Manu A S, Davalgi S. B., and Aithal S. S. (2019) 'Awareness of diabetic retinopathy and barriers for eye screening among adults with type 2 diabetes mellitus attending tertiary care teaching hospital , Davanagere , Karnataka', (July). doi: 10.5455/ijmsph.2018.0514717052018.

33. Ramchandran, R. S., Yousefi-Nooraie, R., Dadgostar, P., Yilmaz, S., Basant, J., & Dozier, A. M. (2022). Implementation of Teleophthalmology to Improve Diabetic Retinopathy Surveillance: Qualitative Interview Study of Clinical Staff Informed by Implementation Science Frameworks. JMIR diabetes, 7(1), e32162.

34. Khalaf, F. R., Fahmy, H. M., Ibrahim, A. K., Mohamed, G. A., Eldeen, M. E. S. E., Elkady, A., & Hetta, H. F. (2019). Does a diabetic retinopathy educational program raise awareness among elderly diabetic patients?. Diabetes, metabolic syndrome and obesity: targets and therapy, 12, 1867.

35. Egunsola, O., Dowsett, L. E., Diaz, R., Brent, M. H., Rac, V., & Clement, F. M. (2021). Diabetic retinopathy screening: a systematic review of qualitative literature. Canadian Journal of Diabetes, 45(8), 725-733.

36. 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.

37. Valikodath, N. G., Leveque, T. K., Wang, S. Y., Lee, P. P., Newman-Casey, P. A., Hansen, S. O., & Woodward, M. A. (2017). Patient attitudes toward telemedicine for diabetic retinopathy. Telemedicine and e-Health, 23(3), 205-212.

38. Seid, K., Tesfaye, T., Belay, A., & Mohammed, H. (2021). Determinants of diabetic retinopathy in Tikur Anbessa Hospital, Ethiopia: a case–control study. Clinical Diabetes and Endocrinology, 7(1), 1-9.

39. Abdool, Z., Naidoo, K., & Visser, L. (2016). The management of diabetic retinopathy in the public sector of eThekwini district of KwaZulu-Natal. African Vision and Eye Health, 75(1), 1-10.

40. Ibrahim, O. A., Foster, A., & Oluleye, T. S. (2015). Barriers to an effective diabetic retinopathy service in Ibadan, Nigeria (sub–Saharan Africa)-A pilot qualitative study. Annals of Ibadan postgraduate medicine, 13(1), 36-43.

41. Kashim, R. M., Newton, P., & Ojo, O. (2018). Diabetic retinopathy screening: A systematic review on patients' non-attendance. International journal of environmental research and public health, 15(1), 157.

42. Watson, M. J., McCluskey, P. J., Grigg, J. R., Kanagasingam, Y., Daire, J., & Estai, M. (2021). Barriers and facilitators to diabetic retinopathy screening within Australian primary care. BMC family practice, 22(1), 1-10.

43. Mohamed, S. S., Mohamed, R. F., & Mohamed, S. H. (2019). Impact of educational intervention program on diabetic retinopathy patient's compliance. American Journal of Nursing, 7(6), 1000-1008.

44. Baiuomy, A., Ezzat, M., Salem, Y. M., Bedier, N. A., Ghaleb, M. A., & Abou Shousha, M. A. (2021). Effect of an Educational Intervention on Self-Care Practices among Patients with Diabetic Retinopathy. Alexandria Scientific Nursing Journal, 23(2), 22-38.