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Efficacy of Instructional Platform Regarding Prevention of Retinopathy on Type II Diabetic Patient's Knowledge, Attitude, and Practice

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Abstract

Background: DR is a serious complication of diabetes that results in irreversible blindness and is one of the most leading causes of visual impairment and blindness. Appropriate interventions and self-care measures can interrupt or stop the resulting vision loss. **The study aim**: Evaluate efficacy of instructional platform regarding prevention of retinopathy on type II diabetic patient's knowledge, Attitude, and Practice (KAP). **Study design & setting:** A quasi-experimental design (pre-post and follow-up) was used to conduct this study. This study was conducted in the medical outpatient department of a private hospital at Jedda City. **Sample:** A purposive sample of 120 patients with type II diabetes were included. **Tools:** The efficacy of instructional platform regarding prevention of retinopathy evaluated by using two tools for data collection at pre, post, and follow-up stages. The first tool was structured interview questionnaire to assess sociodemographic data. The second tool contains three-part to assess patients' KAP regarding prevention of retinopathy. After the instructional platform was implemented in 3 training sessions, data collection was repeated immediately and 3 months later and HbA1C was retested. **Results:** A highly significant improvements in the patients' level of KAP about retinopathy prevention post- instructional platform implementation compared to pre- instructional platform implementation with p= (0.001). Furthermore, there was a highly significant correlation between patients' knowledge, Attitude, and Practice regarding prevention of retinopathy with p= (0.001). Finally, a significant positive correlation was found between patients' KAP regarding retinopathy prevention and all components of sociodemographic characteristics at p = (0.001) except the duration of DM. **Conclusion:** The implementation of instructional platform for type II diabetic patients revealed a significant improvement in the patients' level of KAP about retinopathy prevention post- instructional platform implementation compared to pre- instructional platform implementation. **Recommendations:** Efforts should be made to design and implement an appropriate educational platform to expand patient education approaches and KAP of patients with type II diabetes.

Keywords
Efficacy, instructional platform, prevention, diabetic retinopathy, knowledge, attitude, and practice

Diabetes mellitus (DM) is recognized as a major public health problem worldwide. Diabetes causes many long-term complications and has a tremendous impact on patients, families and society. This is because illness disrupts individuals during their most productive times (Elshemy, Ibrahim, & Elkazeh, 2018). DM will affect 642 million adults by 2040, about 75% of whom live in low- and middle-income countries. However, diabetic retinopathy (DR) affects one in three diabetic patients and remains the leading cause of blindness in adults (Wong & Sabanayagam, 2020).

According to World Health Organization (2020), the number of people exposed to DM has increased from 108 million in 1980 to 422 million in

2014. Prevalence is increasing faster in lower-middle income countries than in high-income countries. In recent years, the successful application of public health programs in developed countries is assumed to improve and modify the status quo of public health practices, including risk factor management, screening and treatment of diabetic retinopathy (DR).

DR is the most common microvascular complication of DM and remains the leading cause of visual impairment and blindness in these patients. Nevertheless, researches on factors leading to diabetic retinopathy is limited (Hosseini et al., 2021; Seid et al., 2021). Furthermore, discovering barriers to income attitudes in different countries can accelerate the development of successful DR screening programs (Piyasena et al., 2019).

All people diagnosed with DM, regardless of type of diabetes, require regular retinal screening for early detection and treatment of diabetic retinopathy. Curiously, screening for retinopathy is by fundus examination by an ophthalmologist or using color fundus photography using a conventional fundus camera (mydriatic or non-mydriatic) by a licensed ophthalmologist or optometrist. It will be executed. (Padhy et al., 2019; Rodriguez-Acuña et al., 2020)

Chen et al. (2021), Seid et al. (2021), Valikodath et al. (2017) and Jani et al. (2017) highlighted that vision loss due to DR is a public health responsibility. Telemedicine screening can increase surveillance rates, reduces socioeconomic disparities, increase access to treatment, and in the long term prevent vision-threatening DR and enhance visual outcomes and quality of life for patients with diabetes.

Preventing DR also requires understanding community knowledge, attitudes and practices (KAP) and producing materials relevant to the region and culture. KAP is a method of gathering specific information about what a patient knows, believes, or does about a particular topic. A community's understanding of a particular topic is knowledge. Attitudes refer to feelings towards the problem and any prejudices they may have. Practice is a way of demonstrating knowledge and attitude through action. (Aly et al., 2021; Mohamed, Mohamed, & Mohamed, 2019)

Self-care remains an important component of dealing with chronic illness. Combatting DR requires a strategic attention and resource paradigm shift away from primary and secondary tertiary prevention to be more widespread, more effective, and cheaper for large populations. (Kashim, Newton, & Ojo, 2018). Finally, strengthening facilitators is a key issue in advancing the challenges identified in DR. It also allows program managers to model new screening programs after successful local individuals (Egunsola et al., 2021).

Significance of the study

Approximately 422 million people worldwide have diabetes, and the number and prevalence of diabetes has increased steadily in recent decades (World Health Organization, 2020). Saudi Arabia has the highest prevalence of DM, estimated at 24% in the Middle East and North Africa (MENA) region. Saudi Arabia ranks 7th among the top 10 countries with the largest population aged 20-79 (Alharbi et al., 2021; AlSawahli et al., 2021).

Although DR is a leading cause of blindness, it has preventable adverse effects with early detection and treatment. Screening for DR may increase the number of cases treated early, especially in populations with limited access to care (Ramchandran et al., 2022; Riordan, Racine, Phillip, et al., 2020). The success of a DR public health screening program depends on the screening program adhering to the eye care schedule. Both African Americans are at greatest risk for DR and he is one of the least likely to receive ophthalmic care (Aly, Qalawa, & Shrief, 2022).

In addition, the training of medical staff and community nurses in screening and referral of diabetic patients to eye centers, assisting in providing information to diabetic patients, and training community and medical staff or conducting or facilitating continuing medical education should be stressed to decrease the disease morbidity and occurrence of blindness associated with (Shetty & Swapnika, 2017).

Aim of the Study

The aim of current study was to evaluate the efficacy of instructional platform regarding prevention of retinopathy on type II diabetic patient's knowledge, Attitude, and Practice.

Research Hypothesis

H 1: Patients' knowledge regarding prevention of diabetic retinopathy will improves post-instructional platform implementation compared to pre- instructional platform implementation

H 2: Patients' attitude regarding prevention of diabetic retinopathy will improves post-instructional platform implementation compared to pre- instructional platform implementation

H3: Patients' practice regarding prevention of diabetic retinopathy will improves post-instructional platform implementation compared to pre- instructional platform implementation

Research Design

Quasi-experimental design procedure with pre-post and follow-up plans was used to conduct the study. This design was estimated the causal effect of the intervention. This design estimated the causal impact of an intervention (instructional platform) on the dependent variables (patient's level of knowledge, attitudes, and practice).

Setting

The current study was conducted in the outpatient clinic of a private Hospital, Jeddah, Saudi Arabia.

Sampling

A purposive sample of 120 type II diabetics (male and female). Sample selection criteria were type II diabetic patients aged 30-70 years with no ocular complications and a history of diabetes for at least 1 year who volunteered to participate in the study. Exclusion criteria included patients diagnosed with diabetic retinopathy or who developed ocular complications during the study and required specific treatment and education, patient reluctance and refusal to participate in the study, or Patients who failed to attend all sessions or did not complete the questionnaire after completing the educational platform were included Patients who had previously participated in a diabetic retinopathy educational program

The tool of data collection

Two data collection tools were used during the pre-, post-, and follow-up phases to assess the efficacy of the instructional platform regarding DR prevention on patients' KAP:

Tool (I)

Structured interview questionnaire were adopted from Manu et al. (2018) and Alharbi et al. (2021) and modified by researchers after reviewing relevant literature. It was written in plain Arabic and were used to evaluating the sociodemographic information of the studied sample. The tool was composed of Nine items containing patients' age, gender, patients 'educational level, duration of diabetes, family history with diabetes, and the result of blood sugar control by the Hb-A1c test, which is the main source of information regarding diabetes and diabetic retinopathy. Referral to an ophthalmologist, and effect of vision by DM.

Tool (II)

The structured interview questionnaire were adopted from Khalaf et al. (2019) and Jani et al. (2021) and modified by researchers after reviewing relevant literature. It was written in simple Arabic and were used to evaluating patients' knowledge, attitude and practice (KAP), and it was composed of three parts as follows:

Part I: This section includes Eleven (yes/no) questions regarding patients' knowledge related to diabetic retinopathy. Correct answers received a score of 1 while incorrect answers scored 0 with total possible scores ranging from 0 to 11. Good knowledge accounts for >75% of the total score, 75% to 60% is considered average knowledge, <60% is poor knowledge.

Part II: This section consists of Twelve statements expressing the patient's attitudes toward the DR. The scoring system is a three-point Likert scale of (agree = 1), (unlikely = 2), and (disagree = 3) mirrored points for negative statements. The overall score for the attitudes is calculated by summing up each respondent's responses. An overall score of 3 or higher is considered a positive attitude, a score of less than 3 is considered a negative attitude.

Part III: This section contains Eight (yes/no) questions about patients' practices related to diabetic retinopathy. Correct answers received a score of 1 and incorrect answers scored 0. Good practice counts if the total score for practice is above 75%, 75% to 60% is considered average practice, and if less than 60% of the total score is poor practice.

Validity and Reliability of the Tool

Validly of the tools were carried out by 5 medical surgical nursing experts and 2 consulting ophthalmologists. The reliability of the tools on patients' KAP were confirmed by Cronbach's alpha = 0.094 factor test.

Pilot study: Pilot study was carried out on 12 type II diabetic patients (10% of the study sample) to test the clarity and applicability of this tool and to assess the mean time required to complete the questionnaire. The pilot sample has been added to the study sample because no changes were made to the research tools.

Ethical Considerations

Formal approval to conduct the study was obtained from appropriate authoritative personnel. The purpose and importance of the current study were explained for each patient. Patients were informed that they had the right to refuse or discontinue the study at any time without harm. Data encryption ensured anonymity and confidentiality. Additionally, patients were knowledgeable that these data would not be reused in further research without consent. Finally, written knowledgeable consent have been taken from the patients who approved to participate.

Procedures

The study was carried out through the following three stages; Pre-instructional platform stage, instructional platform development, implementation stage, and post-instructional platform stage. Data collection was carried out over a period of seven months, from the beginning of June 2022 to the end of December 2022.

1- Pre-instructional Platform Stage

Official permission from relevant authoritative personnel have been granted. Patients who met the study criteria and gave consent to participate in the study were interviewed individually to explain the nature and benefits of the current study, after which informed written consent was obtained. Each selected patient was asked to complete a questionnaire to assess the patient's KAP with the instrument (I, II, and III). The patient was tested for HbA1C. This phase continued until the required number of patients in the study (120 patients) was reached, which lasted for 3 months.

2- Instructional Platform development and implementation Stage:

The instructional platform is established according to the identified needs and problems assessed in the period before and after the review of the relevant literature. The educational platform was developed in 3 sessions per group (10 patients). Each session lasts approximately 30 to forty-five minutes. The first session focused on improving the patient's knowledge of the definition of DR, causes and risk factors, symptoms, prevention, when a patient should contact a physician, variables symptoms of untreated RD and treatments.

Second session was focused on improving patient attitudes by explaining the benefits of proper eye care, proper management, monitoring of blood glucose control, regular ophthalmologist visits, and physical examination. Regular eye exams, adherence to medication schedule, proper nutrition and appropriate physical activity. Third session was focused on improving patient practice to prevent DR such as measures to familiarize patients with barriers to retinopathy, improve patient intent to continue follow-up, eye care, including how often to monitor the patient, to check blood glucose levels accurately with a glucometer. , an eye exam schedule, a method of achieving or maintaining a moderate weight with physical activity, following your doctor's recommended measures with antihypertensive medications, and stopping smoking.

Researchers present material during these sessions in a simple way using lectures, illustrations, and videos on practical skills related to diabetic retinopathy. Each session ended with the researchers summarizing key points and reviewing session content with time spent on patient questions. Each patient receives a DR preventive self-care booklet that includes theoretical and practical sections.

4-Evaluation Stage

After each group accomplished the three learning sessions across three weeks, knowledge, attitudes, and practices were reevaluated using Tool I and Tool II immediately after instructional platform implementation. Three months later (follow-up test) reassess for retention was carried out and re-measured blood glucose (HbA1C).

Data processing & analysis

Data were collected, entered, analyzed, then tabulated. Data were analyzed with IBM SPSS version 26. (Armonk, NY: IBM Corp) qualitative data are allocated by percentage and number. Normal distribution was verified by using the Kolmogorov-Smirnov test. Quantitative data were determined using a combination of tests (minimum and maximum), mean, standard deviation, and chi-squared, and categorical variable inferential statistics were used for comparison. different groups and find relationships. The value of the Pearson correlation coefficient (R) was used to measure associations and relationships among variables in chi-squared correction. T-test or ANOVA to compare the two study groups. The significance level is set at $p < 0.05$, while high significance is set at $p < 0.001$.

Results

Table (1): Shows that (61.7%) were male and

(43.3%) belong to the 50-60-year-old group. Additionally, (47.5%) were highly educated, (43.3%) had diabetes <5 years, (76.7%) had a family history of DM, and (78.3%) monitored their blood glucose levels (HbA1C test), (54.2%) clarified that their primary source of information about diabetes and DR was their physician, (45%) had a referral to an ophthalmologist through their general practitioner, and (56.7%) had vision problems.

Table (2): Illustrate that the level of knowledge of type II diabetic patients, their attitudes, and practices regarding the prevention of retinopathy had highly significant differences at the post-instruction platform implementation stage and follow-up compared to the pre-instruction platform implementation stage with p= (0.001)

Table (3): Revealed that there was a significant positive correlation was found between pre- post, pre- follow-up, and follow-up- post instructional platform implementation phases in terms of total scores for knowledge, attitudes and practices in patients with type II diabetes

Table (4): Show a highly significant correlation between type II diabetic patients Knowledge, attitude, practice regarding prevention of retinopathy (p-value =<0.001).

Table (5): Reflected a highly significant positive correlation was found between type II diabetic patients' knowledge, attitudes, and practices regarding retinopathy prevention and sociodemographic characteristics mainly in items of age, gender, level of education, family history of diabetes, and glycemic control level at p = (0.001). While there was no significant correlation between diabetic patients ' KAP scores and sociodemographic characteristics in relation to the duration of DM with a p-value (0.341, 0.286, 0.637) respectively.

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

Variables	N	%
Age		
30 - <40	14	11.7
40 -<50	28	23.3
50 -<60	52	43.3
60 -70	26	21.7
Mean ± SD	38.201±10.324	
Gender		
Female	46	38.3
Male	74	61.7
Level of education		
None educated	13	10.8
Elementary	12	10
Intermediate education	27	22.5
High School	57	47.5
Higher education	11	9.2
Duration of DM		
Less than 5 years	52	43.3
6 to 10 years	36	30
More than 11 years	32	26.7
Family history of DM		
Yes	92	76.7
No	28	23.3
Blood glucose level (HbC1A)		
Controlled	94	78.3
Uncontrolled	26	21.7
Main source of information about DM and DR		
Physician	54	45
Nurse	28	23.3
Internet /social media	15	12.5
Friends and relatives	18	15
Not received any information	5	4.2
Referral to ophthalmologist		
General practitioner	76	63.3
Patient himself	24	20

Variables	N	%
Have no referral yet	20	16.7
Is your vision is affected by DM?		
Yes	68	56.7
No	52	43.3

Table (2): Comparison between type II diabetic patients' KAP score levels in pre, post and follow-up instructional platform implementation phases:

Items		Test						P-value
		Pre		Post		Follow up		
		N	%	N	%	N	%	
Knowledge	Poor	40	33.3%	0	0.0%	7	5.9%	<0.001*
	Average	73	60.8%	22	18.3%	50	41.6%	
	Good	7	5.9%	98	81.7%	63	52.5%	
Attitude	Negative	92	76.7 %	18	15.0%	26	21.7%	<0.001*
	Positive	28	23.3 %	102	85.0%	94	78.3%	
Practices	Poor	75	62.5%	0	0.0%	8	6.6%	<0.001*
	Average	42	35.0%	6	5.0%	53	44.2%	
	Good	3	2.5%	114	95.0%	59	49.2%	

*Significant at P≤0.05

Table (3): Correlation between pre, post and follow-up instructional platform implementation phases regarding type II diabetic patients' knowledge, Attitude, and practice

Comp.	Knowledge		Attitude		Practices	
	T-test	P-value	T-test	P-value	T-test	P-value
Pre-Post	-67.300	<0.001*	-87.003	<0.001*	-63.830	<0.001*
Pre-Follow up	-38.098	<0.001*	-62.216	<0.001*	-36.432	<0.001*
Follow up-Post	-23.153	<0.001*	-27.178	<0.001*	-21.102	<0.001*

*Significant at P≤0.05

Table (4): Correlation between type II diabetic patient knowledge, attitude, and practice scores regarding prevention of diabetic retinopathy

Correlation		Knowledge	Practices
Practices	**r**	0.798	
	P-value	<0.001*	
Attitude	**r**	0.787	0.793
	P-value	<0.001*	<0.001*

r: Pearson Correlation Coefficient
*significant at P≤0.05

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

Demographic data		N	Knowledge	Attitude	Practice
			P-value	P-value	P-value
Age	30 - <40	14	<0.001*	<0.001*	<0.001*
	40 -<50	28			
	50 -<60	52			
	60 -70	26			
Gender	Female	46	<0.001*	<0.001*	<0.001*
	Male	74			
Level of education	None educated	13	<0.001*	<0.001*	<0.001*
	Elementary	12			
	Intermediate education	27			
	High School	57			
	Higher education	11			
Duration of DM	Less than 5 years	52	0.341	0.286	0.637
	6 to 10 years	36			
	More than 11 years	32			
Family history of DM	Yes	92	<0.001*	<0.001*	<0.001*

	No	28			
Blood glucoses levels (HbC1A)	Controlled	94	<0.001*	<0.001*	<0.001*
	Uncontrolled	26			

* Significant at p ≤ 0.05

Discussion

Diabetic retinopathy is a common complication of DM. It is the leading cause of blindness in adults worldwide. It is the most common microvascular complications of diabetes with damage to retinal capillaries. DR requires an additional socioeconomic burden through reducing productivity and quality of life (Aly et al., 2021; Said & Hamed, 2021). DR can be avoided by proper screening and treatment of diabetes. Tight glycemic control, early detection and appropriate treatment are the keys to halting disease progression. (Alzahrani et al., 2018; Ghoreishi et al., 2019; Soleimani Kamran et al., 2017; Willis et al., 2017).

Riordan, Racine, Smith, et al. (2020), Shetty and Swapnika (2017) and Watson et al. (2021) emphasizing the correct knowledge, attitudes, and practices of medical staff can bridge the gap between ophthalmologists and diabetic patients. Similarly, it can be of great help in uncovering covert cases of DM, as it aids early detection of families with DM. All opportunities for contact with high-risk cases of DR in healthcare facilities should be developed to identify patients with diabetic retinopathy.

With regard to the sociodemographic characteristics of patients with type II diabetes that were studied, the current study found that slightly more than half of the patients were male, almost half were in the 50-60-year-old group, had a high level of education, and indicated that they were male. For diabetics from less than 5 years. While there is a family history of diabetes and monitoring of blood glucose levels, referral to an ophthalmologist reveals that the physician is the primary source of information regarding diabetes and DR. These finding is agreed with Abel, Issifou, and Zabdi (2021) and Aly et al. (2022)**.** While it contrasts with Salahen et al. (2020), who revealed that more than half of the participants were female, the average age of the participants was 39.13 years, and she had a primary school certificate. More than a third of the participants had a disease period of 3 to 5 years, the majority developed complications of diabetes, and more than half had a family history of diabetes.

The results of the current study of type II diabetic patients' knowledge, attitude, and practices showed a significant improvement in KAP scores related to retinopathy prevention during the post and follow-up phases of the instruction platform compared to the pre-instruction implementation phase. These findings are in the line with Salahen et al. (2020); Watson et al. (2021)**,** who concluded that knowledge and attitudes of people with diabetes towards diabetes and DR changed positively in the short term after the implementation of an education program, suggesting that global education programs and strategies emphasized that can ensure better long-term outcomes. This finding is supported with M Abd Elmouty and Hamed Mohammed (2022) who highlighted a satisfactory KAP scores for diabetic retinopathy prevention performance after the training course, with highly statistically significant differences compared to before the course.

Furthermore**,** these results are concurred to Baiuomy et al. (2021) who found that self-care knowledge and practice improved significantly in patients who received the educational program over those who did not. In addition, it is comparable with, Askari et al. (2018) illustrated the benefit of an educational program based on the BASNEF model on type II diabetic patients' self-care behaviors which is very effective and advantageous in controlling, checking, and follow-up of blood glucose levels.

Another researchers emphasized the need to raise community awareness, screening services for diabetic patients, early detection of DR, and the critical need to develop approaches for educating people with diabetes about their potential for developing retinopathy is critical to diabetes education and care (Nizamani et al., 2017; Pearce & Sivaprasad, 2020; Raman et al., 2021; Salamanca et al., 2018; Wong & Sabanayagam, 2019).

Conversely, Kashim et al. (2018), Salahen et al. (2020), Wong and Sabanayagam (2019) and Zhu et al. (2020) established a significantly negative improvement in patients' attitude related to eye examination after implementation of the educational program. Therefore, they justified these findings that behavioral modifications require knowledge about the urgency of the situation and enthusiasm for making changes that need patient education and support.

The current study findings revealed that there was a significant positive correlation was found between pre- post, pre- follow-up, and follow-up- post instructional platform implementation phases in terms of total scores for knowledge, attitudes, and practices in patients with type II diabetes This results in the same context as Aly et al. (2022) who stated that a significant correlation between pre-post, pre-follow-up, and follow-up-post instructional platform implementation phases. with respect to the level of patients' KAP regarding preventive measures for diabetic retinopathy.

The current study clarified a highly significant correlation between type II diabetic patients' knowledge, attitude, practice related to retinopathy prevention. This finding is consistent with Aly et al. (2022)**,** who found a positive and highly significant correlation between total knowledge attitude, practice related to preventive measures of retinopathy in post program. This result is supported by Abel et al. (2021), Aly et al. (2021), Venugopal et al. (2020) and Watson et al. (2021)**,** who have reported that, good knowledge about diabetic retinopathy is significantly associated with a positive attitude regarding retinopathy and good practices.

Findings of the present study reflect a highly significant positive correlation was found between type II diabetic patients' knowledge, attitudes, and practices regarding retinopathy prevention and sociodemographic characteristics mainly in items of age, gender, level of education, family history of diabetes, and glycemic control level. While there was no significant correlation between diabetic patients' KAP scores and sociodemographic characteristics in relation to the duration of DM.

These findings are supported with Aly et al. (2021) who illustrated a highly statistically significance between patient knowledge, attitudes, and practices in relation to age, education level, and glycemic control. In addition to highly statistically significant relationships between sociodemographic characteristics with patients' attitudes and practices, particularly in terms of gender, family history of DM, and the impact of DM on visual acuity. While there are no significant associations were found between knowledge and duration of DM or gender.

In the same context, Abel et al. (2021) highlighted that knowledge and practice levels are positively correlated with female gender and educational level. The patient had a good attitude when the ocular symptoms began. These results also consistent with Khalaf et al. (2019) who reported a statistically significant association between level of education and level of knowledge.

On the contrary, two other studies showed that prolonged diabetes persistence was positively associated with good knowledge of diabetics about diabetic retinopathy (Assem et al., 2020; Gupta, Gupta, & Kalra, 2018).

Stojanović et al. (2018) illustrated that in addition to the long-term complications of diabetes, both socioeconomic and chronic complications due to age, low education level, and low socioeconomic status are associated with type I and significant factors affecting the quality of life of type II Diabetes mellitus. Therefore, healthcare providers should be aware not only of the clinical parameters of diabetic patients but also of their working conditions and educational level.

Finally, diabetic retinopathy is an endless growing problem. Early examination and timely treatment can reduce the impending retinopathy problem. Any tool that can aid in the rapid screening of this disorder and reducing the supply of trained human beings for both diabetic patients and ophthalmologists (Al Rasheed & Al Adel, 2017; Padhy et al., 2019; Riordan, Racine, Phillip, et al., 2020).

Conclusion

Depending on the finding of the current study, the study hypotheses were accepted. As there were a highly significant improvements in the patients' level of knowledge, attitudes, and practices, about retinopathy prevention post- instructional platform implementation compared to pre-instructional platform implementation

Recommendations

- Efforts should be made to design and implement an appropriate educational platform to expand patient education approaches and knowledge and practice of patients with type 2 diabetes.
- Information about preventive measures for diabetic retinopathy should be provided at all health services.
- Brief educational brochures and/or posters on preventive measures for diabetic retinopathy should be made available to diabetics in outpatient clinics.
- Further research is needed to enable health screening for all diabetics in different age groups for early detection of diabetic retinopathy in different healthcare settings.
- Early treatment for retinopathy, and follow-up schedules for noncompliant diabetic patients.

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