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Knowledge, Attitude and Practice of Diabetic Patients About Diabetic Retinopathy

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Abstract. **General Background**: Diabetic retinopathy (DR) is a leading microvascular complication of diabetes mellitus, resulting in progressive retinal damage and vision loss worldwide. **Specific Background**: Despite the availability of effective screening and treatment options, many patients remain unaware of the risks and preventive measures, particularly in middle-income countries. **Knowledge Gap**: Limited data exist on the knowledge, attitudes, and practices (KAP) of diabetic patients in Iraq regarding DR, which hinders the development of targeted educational and preventive strategies. Aims: This study aimed to assess the KAP of diabetic patients toward DR at Imam Hassan Center for Diabetes and Endocrinology in Kerbala. **Results:** Among 368 participants, poor blood sugar control was the most recognized risk factor (59%), while over half (51.1%) were unfamiliar with treatment options. Only 41% believed eye exams were necessary even with controlled blood sugar, and although 83.7% reported regular eye checks, most visits were for spectacle adjustments rather than DR follow-up. **Novelty:** This is one of the first studies in Iraq to comprehensively evaluate patient KAP toward DR, highlighting systemic gaps in awareness and practice. **Implications**: Findings underscore the urgent need for structured educational programs and improved screening strategies to enhance patient understanding, promote preventive care, and reduce DR-related vision loss.

Highlights:

1. The study highlights limited patient knowledge about diabetic retinopathy.
2. Attitudes toward regular eye exams remain inconsistent among participants.
3. Practices show gaps in routine screening and treatment awareness.

Keywords: Diabetic Retinopathy, Knowledge, Attitude, Practice, Diabetic Patients

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Introduction

Diabetic Retinopathy, often known as diabetic eye disease, is a major complication of Diabetes Mellitus (DM). It's a microvascular condition that is brought on by progressive microangiopathy resulting in a gradual damage to the retina, and an eventual loss of sight [1]. in DR, hyperglycemia-induced capillary occlusion causes the production of vascular endothelial growth factor (VEGF), which increases capillary permeability, leading to retinal edema, it can also stimulate angiogenesis, leading to neovascularization [2]. Clinically, DR is distributed into stages based on vessel degeneration and ischemic changes: proliferative diabetic retinopathy (PDR) and nonproliferative diabetic retinopathy (NPDR). NPDR is considered an early stage of DR, during which increased vascular permeability and capillary occlusion are the main findings in the retinal vessels. Microaneurysms (swellings of thin vessels that show as tiny isolated red dots with sharp borders in the retina), Hemorrhages (due to leaking of weak capillaries, appear like red deposits with irregular margins) and hard exudates (caused by protein leakage from vessels and seem like small whitish spots), all three can be detected by fundus imaging. On the other hand, PDR, is considered a more advanced stage of DR, neovascularization is the main characteristic. primary symptoms of DR may include fluctuating vision, blurred vision, and rapid vision loss. Patients with NPDR may not complain of symptoms, as for PDR, patients may go through severe vision impairment If the new anomalous vessels bleed into the vitreous humor aka vitreous hemorrhage, this can also happen if the patient develops retinal detachment [3][4].

The prevalence of DR was found to escalate with longer durations of diabetes and higher HbA1c levels (poorly controlled diabetes) and hypertension [2][5], age, sedentary lifestyle, nephropathy, dyslipidemia, smoking, and higher body mass index were also found to be important risk factors [6][7]. All Diabetic patients would eventually develop a form of DR after 20 years of the onset of DM, many of them go undiagnosed until the DR becomes advanced. DR causes about 4.8% of the cases of blindness worldwide, DR is a leading cause of newonset blindness in working age group in industrialized countries, and frequently a cause of blindness in middle income countries [8]. Among neighboring and other Asian countries, the prevalences of DR among DM patients in some studies were: 48.4% in northern Jordan [9], 51.1% in Pakistan [6], 20.64±1.06% in south Korea [5], 23.4% in Iran [10], 16.3% in China [11], 34% in Egypt [12]. Regular screening program for DR can help patients with DM to preserve their vision since the current treatments are effective for preventing further visual loss rather than reversing the existing damage [7]. According to current guidelines for screening of DR; the American Diabetes Association (ADA) recommends Adults with type 1 diabetes to have the first eye exam within 5 years after the onset of DM, Patients with type 2 DM should have it at the time of their DM diagnosis [13]. According to the International Council of Ophthalmology (ICO), the screening exam can include visual acuity and retinal examinations, the retinal exam can be done by: direct/indirect ophthalmoscopy, slit lamp, Retinal photography with or without optical coherence tomography (OCT) [14]. the first auto-mated diabetic retinopathy screening program has been approved by FDA in April 2018, accomplishing a 96.8% sensitivity and 87% specificity for detecting referable DR [7], the device that is used is called IDx-DR, is a software application that analyzes ocular images captured by the retinal camera using an artificial intelligence algorithm, The patient's digital retinal scans are uploaded to a cloud server running IDx-DR software, The software gives one of two outcomes: (1) "more than mild diabetic retinopathy detected: refer to an eye care professional" or (2) "negative for more than mild diabetic retinopathy; rescreen in 12

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months". Patients should consult an eye care professional as soon as possible for other diagnostic testing and probable treatment if a positive result is found [15].

In addition to medical therapy, controlling blood glucose, blood pressure levels, serum cholesterol are important factors in DR management. anti-VEGF agents (ranibizumab, bevacizumab, and aflibercept) are effective in the reduction of diabetic macular edema and in vison improvement. patients with PDR, panretinal laser photocoagulation (PRP) has been effective in decreasing the risk of vision loss in this type, PRP can be used in severe NPDR. Intra-vitreous antiVEGF is also an excellent alternative choice for treatment of PDR [7].

Aim of the study

To assess the knowledge of diabetic patients regarding diabetic retinopathy and their practice and attitude toward it

Materials and methods

Study design: Cross sectional study.

Study setting and time: data was collected from September 2023 to July 2024 at random occasions during that time period at Imam Hassan center for Diabetes and endocrinology in Kerbala, Iraq.

There were 368 participants. All diabetic patients are eligible to enroll in this study except for: Children aged less than 6 years old, patients who don't speak Arabic, mentally challenged patients, patients who can't give verbal consent, and patients with any other form of disability that prevents them from efficient communication with the investigators.

Consent and legal requirements were obtained before data collection at the center. Diabetic patients, who met the above criteria, were enrolled after obtaining verbal consent. Data were collected using questionnaire in paper form. KAP info were obtained using 44-point questions, they were either single choice or multiplechoice questions, the patient didn't fill the form himself rather was told the questions by the investigator verbally and the form was filled by the latter.

The questionnaire was chosen by the investigators after conducting a thorough reading of existing similar researches, mostly from Srinivasan et al study in India [8]. Which were translated later into Arabic. To avoid inaccurate info due to leading questions, most of the questions in the knowledge and practice sections of the questionnaire were open-ended questions. The questions in the attitude section were framed as statements, and the patient was asked whether he agreed or disagreed with the statement, or didn't know. The questionnaire was administered in all cases by one of two investigators, who were final year medical students.

There are 8 questions in the knowledge section, 5 questions in the attitude section, and 13 questions in the practice section, and additional 7 questions reserved only for those who said they have been diagnosed with DR. This questionnaire was verbally administered by the investigators themselves to the patients to avoid guessing answers and to include those who can't read but can communicate efficiently to assess their

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knowledge, attitude and practice patterns regarding diabetic retinopathy.

Statistical analysis: Data were organized and analyzed by using SPSS statistics V 24.

Synthesis and Characterization of API-ILs

Demographic and clinical characteristics:

Table 1 summarizes the demographic characteristics of the 368 participants. 184 (50%) of patients were age (40 to 59 Years), 104 (28.3%) of patients were age (60 years or more) 43 (11.7%) of patients were age (21 to 39 years) and 37 (10.1%) were age 20 or less.

The sample includes 135 (36.7%) males and 233 (63.3%) females.

125 (34%) reported having low income, 231 (62.8) sometimes enough (moderate) and 12 (3.3) enough income (high).

The study's population was predominantly urban 309 (84%) with only 58 (15.8%) residing in rural areas.

Regarding the education level, about 42 (11.4%) of patient had university degrees (bachelor degree or more). patients who have preparatory school degree were about 32 (8.7%) and middle school were 74 (20.1%) while the primary school were 139 (37.8%) and Illiteracy accounted for 81 (22%), as shown in table 1.

Table 1: The demographic characteristics of the participants children with Attitudes, knowledge and practices of diabetic patients about diabetic retinopathy. (N=368)

Variable	Group	Frequency	%
Age (Years)	20 years and less	37	10.1
	21-39 years	43	11.7
	40-59 years	184	50
	60 and more years	104	28.3
Sex	female	135	36.7
	male	233	63.3
Educational Level	Illiteracy	81	22
	primary school	139	37.8
	secondary school	74	20.1
	preparatory	32	8.7
	collage or more	42	11.4

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economic situation	low	125	34
	moderate	231	62.8
	high	12	3.3
Residence	rural area	59	16
	urban	309	84

Table (2) shows various factors potentially associated with diabetic retinopathy in the study's population. As shown in the table, about 59 (16%) of the patient had a kidney disease while 296 (80.4%) did not have and 13 (3.5%) of patients didn't know if they have kidney diseases or not.

Furthermore, A 245 (66.6%) of them did not have any heart diseases, and 114 (31%) of the patient in this study had, but 9 (2.4%) of them didn't know if they had a disease or not.

if they had a diseases or not.

Table 2. factors potentially associated with diabetic retinopathy in the study population **(N=368).**

Risk factors	**Group**	**N**	**%**
Have kidney diseases	No	296	80.4
	Yes	59	16
	I don't know	13	3.5
Have any heart or vascular diseases	No	245	66.6
	Yes	114	31
	I don't know	9	2.4

Table (3) summarizes information of patients about diabetic complications.

The majority of patients 168 (45.7%) recognized retinopathy as an ocular complication, 7 (1.9%) recognized glaucoma while 48 (13%) recognized cataract and 8 (2.2%) of them recognized infection, 64 (17.4%) mentioned visual impairment, the remaining patients 73 (19.8%) didn't recognize any ocular complication of DM.

Table 3: Frequencies of the participants based on information of patients about diabetic complications:

Variable	**Group**	**Frequency**	**Percentage**
Problems come from DM	Retinopathy	168	45.7

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	Glaucoma	7	1.9
	Cataract	48	13
	Infection	8	2.2
	Visual impairment	64	17.4
	I don't know	73	19.8

Table 4 shows how the patients knew that DM causes DR.

The results show 100(27.2%) learned firstly from a general physician,161 (43.8%) from an ophthalmologist and 10 (2.7%) from optometrist, while 9 (2.4%) knew from books, 32 (8.7%) knew from social media and 43 (11.7%) knew from family, remaining 13 (3.5%) knew from friends.

Table 4: Frequencies of the participants based how the patients know that the DM causes diabetic retinopathy.

Group	Frequency	Percentage
General doctor	100	27.2
Ophthalmologist	161	43.8
Optics technique	10	2.7
Book	9	2.4
Social media	32	8.7
Family	43	11.7
Friends	13	3.5

Table (5), shows the factors that contribute to the worsening of DR, so according to 368 participants, 1 (0.3%) of them chose the duration of DM, 217 (59%) of them chose poor blood sugar control, 1 (0.3%) of them chose hypertension, 22 (6%) chose nephropathy but 127 (34.5%) didn't know.

Table 5: Frequencies of the participants based factors that worsening of diabetic retinopathy.

Variable	Frequency	Percentage
Duration of disease	1	0.3
Poor blood sugar control	217	59

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Hypertension	1	0.3
Kidney disease	22	6
I don't know	127	34.5

Table (6) shows the types of available treatments for DR that the participants could recognize.

About 13 (3.5%) recognized spectacles, 66(17.9%) recognized laser, surgery was recognized by 67(18.2%) of patients ,34(9.2%) recognized eye injection but the remaining 188(51.1%) didn't know about any treatment for the condition.

Table 6: Frequencies of the participants based on the available options for patients with diabetic retinopathy

Variable	**Frequency**	**Percentage**
spectacles	13	3.5
laser	66	17.9
surgery	67	18.2
Eye injection	34	9.2
I don't know	188	51.1

Attitude of participants about DR:

Table 7: summarizes the attitude of precipitants about the regular examination and the regular check of DR.

About 151 (41%) agree with that DM patients should have regular eye exams if blood sugar is well controlled, 202(54.9%) of participants disagreed with that and the remaining 15(4.1%) didn't know.

On other hand 180(48%) of precipitants agree with that even if they didn't have any eye problem they should have regular eye exams, 175(47.6%) didn't agree with that and the remain 13(3.5%) didn't know about that.

103(28%) of the participants agree with that eye doctors say that good control of diabetes prevents problems due to diabetic retinopathy; but it is not possible to keep sugars under perfect control as they say, 213(57.9%) disagree with that and the remaining 52(14.1%) didn't know.

40(10.9%) agree with no matter they do, vision may worsen or not improve, so what is the use of doing all this treatment/follow up for DR, 260(70%) disagree with that and

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about 68(18.5%) didn't know.

Table 7: Frequencies of the participants based on the attitude of precipitants about the regular examination and the regular check of the diabetic complication.

Variable	Group	Frequency	Percentage
Once every 6 months diabetes patients should have regular eye exams if the blood sugar well controlled	agree	151	41
	disagree	202	54.9
	I don't know	15	4.1
even if they didn't have any eye problems they should have a regular eye exams	agree	180	48.9
	disagree	175	47.6
	I don't know	13	3.5
no need for exam even if ophthalmogist say that they need a regular eye exam but they have a regular blood sugar	agree	103	28
	disagree	213	57.9
	I don't know	52	14.1
no matter they do, the vision worse or not improved	agree	40	10.9
	disagree	260	70.7
	I don't know	68	18.5

Practices of participants about DR:

Table 8, summarized the participants that answered with yes, who had a regular vision check.

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5(3.7%) went to general physician to check their vision, 113(83.7%) went to ophthalmologist and about 17(12.59%) went to optometrists.

And according to this detail we ask the precipitants, why did you go the checkups? And about 37(27.4%) said for follow up or treatment of DR, 51(37.77%) said to check the power of spectacles, 39(28.88%) said that they were told to do it and they don't know why and remaining 8(5.92%) for other reasons.

And on the check up some of them use eye drops, from 368 of precipitants about 71 use it, 17(23.94%) once every 3 months, 19(26.76%) once every 6 months, 5(7.04%) once a year and 30(42.25%) use as directed by the ophthalmologist.

Table 8: assessment of participants who had a regular vision check.

Variable	Group	Frequency	Percentage
The specialist that exam the eye	General doctor	5	1.4
	Ophthalmologist	113	30.7
	Optics techniques	17	4.6
The cause for check-ups of vision	Follow up and treatment of diabetic retinopathy	37	10.1
	Check power of spectacles	51	13.9
	I told to check	39	10.6
	other	8	2.2
Use of dilating eye drops	Once every 3 months	17	4.6
	Once every 6 months	19	5.2
	Once a year	5	1.4
	As ophthalmogist prescription	30	8.2
Dilating eye drop exam done by	General doctor	2	0.5
	ophthalmologist	66	17.9

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Table 9: summarizes reasons participants didn't do regular vision check-ups.

10(5.61%) didn't trust doctors, 23(12.92%) lack of family support, 13(7.3%) due to long distance, 32(17.97%) the financial problems, 11(6.17%) for physical disabilities, 7(3.93%) didn't know they had to do that and 82(46.06%) had a good vision so didn't see any need.

Table 9: causes of having no eye examination.

Variable	Frequency	Percentage
Didn't trust in doctors	10	2.7
Lack of family support	23	6.3
Long distance	13	3.5
Financial problems	32	8.7
Physical disabilities	11	3
Didn't know they had to do it	7	1.9
Had good vision and no need for it	82	22.3

Discussion

Table (1) highlights the demographic and socioeconomic characteristics of diabetic patients and their association with knowledge and attitudes about diabetic retinopathy (DR). The majority of respondents are aged 40-59 years (50%), predominantly male (63.3%), and urban residents (84%). Educationally, primary school attendees constitute the largest group (37.8%), followed by illiterate individuals (22%). Regarding the economic status about 62% was from the middle-income people. If we compare this result with a study published in 2016 in Saudi Arabia, which reported similar demographic data, with the same age distribution, this may reflect this age group has the greatest prevalence of diabetes as older people may not get the same medical services and may get neglected. Also, it showed more male participant which indicate more male patients getting the disease. The educational status considered an important factor in assessing patient diabetic status and their action toward there disease follow up and understanding its complication. Both studies showed more people from urban areas participating in the studies, this reflects easier access to the medical services in the urban areas comparing to the rural areas in which their people may get difficulty in reaching the centers specialized in managing the disease. Another point to be addressed was the economic status, poor people have no ability to deal with all the diabetes aspect and may another priority than eye care as they have good vision.[16]. No recently published article discussing the same idea In Iraq.

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Regarding table (2), it highlights the association between systemic risk factors and diabetic retinopathy (DR) among a study population of 368 participants. It shows that 16% of patients reported having kidney diseases, while 80.4% did not, and 3.5% were unaware of their condition. Similarly, 31% of participants had heart or vascular diseases, whereas 66.6% did not, and 2.4% were unsure. These findings emphasize the significant role of systemic comorbidities, such as kidney and cardiovascular diseases, in the progression of DR. A similar study by Afroz et al. (2021) in Bangladesh found that 18% of participants had chronic kidney disease (CKD) and 33% had cardiovascular diseases, both of which were significantly associated with an increased risk of DR. The overlap in findings between the two studies underscores the need for regular screening for systemic conditions and greater patient education about their impact on DR. Additionally, both studies highlight a lack of awareness among many patients about their systemic health conditions, pointing to gaps in routine screening and patient knowledge. Addressing these gaps through integrated diabetes care, multidisciplinary approaches, and early detection of comorbidities is essential to reduce the burden of DR and improve patient outcomes.[17]

Table (3) asses the level of knowledge among diabetic patients regarding complications associated with diabetes mellitus (DM). about half of the participants (45.7%) identified diabetic retinopathy (DR) as a complication, while 17.4% said visual impairment, 13% identifying cataracts, about 2% said infections, and only 1.9% considered glaucoma as complication of the disease. While about 20% said they donot know about the effect of diabetes on the eye. These findings is similar to a study done by AlRubeaan et al. in Saudi Arabia in (2018), in which 48% of patients were aware of DR as a complication, while (2.3%) said glaucoma and (12.6%) considered cataracts as a complication.[18]

Table (4) demonstrates the sources through which diabetic patients learned that diabetes mellitus (DM) can cause diabetic retinopathy (DR). The majority of participants (43.8%) had information about DR from ophthalmologists, followed by general doctors (27.2%). Other sources included family (11.7%), social media (8.7%), friends (3.5%), books (2.4%), and optics technicians (2.7%). These findings is similar to what was found with a study done by Al Rasheed et al. in (2022) in Saudi Arabia, in which 40% of diabetic patients said the ophthalmologists is their primary source of information, followed by general physicians (25%).[19]

Table 5 asses participants' knowledge about factors contributing to the development and progression of diabetic retinopathy (DR). more than half of the participants said poor control of diabetes is the most important factor, while less than 1% know about the effect of the duration of the disease on the eye which is the mot important factor, this indicate lack of awareness about the nature of the disease and the important of follow up. However about one third of the participants had no idea about any risk factor. A similar result was found by a study done by Al-Rubeaan et al. (2018) in Saudi Arabia, where 61% of participants said poor glycemic control as the primary factor affecting DR progression. Both studies indicate the important of health education and health programs to raise the knowledge of the patients about the risk of diabetes complications and how to discover it.[18]

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Table 6 asses what patients knows about the treatment of diabetes eye complication. From these participants about 18% said the surgery is the treatment and the same percent said the laser is the treatment, while only about 9% know about injection, it is a great misunderstanding for the new and available treatment options for diabetic eye complications. More than half of the participants have no idea about any treatment options for the DR. These findings similar with a study done by Shah et al. at (2021) in India, in which only 12% know about injection and 47% have no idea about any treatment option. However these result indicate that health care provider need to educate the people about the available treatment options for DR especially anti VEGF injection.[20]

Regarding the attitude 41% thought that it's unnecessary to get a regular eye exam if their DM is under control, 54.9% thought it's necessary, compared to what Ahmed, I. A. B. et al found a study was conducted in Saudi Arabia where 39.32% thought it's unnecessary and 38.84% thought it's necessary. [21] indicating more positive attitude toward eye screening among our participants. In contrast to their results which were more balanced. While 48.9% thought DM patient should go for an eye exam even if their vision is normal, 47.6% thought they shouldn't. compared to Ahmed, I. A.et al Where they found that 42.69% agreed, 38.36% disagreed.[21] the results were close which indicates the common need to improve education regarding DR and that the eye being symptomless doesn't mean it isn't affected by DR yet. 28% agreed and 57.9% disagreed that eye doctors say that good control of diabetes prevents problems due to DR but it is not possible to keep sugars under perfect control as they say. Ahmed, I. A. B. et al found that 40.28% agreed and 40.93 disagreed.[21] this indicates higher trust between participants and the medical system, and possibly better access to high quality diabetic care. 10.9% agreed that no matter what they do, vision may become poor in the end. so there is no use of doing all this treatment for DR, while 70.7% disagreed. Ahmed, I. A. B. et al found that 38.04% agreed, 43.17% disagreed. [21] which can indicate a more optimistic view and better trust in the effectiveness of DR treatments and medical staff, in contrast to a more pessimistic view towards the prognosis of DR in the other study.

Table (8) showed that 3.7% said they would go to the general physician for periodic eye exam, 83.7% for the Ophthalmologist,12.59% for Optometrist. While Ahmed, I. A. B. et al found that 40% went to an ophthalmologist, 18% an optometrist and 42% a physician at a local hospital.[21] the greater reliance of our participants can indicate that patients recognize the importance of DR and that they think it should be handled firsthand by a specialist, it can also indicate a defect in the referral system and a general distrust and unawareness of the role other physicians, optometrists and primary health care can play in recognizing DR, which highlight the need to educate the patients to seek the correct sequence in eye care route. 23.94% said they go every 3 months for a dilated eye checkup, 26.76% every 6 months, 7.04% once a year, while Al Zarea, B. K. (2016) found that 12.07% went monthly, 33.94 went every 6 months, 48.97% went every year. [16] the higher rates of or participants going for frequent visits may indicate a greater wariness and fear of possible vision loss among those aware of DR, yet in contrast to the other study where the majority were adherent to the recommended annual screen

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for DR, which brings the need to educate about the international guidelines.

Table 9 summarize the cause of not undergoing regular eye examination. When asked why have you not gone for a periodic/ regular eye checkup, 5.61% didn't trust the doctors, 12.92% had lack of family support, 7.3% complained of long distances. 17.97% mentioned financial struggles. 6.17% mentioned physical hindrances, 3.93% didn't know they had to go regularly in the first place,46.06% said they don't need to since their vision is well. While Hope, M. (2019) found it to be 0%, 0%, 1.5%, 14.2%, 0.4%, 61.2%, 22.4% respectively for the same reasons [22] this again highlights the need to educate about the asymptomatic nature of DR and that it shouldn't be taken for granted. The other study had majority stating they didn't know they should, which indicates a better awareness and more successful educational campaigns. The high rates in the lack of family support, physical hindrances and distrust of doctors are mostly cultural problems. Problems in distance may indicate the need for more centers especially in the peripheries of the province

Conclusion

1. Poor knowledge, attitude, and practice are still notable among diabetic population about DR.
2. Despite having heard about how diabetes affects the eyes in many instances, there were still marks of ignorance about available treatments for DR.
3. Given that posttreatment follow-up is important, but a high proportion of participants did not do the follow-up regularly because of economic difficulties and lack of an alert system.
4. Awareness of the need for regular eye check-ups for diabetics was generally high, but some of the participants were not willing, they had some resistance mainly in terms of having an incorrect image of themselves.

Recommendations

1. Enhancing Public Awareness and Education
2. Improving Access to Treatment Information
3. Strengthening Diabetes Management Programs
4. Facilitating Regular Eye Check-Ups
5. Addressing Barriers to Follow-Up Care
6. Improving Interdisciplinary Collaboration
7. Promoting Community-Based Interventions
8. Incorporating Technology for Better Monitoring

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