

## KNOWLEDGE, ATTITUDE, AND PRACTICE REGARDING DIABETIC RETINOPATHY IN A TERTIARY HEALTH CARE CENTRE AMONG DIABETIC POPULATION IN THE FRONTIER REGION OF BIHAR

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### ABSTRACT

**Objectives:** The objective of the study was to determine the association between knowledge, attitude, and practice and to identify barriers to compliance with follow-up and treatment regimes.

**Methods:** This study was conducted in the Department of Ophthalmology, M.G.M. Medical College and L.S.K. Hospital, Kishanganj, Bihar. It was a cross-sectional study. One hundred and thirty patients were enrolled for the study. Knowledge, attitude, and practice questionnaire consisting of 22 questions was formulated [1]. For fundus examination direct ophthalmoscope, indirect ophthalmoscope, slit lamp with 90D lens, and optical coherence tomography were used.

**Results:** In the assessment of knowledge and attitude, 56.92% of participants exhibited good knowledge and a positive attitude, while 43.08% had poor knowledge and a negative attitude regarding diabetic retinopathy (DR). Regarding practice, 43.08% demonstrated good practice, whereas 56.92% showed poor practice. Correlation between knowledge, attitude, and practice regarding DR. Among individuals with good knowledge and positive attitudes, 48 had good practice, while 26 had poor practice. Among individuals with poor knowledge and negative attitudes, eight had good practice, while 48 had poor practice. The statistical analysis reveals a significant correlation between knowledge and practice (Chi-square=33.2572,  $p < 0.0001$ ).

**Conclusion:** A significant correlation between knowledge of diabetes and practice regarding DR is noted. Individuals with better knowledge tend to exhibit better practices related to DR screening and management. There is a notable association between knowledge of DR, attitude toward the condition, and practice regarding DR. Individuals with better knowledge generally tend to have a more positive attitude and thus exhibit better practices toward diabetes and DR management and care.

**Keywords:** Diabetes mellitus, Diabetic retinopathy, Regular, Tertiary health care, Diabetes awareness, Knowledge, Attitude, and practice.

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### INTRODUCTION

Long-term high blood glucose levels can cause diabetic retinopathy (DR). In general, it occurs in patients with Type 1, Type 2, or gestational diabetes. DR is recognized by retinal ischemia and increased retinal vascular permeability. Prolonged periods of hyperglycemia can damage small blood vessels in the retina, causing hemorrhage, exudates, and retinal swelling. Over time, the retina becomes oxygen-starved, abnormal blood vessels grow incorrectly, and retinal blood vessels leak [1]. It is important to note that patients with uncontrolled diabetes can develop other serious complications such as diabetic nephropathy, neuropathy, and cardiomyopathy [2].

DR is by far the most common type of diabetic eye disease. However, other eye diseases can develop, including diabetic macular edema, neovascular glaucoma, and retinal detachment [3]. The early stages of DR can occur without any initial symptoms or pain. Nevertheless, a few symptoms can appear as the disease worsens, such as sudden vision changes, blurred vision, eye floaters, spots, double vision, and eye pain [1]. As of 2020, 103 million adults worldwide have DR, which is predicted to increase to 160 million by 2045 [3]. Untreated DR not only causes blindness, which is a personal disaster for the individual, but it also raises the community's economic burden of health care services [4]. Most causes of the DR burden may be due to absenteeism, lost productivity from disease-related absenteeism, unemployment from disease-related disability, and lost productivity due to visual loss from the disease.

The prevalence of DR is growing rapidly in India. A recent study in individuals with diabetes over the age of 40 years estimated the national prevalence of any form of DR to be 12.5%, and sight-threatening DR to be 4% [5]. In individuals aged 50 years or above, a higher prevalence of DR (17%) was reported with a narrow difference between rural (14%) and urban (17.4%) settings [6]. Studies conducted in patients attending tertiary care hospitals suggest a range of DR that varied between 32% and 63% [7].

### Signs and symptoms of DR

In the initial stages of DR, patients are generally asymptomatic; in the more advanced stages of the disease, however, patients may experience symptoms that include floaters, blurred vision, distortion, and progressive visual acuity loss. Signs of DR include the following:

- Microaneurysms
- Dot and blot hemorrhages
- Flame-shaped hemorrhages
- Retinal edema and hard exudates
- Cotton-wool spots
- Venous loops and venous beading
- Intraretinal microvascular abnormalities
- Macular edema.

### Non-proliferative DR

- Mild: Indicated by the presence of at least 1 microaneurysm
- Moderate: Includes the presence of hemorrhages, microaneurysms, and hard exudates

- Severe (4-2-1): Characterized by hemorrhages and microaneurysms in 4 quadrants, with venous beading in at least 2 quadrants and intraretinal microvascular abnormalities in at least 1 quadrant
- Proliferative DR
- Neovascularization
- Preretinal hemorrhages
- Hemorrhage into the vitreous
- Fibrovascular tissue proliferation
- Traction retinal detachments
- Macular edema
- Diagnosis of DR.

Laboratory studies of hemoglobin A1c (HbA1c) levels are important in the long-term follow-up care of patients with diabetes and DR.

Imaging studies used in the diagnosis of DR include the following:

- Fluorescein angiography: Microaneurysms appear as pinpoint, hyperfluorescent lesions in the early phases of the angiogram and typically leak in the later phases of the test
- Optical coherence tomography scanning: Administered to determine the thickness of the retina and the presence of swelling within the retina, as well as vitreomacular traction
- B-scan ultrasonography.

Knowledge, attitude, and practice (KAP) of diabetes are known to influence the control of DR [8]. Poor KAP encompasses factors including (but not limited to) not knowing whether diabetes can affect the eyes, being unaware of the potential benefits of attending diabetes and DR screening services, forgetting to take medication, and not attending screening services for reasons that range from reduced access to healthcare facilities, financial problems, and underlying comorbid health conditions [9]. Lifestyle practices including engaging in physical exercise, eating a healthy diet, and refraining from or minimizing smoking and alcohol consumption, play an important role in controlling blood sugar, blood pressure, and cholesterol levels. In addition, self-care practices such as adherence to prescribed medication regimen, and regular monitoring of blood glucose, cholesterol, and blood pressure levels regularly are also vital for ensuring good control of diabetes and DR [10].

Low health literacy around diabetes and DR has been widely reported in both the general and the diabetic population in Indian and other South Asian communities [9,11]. For example in a study with a sample of 288 Indian people with diabetes, only around 4.5% were found to have good knowledge about how to control DR, and 61% did not have periodic eye examinations, of which 38.5% were not even aware of the benefits of having regular retinal screening [12]. Rani *et al.* [11] reported that 63% of the rural Indian population did not know that DR is a complication of uncontrolled diabetes. In addition to low health literacy, lower uptake of retinal examination with dilated pupils is reported to be the most important risk factor for sight-threatening DR in India [13].

Knowledge about DR encompasses understanding its risk factors, progression, and the importance of regular screening and timely intervention. Attitudes refer to individuals' perceptions, beliefs, and emotional responses toward DR and its management. Practices involve the actual behaviors and actions taken by individuals concerning DR screening, treatment adherence, and lifestyle modifications.

This study aims to delve into the KAP regarding DR among the diabetic population in a tertiary health care center situated in the frontier region of Bihar. By examining these aspects, insights can be gained into the existing gaps and challenges in DR management within this demographic, paving the way for targeted interventions and enhanced healthcare delivery.

## METHODS

This study was conducted in the Department of Ophthalmology, M.G.M. Medical College and L.S.K. Hospital, Kishanganj, Bihar. It was a cross-sectional study.

## Study period

The study period was September 01<sup>st</sup>, 2022–April 30<sup>th</sup>, 2024.

## Source of data

Patients presenting to the Department of Ophthalmology (outpatient department) M.G.M. Medical College and L.S.K. Hospital, with diabetes in one or both eyes during the study period. A minimum of 130 patients were enrolled for the study.

To determine a good and reliable sample as a representative of the population, our study undertakes the Cochran Formula (Cochran, 1977) where, if the population size is unknown but large; however, the population proportion is known, and then one can formulate the sample size as follows:

$$n = \frac{Z^2(p)(1-p)}{e^2}$$

n=sample size

p=prevalence of diabetic patients in India [14].

e=acceptable sampling error (e=0.05).

z=z value at reliability level or significance level. (Reliability level 95%, or, significance level 0.05; z=1.96).

$$N = \frac{1.96^2(0.09)(1-0.09)}{0.05^2} = 130$$

The final sample size was 130.

## Inclusion criteria

- Known diabetic for at least 1 year
- Participants >18 years
- Willing for the study.

## Exclusion criteria

- Gestational diabetes mellitus
- Case of hypertension
- Hazy media due to other causes
- Unwilling for the study.

## Methodology

Knowledge, attitude, and practice questionnaire consisting of 22 questions was formulated [ANNEXURE 1] in which two questions were of name and contact details, five questions of other demographic data, nine questions of knowledge and attitude, four questions regarding practice and two questions regarding follow-up visits. Relevant demographic data and baseline information of the participants consisting of the age, sex, and duration since diagnosis of diabetes was recorded, previous admissions, previous operations, and any complications and comorbidities were noted. Questions are composed of aspects to measure the knowledge, attitude, and practice of the patients regarding DR. This study used a survey questionnaire which was validated by administering safety attitudes questionnaire on the separate sets of patients. The sum of knowledge and attitude questions was graded as good and positive, respectively, if the score was 50% or higher. The practice was considered safe if the sum of all the responses in this section was >50%. An informed consent was taken from the patient after explaining the purpose of this study. The consent form also indicated the right of the participant to withdraw at any time without any obligation. Then an analysis between various parameters was done based on the data collected for example difference of knowledge and attitude between males and females. Fasting blood sugar/PP/Random, glycated HbA1c. Examination of eye with the torch and for fundus examination direct ophthalmoscope, indirect ophthalmoscope, slit lamp with 90D lens, optical coherence tomography was used to rule out glaucoma, applanation tonometry and to see the angle of anterior chamber gonioscopy was used.

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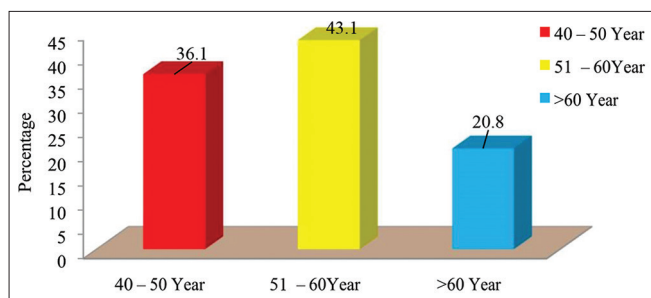


Fig. 1: Age distribution among study population

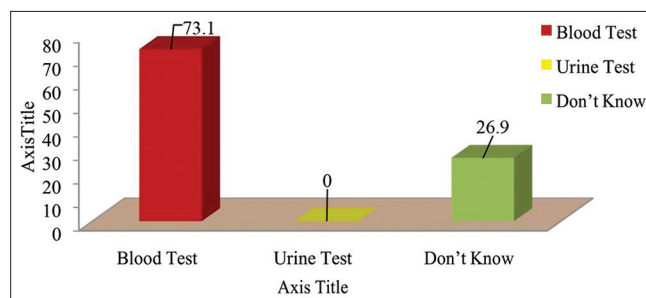


Fig. 5: What are the tests done to diagnose diabetes?

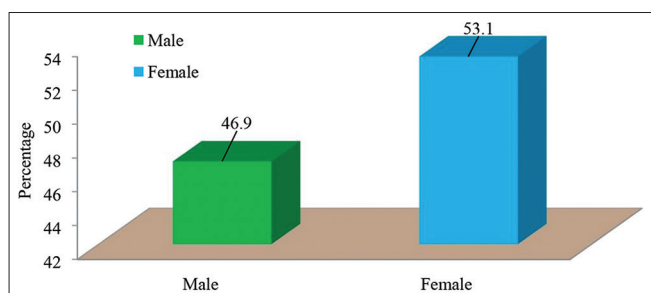


Fig. 2: Sex distribution among study population

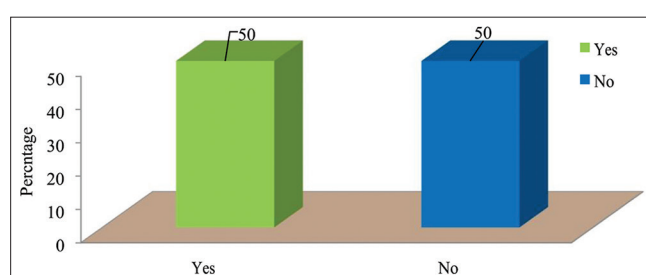


Fig. 6: Do you know that diabetes can cause eye disease?

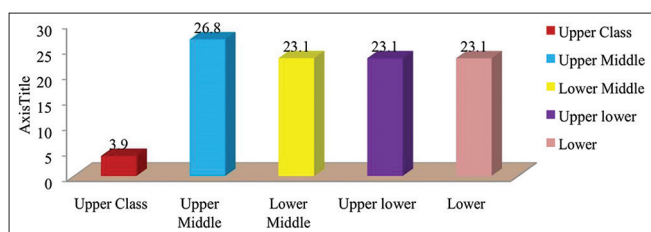


Fig. 3: Economical status (modified Kuppaswamy classification) among study population

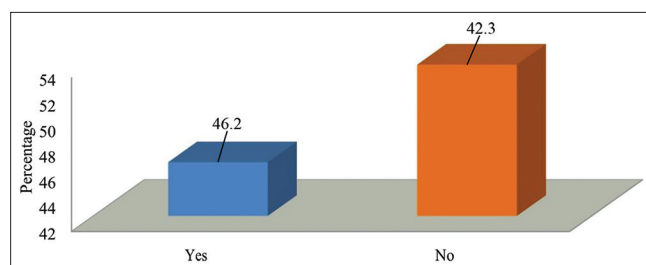


Fig. 7: Do you know that timely treatment can prevent/delay, damage due to diabetes in eyes?

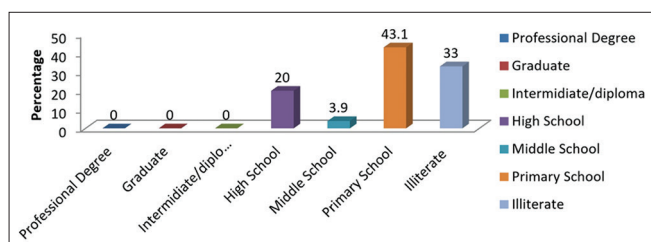


Fig. 4: Educational status (modified Kuppaswamy classification) among study population

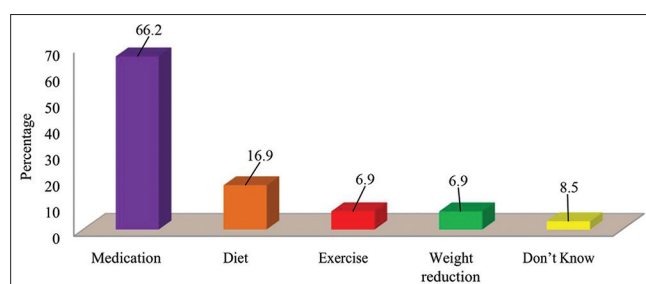


Fig. 8: What methods do you know to control diabetes?

### Statistical analysis

The data collected will be entered into an Excel sheet. It was subjected to statistical analysis in MS Excel and Statistical Packages for the Social Sciences version 23.0. Data were expressed in frequencies and percentages when qualitative and in mean±standard deviation when quantitative. Chi-square test will be used for comparing the trends for all parameters. A p-value of ethical consideration:

Ethical consideration was taken from the Ethical Committee of M.G.M. Medical College and L.S.K. Hospital, Kishanganj, Bihar.

## RESULTS AND DISCUSSION

### Demographic evaluation

The majority of participants were within the 51–60 years age group, comprising 43.1% of the total sample. The minimum age was 40 and the maximum was 70 years. The mean age was 54.16 years.

Among the study population, 61 individuals were male, constituting 46.9% of the total sample. On the other hand, 69 individuals were female, accounting for 53.1%, respectively.

The table presents the distribution of economic status, classified according to the modified Kuppaswamy classification, Among the study population, upper-class category, constituting 3.9% the upper middle category comprises representing 26.8% similarly, 30 individuals were into both the lower middle and upper lower categories, each accounting for 23.1%, respectively.

The educational status distribution among the study population demonstrates a significant proportion of individuals with primary school education, that is, 43.0%, followed by a notable presence of illiterate individuals 33%. Moreover, high school education was taken

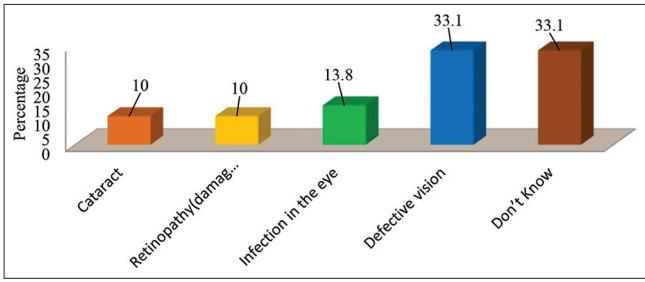


Fig. 9: What type of problems can diabetes cause in the eyes?

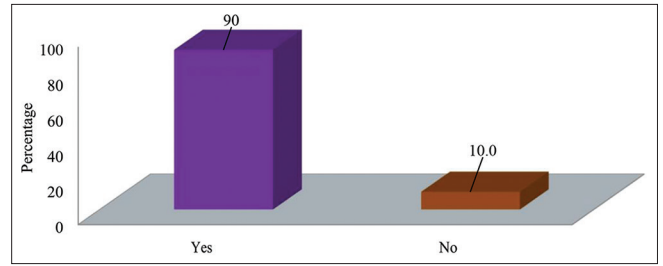


Fig. 14: Do you take medicines for diabetes?

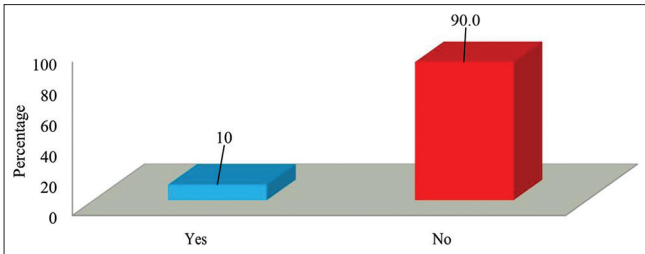


Fig. 10: Do you know that diabetes can cause retinopathy/retina changes?

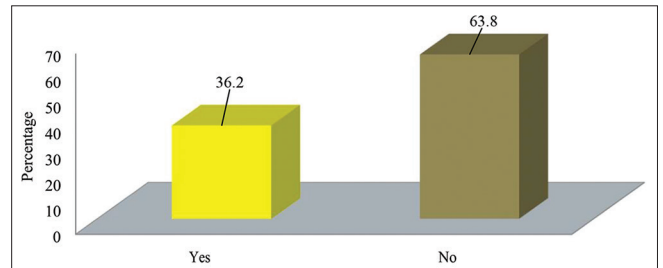


Fig. 15: Do you do regular exercise?

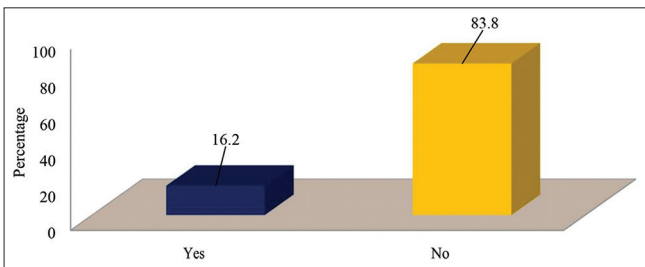


Fig. 11: Can diabetic retinopathy cause blindness?

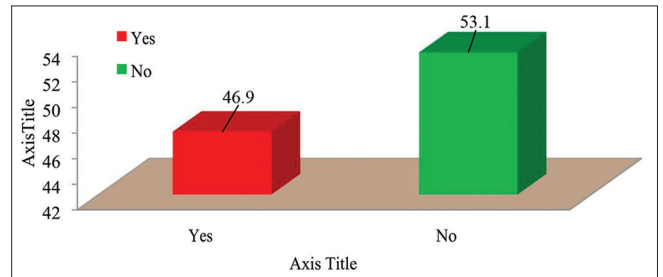


Fig. 16: Do you follow the diet schedule as advised by the physicians?

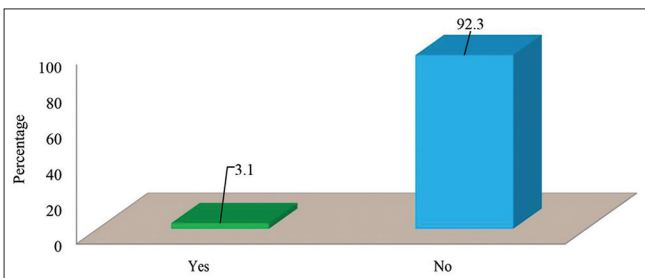


Fig. 12: Irregular medication, is it alright?

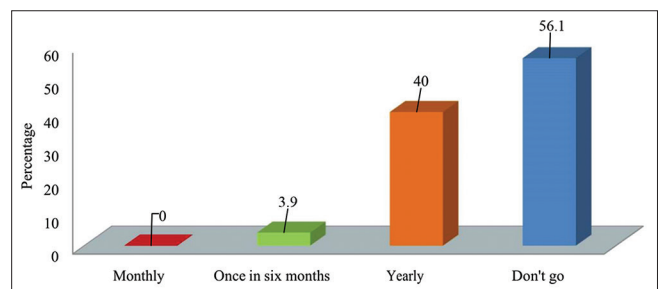


Fig. 17: How often do you go for an eye examination?

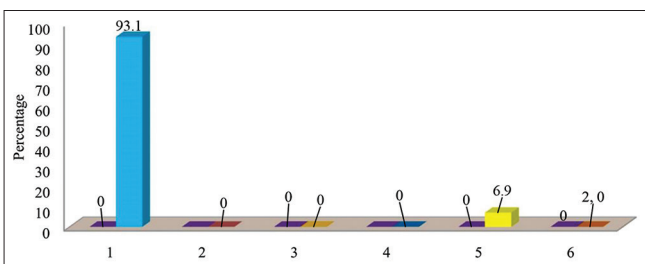


Fig. 13: To whom do you go for eye problems?

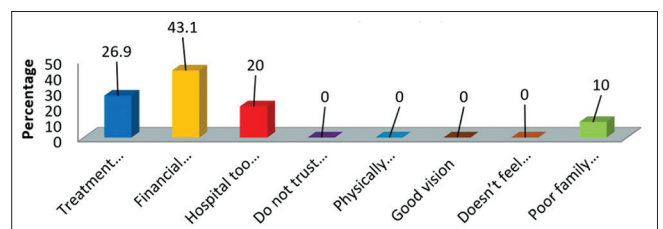


Fig. 18: Why have you not taken any treatment for diabetic retinopathy yet?

20% individuals. There are no participants with higher education qualifications such as professional degrees, intermediate/diploma, or graduates.

The minimum duration of diabetes observed among the participants is 39.0 months. The maximum duration recorded was 240.0 months.

**Table 1: Age distribution among study population (n=130)**

Age in year	Frequency	Percentage
40-50	47	36.1
51-60	56	43.1
>60	27	20.8
Minimum	4	0
Maximum	7	0
Mean and SD	54.16	±8.13

**Table 2: Sex distribution among study population (n=130)**

Sex	Frequency	Percentage
Male	61	46.9
Female	69	53.1
Total	130	100.0

**Table 3: Economical status (modified Kuppaswamy classification) among study population (n=130)**

Economical status	Frequency	Percentage
Upper class	5	3.9
Upper middle	35	26.8
Lower middle	30	23.1
Upper lower	30	23.1
Lower	30	23.1
Total	130	100.0

**Table 4: Educational status (modified Kuppaswamy classification) among study population (n=130)**

Educational status	Frequency	Percentage
Professional degree	0	0.0
Graduate	0	0.0
Intermediate/diploma	0	0.0
High school	26	20.0
Middle school	5	3.9
Primary school	56	43.1
Illiterate	43	33.0
Total	130	100.0

**Table 5: Duration of diabetes among study population (n=130)**

Duration of diabetes in months	No of cases	Minimum (month)	Maximum (month)	Mean	SD
	130	39.0	240.0	74.0333	±39.27663

**Table 6: What are the tests done to diagnose diabetes?**

Patient answer	Frequency	Percentage
Blood test	95	73.1
Urine test	00	0.0
Don't know	35	26.9
Total	130	100.0

Moreover, mean duration of diabetes among the study population was found 74.1±39.3 months.

#### Knowledge and attitude

Blood tests were the most commonly reported method, utilized by 73.1% of patients. Urine tests were not mentioned by any patients. Approximately a quarter of the patients (26.9%) expressed uncertainty or lack of knowledge regarding the diagnostic tests for diabetes.

**Table 7: Do you know that diabetes can cause eye disease?**

Patient answer	Frequency	Percentage
Yes	65	50.0
No	65	50.0
Total	130	100.0

**Table 8: Do you know that timely treatment can prevent/delay, damage due to diabetes in eyes?**

Patient answer	Frequency	Percentage
Yes	60	46.2
No	70	53.8
Total	130	100.0

**Table 9: What methods do you know to control diabetes?**

Patient answer	Frequency	Percentage
Medication	86	66.2
Diet	22	16.9
Exercise	9	6.9
Weight reduction	9	6.9
Don't know	4	3.1
Total	130	100.0

**Table 10: What type of problems can diabetes cause in the eyes?**

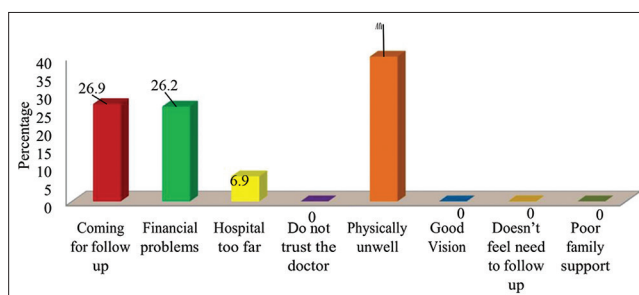
Patient answer	Frequency	Percentage
Cataract	13	10.0
Retinopathy (damage to retina, nerve at the back of the eye)	13	10.0
Infection in the eye	18	13.8
Defective vision	43	33.1
Do not know	43	33.1
Total	130	100.0

**Table 11: Do you know that diabetes can cause retinopathy/retina changes?**

Patient answer	Frequency	Percentage
Yes	13	10.0
No	117	90.0
Total	130	100.0

**Table 12: Can diabetic retinopathy cause blindness?**

Patient answer	Frequency	Percentage
Yes	21	16.2
No	109	83.8
Total	130	100.0

**Fig. 19: Why have you not come for follow-up visits?**

**Table 13: Irregular medication, is it alright?**

Patient answer	Frequency	Percentage
Yes	4	3.1
No	126	96.9
Total	130	100.0

**Table 14: To whom do you go for eye problems?**

Patient answer	Frequency	Percentage
Ophthalmologist		
Yes	121	93.1
No	0	0.0
Optometrist		
Yes	0	0.0
No	0	0.0
General physician		
Yes	9	6.9
No	0	0.0
Total	130	100.0

**Table 15: Do you take medicines for diabetes?**

Patient answer	Frequency	Percentage
Yes	117	90.0
No	13	10.0
Total	130	100.0

**Table 16: Do you do regular exercise?**

Patient answer	Frequency	Percentage
Yes	47	36.2
No	83	63.8
Total	130	100.0

**Table 17: Do you follow the diet schedule as advised by the physicians?**

Patient answer	Frequency	Percentage
Yes	61	46.9
No	69	53.1
Total	130	100.0

**Table 18: How often do you go for an eye examination?**

Patient answer	Frequency	Percentage
Monthly	0	0.0
Once in 6 months	5	3.9
Yearly	52	40.0
Do not go	73	56.1
Total	130	100.0

**Table 19: Why have you not taken any treatment for diabetic retinopathy yet?**

Patient answer	Frequency	Percentage
Treatment Taken	35	26.9
Financial problems	56	43.1
Hospital too far	26	20.0
Do not trust the doctor	0	0.0
Physically unwell	0	0.0
Good vision	0	0.0
Does not feel need to get treated	0	0.0
Poor family support	13	10.0
Total	130	100.0

**Table 20: Why have you not come for follow-up visits?**

Patient answer	Frequency	Percentage
Coming for follow-up	35	26.9
Financial problems	34	26.2
Hospital too far	9	6.9
Do not trust the doctor	0	0
Physically unwell	52	40.0
Good Vision	0	0.0
Does not feel need to follow up	0	0.0
Poor family support	0	0.0
Total	130	100.0

**Table 21: Knowledge, attitude, and practice regarding diabetic retinopathy**

Variable	Good/positive (%)	Poor/negative (%)
Knowledge, attitude	74 (56.92)	56 (43.08)
Practice	56 (43.08)	74 (56.92)

**Table 22: Sociodemographic characteristics and correlation with attitude**

Factors	Attitude DM		Analysis	
	Positive (%)	Negative (%)	Chi-square	p-value
Education				
Higher	16	6	29.7409	<0.0001
Lower	18	90		
Socioeconomic status				
Present	12	10	11.0524	0.0008
Absent	22	86		
Duration				
Good	15	7	24.2189	<0.0001
Poor	19	89		
Gender				
Male	18	38	16.2090	0.0005
Female	4	70		
Knowledge DM				
Good	22	35	8.13686	0.004
Poor	12	61		

**Table 23: Association of knowledge of diabetes with practice regarding diabetic retinopathy**

Factors	Practice DR		Analysis	
	Good	Poor	Chi-square	p-value
Education				
Higher	18	4	7.89118	0.004
Lower	52	54		
Knowledge DM				
Good	43	14	19.0430	0.0001
Poor	27	46		

The responses were evenly split, with half of the patients (50%) acknowledging the link between diabetes and eye disease, while the other half (50%) did not express awareness of this connection.

Among the respondents, 60 patients, (46.2%) of the total sample, answered "Yes" when asked if they knew that timely treatment could prevent or delay damage due to diabetes in the eyes.

The majority of patients, 86 in total, representing 66.2% of the sample, cited medication as a known method for controlling diabetes. Diet was mentioned by 22 patients, comprising 16.9%. A smaller proportion of patients mentioned exercise and weight reduction, with nine patients

**Table 24: Correlation between knowledge, attitude, and practice**

Knowledge and attitude	No of cases	Practice		Total
		Good	Poor	
Good/positive	74	48	26	74
Poor/negative	56	08	48	56
Total	130	56	74	130
Statistical inferences		Chi-square - 33.2572 p=0.0001		

each, accounting for 6.9% of the sample for each method. A minority of patients, four in total, representing 3.1% of the sample, indicated a lack of knowledge regarding methods to control diabetes.

Cataract and retinopathy are both mentioned by 10.0% of the total sample. Infection in the eye was cited by 13.8%. Defective vision was reported by 43 patients, making up the largest portion at 33.1%. Similarly, 43 (33.1%) patients also indicated a lack of knowledge regarding the types of eye problems diabetes can cause.

Only 13 patients, comprising 10.0% of the total sample, responded affirmatively when asked if they were aware that diabetes can cause retinopathy or changes in the retina. The majority of patients, 90.0% answered negatively to the same question.

Among the respondents, 21 patients, 16.2%, answered affirmatively when asked if DR can cause blindness. Conversely, the majority of patients, for 83.8%, responded negatively to the same question.

The overwhelming majority of patients, that is, 126 (96.9%) expressed the belief that irregular medication intake is not acceptable.

The majority of patients, totaling 121 individuals (93.1%) of the sample, consulted ophthalmologists for their eye problems, with none opting for optometrists, while a smaller proportion, 9 (6.9%) of the total, sought advice from general physicians.

### Practice

In the study population, 90.0% reported taking medicines for diabetes, while 10.0% indicated not taking any medications for the condition.

Out of the total study population, 36.2% reported engaging in regular exercise, while the majority, 63.8%, indicated not participating in regular exercise routines.

A total of 46.9% reported adhering to the diet schedule advised by physicians, while 53.1% stated they did not follow the recommended diet regimen.

Out of the total sample of 130 individuals, none reported going for monthly eye examinations. However, 3.9% stated they go once every 6 months, while the majority, 40.0%, reported going yearly. A significant portion, 56.1%, indicated that they do not go for eye examinations at all.

### Follow-up

Among the respondents, 26.9% had already taken treatment for DR. The most common reason for not seeking treatment was financial constraints, cited by 43.1% of participants. In addition, 20.0% mentioned that the hospital being too far was a hindrance, while 10.0% attributed it to poor family support. No participants mentioned not trusting the doctor, feeling physically unwell, having good vision, or not feeling the need for treatment as reasons for not seeking treatment.

Among the respondents, 26.9% reported coming for follow-up visits as instructed. Financial constraints were cited by 26.2% as the reason for not attending follow-up visits, while 40.0% mentioned being physically unwell. Nine individuals (6.9%) stated that the hospital being too far

was a hindrance. No participants mentioned not trusting the doctor, having good vision, not feeling the need for follow-up, or lacking family support as reasons for not attending follow-up visits.

In the assessment of knowledge and attitude, 56.92% of participants exhibited good knowledge and positive attitude, while 43.08% had poor knowledge and negative attitude regarding DR. Regarding practice, 43.08% demonstrated good practice, whereas 56.92% showed poor practice.

Education level significantly influenced attitude, with 16% of individuals with higher education exhibiting a positive attitude, compared to only 6% with a negative attitude (Chi-square=29.7409,  $p<0.0001$ ). Conversely, among those with lower education, 18% had a positive attitude, while 90% had a negative attitude. Socioeconomic status also played a significant role, as 12% of individuals with a present socioeconomic status had a positive attitude, compared to 10% with a negative attitude (Chi-square=11.0524,  $p=0.0008$ ). In contrast, among those with an absent socioeconomic status, 22% had a positive attitude, while 86% had a negative attitude. Duration of diabetes showed a notable impact, with 15% of individuals with a good duration having a positive attitude, compared to 7% with a negative attitude (Chi-square=24.2189,  $p<0.0001$ ). Conversely, among those with a poor duration, 19% had a positive attitude, while 89% had a negative attitude. Gender was also a significant factor, as 18% of males exhibited a positive attitude, compared to 38% with a negative attitude (Chi-square=16.2090,  $p=0.0005$ ). In contrast, among females, only 4% had a positive attitude, while 70% had a negative attitude.

Education level demonstrated a significant association with practice regarding DR (Chi-square=7.89118,  $p=0.004$ ). Among individuals with higher education, 18 had good practice, while four had poor practice. In comparison, among those with lower education, 52 had good practice, while 54 had poor practice. Knowledge of diabetes also showed a significant association with practice regarding DR (Chi-square=19.0430,  $p=0.0001$ ). Among individuals with good knowledge of diabetes, 43 had good practice, while 14 had poor practice. Conversely, among those with poor knowledge of diabetes, 27 had good practice, while 46 had poor practice.

The table displays the correlation between knowledge, attitude, and practice regarding DR. Among individuals with good knowledge and positive attitudes, 48 had good practice, while 26 had poor practice. Among individuals with poor knowledge and negative attitudes, eight had good practice, while 48 had poor practice. The statistical analysis reveals a significant correlation between knowledge and practice (Chi-square=33.2572,  $p<0.0001$ ).

### DISCUSSION

This was a hospital-based, cross-sectional study, which documented diabetic patients regarding diabetes and DR. A total of 130 patients were enrolled for this study.

In the present study, the assessment of knowledge and attitude, 56.92% of participants exhibited good knowledge and positive attitude, while 43.08% had poor knowledge and negative attitude regarding DR. Regarding practice, 43.08% demonstrated good practice, whereas 56.92% showed poor practice. This is similar to the results of other studies conducted in South India by Hussain *et al.*, and Rani *et al.*, who reported good knowledge in 40.7% and 49.9%, respectively, of the subjects of their studies [15,11].

The questions to assess knowledge of DR in our study were designed to assess both awareness and knowledge of DR. Just having heard about the disease is awareness, while having understood the disease is knowledge [16]. Among the KAP studies done on diabetes and DR in India, Mahesh *et al.*, have also documented both knowledge and awareness of DR [16]. Koshy *et al.*, and Dandona *et al.*, have reported awareness of DR, [17,18] while Hussain *et al.*, and Rani *et al.* have

documented knowledge of diabetes and retinopathy [15,11]. In the study published by Babu *et al.*, the terms “awareness” and “knowledge” have been used interchangeably [19].

We felt that it was important to differentiate between awareness and knowledge of DR. While awareness of the disease is important, having good knowledge of the disease is probably more important in influencing attitudes and practice patterns regarding the disease. We therefore, documented both awareness and knowledge of DR among our patients, and looked for the association of both awareness and knowledge of DR with attitude and practice patterns regarding retinopathy.

Among the 130 patients in our study, the correlation between knowledge, attitude, and practice regarding DR. Among individuals with good knowledge and positive attitudes, 48 had good practice, while 26 had poor practice.

Among individuals with poor knowledge and negative attitudes, eight had good practice, while 48 had poor practice. The statistical analysis reveals a significant correlation between knowledge and practice (Chi-square=33.2572,  $p<0.0001$ ).

In spite of the fact that DR is the most serious, potentially blinding complication of diabetes in the eye, the majority of the patients were completely unaware of the existence of such an entity. This indicates the poor state of patient education measures regarding DR, as it was the same subgroup of patients who had good knowledge of diabetes.

Strategies should be developed to raise awareness among people with diabetes about diabetes-related issues. This should occur at every point of contact between patients and healthcare services. GPs, physicians, endocrinologists, ophthalmologists, and optometrists should be aware of the lack of knowledge about DR in diabetic patients and everyone should be involved in planning and implementing hospital-based and community-based patient education strategies.

Health education measures should be implemented in primary, secondary, and tertiary health care services. Health education through social media, brochures, leaflets, and DR clinics on special days such as World Diabetes Day and World Sight Day would help people, especially in the lower educational and socioeconomic status groups, to become aware of DR.

We found the correlation between knowledge, attitude, and practice regarding DR. Among individuals with good knowledge and positive attitudes, 48 had good practice, while 26 had poor practice. Among individuals with poor knowledge and negative attitudes, eight had good practice, while 48 had poor practice. The statistical analysis reveals a significant correlation between knowledge and practice (Chi-square=33.2572,  $p<0.0001$ ). Moreover, the correlation between knowledge and attitude regarding diabetes. Among individuals with good knowledge, 32 had a positive attitude, while 25 had a negative attitude. Among individuals with poor knowledge, two had a positive attitude, while 71 had a negative attitude. The statistical analysis indicates a significant correlation between knowledge and attitude (Chi-square=47.258,  $p<0.0001$ ).

Mahesh *et al.*, also found a statistically significant association between awareness of retinopathy and good practice regarding retinopathy [16]. The odds of patients with good knowledge of diabetes having good practice patterns regarding retinopathy were 3.9 (1.97–7.94) times those of patients with poor knowledge of diabetes, after adjusting for educational and retinopathy status, with  $p<0.01$ . Knowledge about the disease and its complications is a powerful tool, which helps patients in developing good practice patterns that will ultimately help them in keeping the disease under good control.

Pardhan *et al.* [20] found usable data from 383 participants (95.8%) were analyzed. Of these, 83 (21.7%) had sight-threatening diabetic

retinopathy (STDR), and 300 (78.3%) had non-STDR (NSTDR). The NSTDR group reported a significantly lower total KAP score (mean rank=183.4) compared to the STDR group (mean rank=233.1),  $z = -3.0$ ,  $p<0.001$ . A significantly greater percentage in the NSTDR group reported to being unaware that diabetes could affect eyes, did not know about possible treatment for DR, and checked their blood sugar less frequently than once a month. Patients who had not developed STDR had poorer KAP about diabetes and diabetes-related eye diseases. This is an important issue to address as the risk of their progressing to STDR is high unless appropriate steps to improve their knowledge/awareness and lifestyle practice are introduced early.

## CONCLUSION

Based on the results of our analysis:

- There is a significant correlation between knowledge of diabetes and practice regarding DR. Individuals with better knowledge tend to exhibit better practices related to DR screening and management.
- There is a notable association between knowledge of DR, attitude toward the condition, and practice regarding DR. Individuals with better knowledge generally tend to have a more positive attitude and thus exhibit better practices toward diabetes and DR management and care.
- Education level, socioeconomic status, duration of diabetes, and gender significantly influence attitude toward diabetes. Higher education, better socioeconomic status, shorter duration of diabetes, and male gender are associated with a more positive attitude.
- Education level and knowledge of diabetes significantly influence practice regarding DR. Higher education and better knowledge are associated with better practice.
- Financial constraints and physical well-being emerged as significant barriers to seeking treatment and attending follow-up visits for DR.

Our findings highlight the importance of education and knowledge in influencing both attitude and practice regarding diabetes and DR. Efforts to improve education and knowledge dissemination about diabetes management and DR could lead to more positive attitudes and better practices among individuals with diabetes. In addition, addressing barriers such as financial constraints and physical well-being is crucial in ensuring access to timely treatment and follow-up care for DR.

## AUTHOR'S CONTRIBUTION

Equal contribution.

## CONFLICTS OF INTEREST

Nil.

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