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Original Article

Diabetic retinopathy awareness and knowledge among diabetic patients in northern Bangladesh

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Abstract

Diabetic retinopathy, a major complication of diabetes, is one of the leading causes of blindness globally. The purpose of this study was to explore the awareness and knowledge levels of diabetic retinopathy (DR) among diabetic patients in northern Bangladesh. The study sought to identify gaps in awareness and knowledge that may hinder early detection and timely treatment. This descriptive cross-sectional study was conducted in diabetic hospitals located in northern Bangladesh from July to December 2023. A purposive sampling method was used to select 200 diabetic patients aged between 30 and 80 years. Data were collected through face-to-face interviews using a semi-structured questionnaire. The collected data included socio-demographic characteristics, diabetes-related factors, and awareness and knowledge of DR. SPSS version 25 was used to analyze the data, and Chi-square tests were employed to explore associations between demographic factors and DR awareness. The results revealed that only 14% of participants had heard of diabetic retinopathy, while 86% were completely unaware of the condition. Of those who had some knowledge, the majority had a poor understanding of the causes, risks, and treatment options for DR. Education and occupation were found to be significant factors influencing awareness, with higher-educated individuals and service holders showing greater knowledge of DR. Additionally, 41% of participants had never undergone an eye examination, citing barriers such as cost, lack of information, and geographic challenges. The study concluded that there is a critical lack of awareness and understanding of diabetic retinopathy among diabetic patients in northern Bangladesh. Educational interventions are urgently needed to improve awareness and promote regular eye examinations. Overcoming barriers to access, such as cost and lack of information, is essential to prevent blindness due to diabetic retinopathy in this population.

Keywords: diabetic retinopathy, diabetes, eye health, awareness

Introduction

Over the past few decades, the global prevalence of diabetes mellitus (DM) has surged dramatically, transforming it into a major public health issue [1]. According to the International Diabetes Federation (IDF), the number of people living with diabetes worldwide reached approximately 537 million in 2021, with projections suggesting this number could rise to 783 million by 2045 [2]. This rise is particularly alarming in low- and middle-income countries, where the burden of diabetes is most acute due to rapid urbanization, lifestyle changes, and inadequate healthcare resources [3, 4].

Diabetic retinopathy (DR) is one of the most significant microvascular complications of diabetes and a leading cause of blindness globally [5]. It occurs due

to prolonged high blood glucose levels damaging retinal blood vessels. DR progresses from mild non-proliferative stages to advanced proliferative retinopathy, potentially causing severe visual impairment or blindness if not properly managed [6]. The WHO estimates that DR accounts for 4.8% of the 37 million cases of blindness worldwide, with a significant proportion occurring in people who have had diabetes for over 20 years [7].

The prevalence of DR varies widely across different regions and patients [8]. In developed countries, routine eye exams and effective diabetes management have reduced the impact of DR. In contrast, limited access to eye care and diabetes management in developing countries worsens the problem. In Bangladesh, the number of adults with diabetes, which was 8.4 million in 2019, is expected to nearly double to 15 million by 2045, affecting over a quarter of the adult population [9]. As diabetes rises, secondary complications like DR are also expected to increase [10]. A study by Akhter *et al*. found that 21.6% of diabetic patients in rural Bangladesh had DR, with many cases undiagnosed due to insufficient screening [11]. Individuals with diabetes often remain unaware of their visual condition or skip regular eye exams, leading to delayed detection when effective treatment may no longer be possible [12]. Non-adherence to diabetes management plans, often due to a lack of education or financial constraints, significantly impacts the progression of DR and overall health outcomes [13].

Efforts to improve the management and prevention of DR involve increasing public awareness about diabetes and its complications. However, in many low-resource settings, including parts of Bangladesh, access to such services remains limited. The establishment of dedicated eye care facilities and the integration of diabetic eye screening into routine diabetes care are essential steps toward addressing this gap [14].

Recent studies have emphasized the importance of comprehensive diabetes care programs that include regular eye examinations. For instance, a study by Lesley *et al*. in Papua New Guinea underscored the need for improved eye care services and patient education to enhance early detection and management of DR [15]. Furthermore, increasing the availability of retinal imaging and laser treatments in regions with high diabetes prevalence is crucial for managing and preventing DR [16].

Diabetic retinopathy remains a major cause of visual impairment and blindness worldwide, particularly in areas with limited access to healthcare. Addressing the rising prevalence of diabetes and its complications requires a multifaceted approach, including improved healthcare infrastructure, better patient education, and widespread screening programs. This study aims to assess the awareness and knowledge levels of diabetic retinopathy (DR) among diabetic patients attending selected diabetic hospitals across the northern region of Bangladesh.

Material and methods

This study utilized a descriptive cross-sectional design to assess the knowledge and awareness of diabetic retinopathy among diabetic patients. The research was conducted in selected diabetic hospitals located in the northern region of Bangladesh from July 2023 to December 2023. The study targeted both male and female diabetic patients aged between 30 and 80 years who were receiving medical care during the study period. A purposive sampling technique was employed to select participants. The final sample size was determined based on the availability of eligible participants and the study's resource constraints. Independent variables included socio-demographic factors (age, sex, religion, education, occupation, income, and marital status), diabetes-related factors (duration, family history, type of diabetes, glycemic control, follow-up frequency, other systemic diseases), and eye examination status (eye complaints, exam history, exam frequency, and follow-up). Dependent variables focused on awareness and knowledge of diabetic retinopathy, including the need for eye check-ups, the effects of diabetes on vision, diabetic retinopathy and blindness risks, and the importance of blood sugar control. Knowledge covered the risks of uncontrolled diabetes, symptoms, treatment, and consequences of untreated diabetic retinopathy.

Data were collected through face-to-face interviews using a semi-structured questionnaire, designed and pretested on a sample group of diabetic patients. The questionnaire comprised two sections: Demographic Information, which included age, gender, occupation, education level, income, and diabetes-related details, and an Awareness and Knowledge Assessment. The awareness section featured six questions to gauge participants' understanding of diabetic retinopathy, while the knowledge section included seven yes/no statements to assess respondents' knowledge levels. The questionnaire was developed based on a comprehensive literature review [16, 17], ensuring relevance and

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coverage of key aspects of diabetic retinopathy awareness and knowledge.

Ethical approval was obtained from the Institutional Review Board of Bangladesh Open University. Informed consent was acquired from the authorities of the participating diabetic hospitals and from all patients involved in the study. Participants were fully informed about the study's scope and limitations, and their confidentiality was strictly maintained.

Data were processed and analyzed using SPSS version 25 and Microsoft Excel. The raw data were cleaned, coded, and entered into Excel for initial processing. The analyzed data were presented using tables and figures. For qualitative data, frequency distributions were used, while quantitative variables were analyzed using descriptive statistics, including mean, median, mode, and standard deviation. The Chi-square test was applied to examine relationships between variables, with a p-value of <0.05 considered statistically significant.

Results

This cross-sectional study was conducted among 200 diabetic patients at selected diabetes hospitals in northern Bangladesh. The aim was to assess the knowledge and awareness of diabetic retinopathy among the study population. The demographic and socioeconomic characteristics of the respondents are summarized in Table 1. The majority of respondents (34%) were aged 40–49 years, with a mean age of 55.67±11.87 years. Most respondents were male (59%) and married (92%). A significant proportion (56%) lived in urban areas; the predominant religion was Islam (90%).

The clinical characteristics of the respondents, including the duration of diabetes, family history, type of diabetes, glycemic control, and follow-up visits. The majority had diabetes for 1–10 years, and 63% had a family history of diabetes. Most respondents (64%) knew their diabetes type, and 57% reported good glycemic control. Follow-up visits were predominantly every 3–6 months. Table 2 summarizes the clinical characteristics of the respondents.

Regarding eye examinations, 59% of participants had undergone at least one check-up, while 41% had never examined their eyes. Among those who had an eye exam, 35% had their last check-up more than 12 months ago, 24% within the last 12 months, and 41% had never had an exam. Despite this, 68% recognized the need for regular eye check-ups for diabetics, although 32% did not. When diagnosed with diabetes, 40% felt eye exams were only necessary when vision

Table 1: Demographic and socioeconomic characteristics of the respondents.

Characteristic	Frequency	Percent
Age group (mean age = 55.67±11.87 years)		
<40 years	6	3.0
40–49 years	68	34.0
50–59 years	48	24.0
60–69 years	48	24.0
70 years & above	30	15.0
Gender		
Male	118	59.0
Female	82	41.0
Marital status		
Single	8	4.0
Married	184	92.0
Widowed	8	4.0
Area of residence		
Urban	112	56.0
Rural	88	44.0

Table 1: Continued.

Characteristic	Frequency	Percent
Religion		
Islam	180	90.0
Hindu	18	9.0
Other	2	1.0
Profession		
Retired	44	22.0
Farmer	32	16.0
Business	22	11.0
Day labor	4	2.0
Service holder	48	24.0
Homemaker	46	23.0
Student	4	2.0
Monthly income (Taka)		
<10000	48	24.0
10000–20000	56	28.0
20001–30000	36	18.0
30001–40000	34	17.0
40001–50000	10	5.0
>50000	16	8.0
Educational status		
No formal education	6	3.0
Primary education	40	20.0
Secondary education	32	16.0
Higher secondary	52	26.0
Graduate	54	27.0
Post-graduate	16	8.0
Total	**200**	**100.0**

was affected, with fewer supporting more regular check-ups: 7% within one month, 10% annually, and 11% every two years (Table 3).

Barriers to regular eye check-ups included cost (71%) and lack of information (60%). Other obstacles were lack of time (41%), living in remote areas (30%), and fear of discovering serious issues (9%) (Table 4).

The study revealed a significant lack of awareness and knowledge about diabetic retinopathy among the respondents. A substantial majority (86.0%) reported that they had never heard of diabetic retinopathy, highlighting a considerable gap in understanding this critical eye condition. Only 14% of the participants were familiar with the term "diabetic retinopathy" (Figure 1). Among those respondents who were aware of diabetic retinopathy, varying levels of knowledge were observed. Specifically, 20 participants (71.4%) exhibited a poor or below-average understanding of the condition. In contrast, only 2 participants (7.1%) demonstrated an average or moderate level of knowledge. Notably, a mere 21.4% of the respondents displayed a good understanding of diabetic retinopathy (Figure 2).

Out of 28 respondents who had encountered the term "diabetic retinopathy", a majority knew it was an

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Table 2: Clinical characteristics of the respondents.

Characteristic	Frequency	Percent
Duration of diabetes (mean duration = 6.27±4.16 years)		
<1 year	14	7.0
1–5 years	82	41.0
6–10 years	80	40.0
11–15 years	8	4.0
>15 years	16	8.0
Family history of diabetes		
Yes	126	63.0
No	72	36.0
Don't know	2	1.0
Type of diabetes		
Type I	16	8.0
Type II	128	64.0
Don't know	56	28.0
Glycemic control		
Good (HbA1c <7–8%)	78	39.0
Poor (HbA1c >7–8%)	122	61.0
Frequency of follow-up visits		
Monthly	28	14.0
3–6 months	116	58.0
6 months	20	10.0
Irregular	26	13.0
No follow-up	10	5.0
Total	**200**	**100.0**

Table 3: Respondents' eye examination history and awareness (n=200).

Variables	Frequency	Percent
History of eye examination		
Yes	118	59.0
No	82	41.0
Time of last eye examination (if yes)		
No	82	41.0
Within 12 months	48	24.0
Before 12 months	70	35.0
Knowledge about the necessity ofeye check-ups		
Yes	136	68.0
No	64	32.0

Table 3: Continued.

Variables	Frequency	Percent
Frequency of eye check-ups after diagnosis		
No	64	32.0
Within 1 month	14	7.0
Yearly	20	10.0
Every two years	22	11.0
When vision affected	80	40.0
Total	**200**	**100.0**

Table 4: Barriers to regular eye check-ups.

Barriers to regular eye check-ups	Frequency*	Percent
Cost of test	142	71.0
Lack of information	120	60.0
Lack of time	82	41.0
Living in remote areas	60	30.0
Fear of discovering something	18	9.0

Note: * – Multiple responses.

eye disease (71.4%). However, knowledge about specific aspects of diabetic retinopathy was limited: Only 42.9% recognized that diabetes duration increases the risk, and 57.1% acknowledged that uncontrolled blood sugar heightens the risk. Knowledge of the potential consequences of untreated diabetic retinopathy was low (21.4%), as was knowledge of treatment options (7.1%). Additionally, only 14.3% knew the eye signs and symptoms associated with the condition (Table 5).

The study found significant associations between demographic factors and awareness of diabetic retinopathy. Age shows a trend towards higher awareness among older groups, particularly those aged 60–69 (P=0.057). Educational attainment strongly influences knowledge levels, with individuals holding graduate degrees demonstrating the highest awareness. This relationship is statistically significant, with a p-value of 0.001. Occupation impacts knowledge, with service

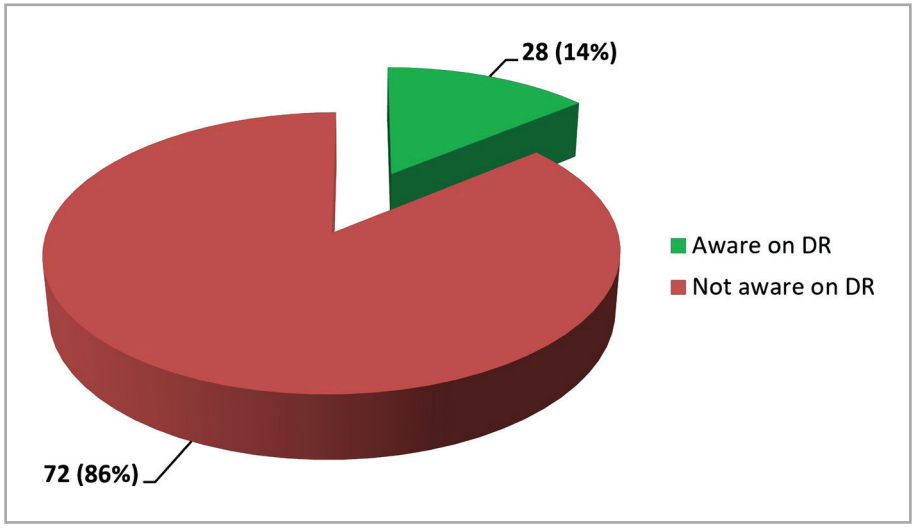

Figure 1: Respondents' awareness of diabetic retinopathy (n=200).

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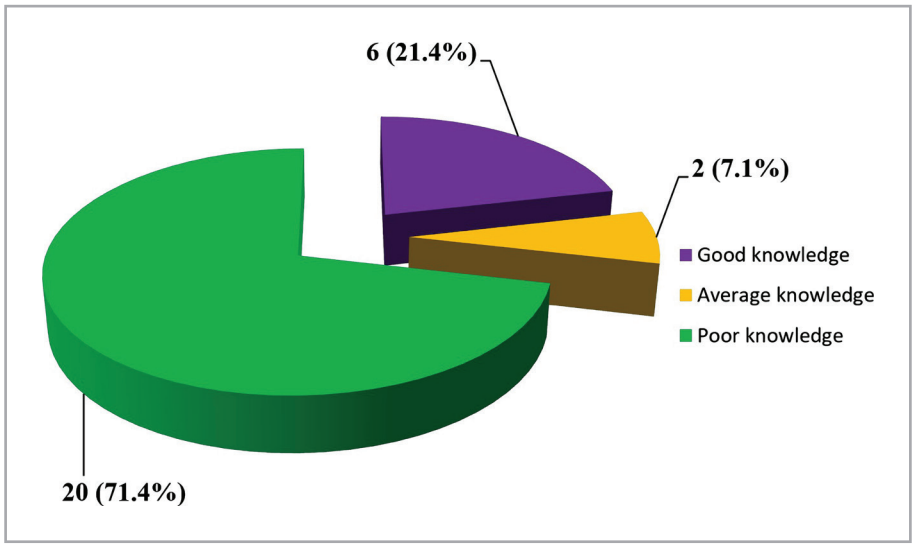

Figure 2: Respondents' level of knowledge on diabetic retinopathy (n=28).

holders showing the highest level of awareness, while day laborers and students exhibit the lowest levels (P=0.003). Additionally, Income level also correlates with awareness, with lower-income respondents exhibiting greater knowledge compared to higher-income groups (P=<0.001) (Table 6).

Discussion

This study aimed to assess the awareness and knowledge levels of diabetic retinopathy (DR) among adults with diabetes in northern Bangladesh, focusing on their understanding of the condition and eye examination practices. The findings revealed that only 14% of participants were aware of DR; among them, the majority of the respondents (71.4%) exhibited a poor understanding of the condition. The awareness and level of knowledge of DR reported in our study are much lower, which is concerning given the importance of early detection and treatment to prevent vision loss.

Notably, studies focusing on DR awareness in Bangladesh are scarce. One study by Islam *et al.* [18] reported that only 4% of participants in rural Bangladesh were aware of DR. While our findings suggest a slight improvement in awareness over time, it remains critically low, underscoring the persistent gap in patient education and public health awareness efforts in the country.

Our findings align with some previous research from India and other global studies, which also report low levels of DR awareness, particularly among diabetic patients. For instance, a study conducted by Sthapak *et al.* [19] found that only 17.1% of patients were aware of DR. Similarly, in a hospital-based cross-sectional study at Christian Medical College, Vellore, Tamil Nadu, India, awareness about DR among patients with diabetes was reported at 17% [20]. However, according to

Table 5: Knowledge of the respondents regarding diabetic retinopathy (n=28).

Statement	Yes (%)	No (%)
Do you know that diabetic retinopathy is an eye disease?	20 (71.4)	8 (28.6)
Have you ever received education or information about diabetic retinopathy from healthcare professionals?	18 (64.3)	10 (35.7)
Does the duration of diabetes in a person increase the risk of diabetic retinopathy?	12 (42.9)	16 (57.1)
Does uncontrolled blood sugar increase the risk of diabetic retinopathy?	16 (57.1)	12 (42.9)
Do you know about eye signs and symptoms of diabetic retinopathy?	4 (14.3)	24 (85.7)
Do you know the treatment options for diabetic retinopathy?	2 (7.1)	26 (92.9)
Do you know the potential consequences of untreated diabetic retinopathy?	6 (21.4)	22 (78.6)

Table 6: Association between demographics characteristics and awareness of diabetic retinopathy.

Demographic characteristics	Subgroup	Aware n (%)	Not aware n (%)	Total n (%)	P-value
Age group	<40 years	2 (7.1)	4 (2.3)	6 (3.0)	0.057
	40–49 years	8 (28.6)	60 (34.9)	68 (34.0)	
	50–59 years	8 (28.6)	40 (23.3)	48 (24.0)	
	60–69 years	10 (35.7)	38 (22.1)	48 (24.0)	
	≥70 years	0 (0.0)	30 (17.4)	30 (15.0)	
Education	Below primary	0 (0.0)	6 (3.5)	6 (3.0)	0.001
	Primary	2 (7.1)	38 (22.1)	40 (20.0)	
	Secondary	2 (7.1)	30 (17.4)	32 (16.0)	
	Higher secondary	4 (14.3)	48 (27.9)	52 (26.0)	
	Graduate	14 (50.0)	40 (23.3)	54 (27.0)	
	Post graduate	6 (21.4)	10 (5.8)	16 (8.0)	
Income	Low	10 (35.7)	38 (22.1)	48 (24.0)	0.000
	Lower-middle	4 (14.3)	52 (30.2)	56 (28.0)	
	Middle	0 (0.0)	36 (20.9)	36 (18.0)	
	Upper-middle	4 (14.3)	30 (17.4)	34 (17.0)	
	High	4 (14.3)	6 (3.5)	10 (5.0)	
	Very high	6 (21.4)	10 (5.8)	16 (8.0)	
Occupation	Retired	4 (14.3)	40 (23.3)	44 (22.0)	0.003
	Farmer	2 (7.1)	30 (17.4)	32 (16.0)	
	Business	6 (21.4)	16 (9.3)	22 (11.0)	
	Day labor	0 (0.0)	4 (2.3)	4 (2.0)	
	Service holder	14 (50.0)	34 (19.8)	48 (24.0)	
	Homemaker	2 (7.1)	44 (25.6)	46 (23.0)	
	Student	0 (0.0)	4 (2.3)	4 (2.0)	
	Total	**28 (14.0)**	**172 (86.0)**	**200 (100.0)**	

Venugopal *et al*. [21], awareness levels about DR in India vary from 17% to 93.2%.

Compared to global findings, DR awareness in our study was lower than in studies conducted in other countries. For example, awareness rates were 82.6% in Jeddah, Saudi Arabia [22], 76.4% in Ilorin, Nigeria [23], 67% in Pakistan [24], and 59% in Yemen [25]. Awareness rates were significantly higher in developed countries, such as the United States, where 91.2% of diabetic patients were aware of DR [26], and Syria, where the rate was 93.8% [27]. Jordan (98.3%) and Iraq (95%) also reported high awareness levels [28, 29]. These variations in awareness may be attributed to differences in healthcare infrastructure, public health campaigns, sample sizes, and study settings. Countries with more developed healthcare systems and robust educational programs tend to have higher awareness rates, suggesting that a stronger focus on patient education in Bangladesh could improve DR awareness and outcomes.

The primary factor contributing to the lack of awareness and knowledge about diabetic retinopathy among diabetic patients in Bangladesh, as identified in the current study, is their low educational attainment. Patients with secondary education or lower exhibited a notable deficiency in understanding the risks and complications associated with DR. This finding aligns with several studies conducted in various countries, which indicate that individuals with higher educational levels

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tend to possess greater knowledge and awareness of DR as a complication of diabetes mellitus compared to those with lower educational backgrounds [30–34].

Previous research has shown that a longer duration of diabetes correlates with a higher risk of diabetic retinopathy [35–37]. In our study, the mean duration of diabetes among participants was 6.27±4.16 years. Longer periods of diabetes, over 5 years, were associated with better awareness in Turkey [31]. Despite most participants having diabetes for six years or more, awareness of ocular complications that can lead to blindness was notably low. The current study did not reveal an association between the duration of diabetes and the level of consciousness. The low levels of awareness highlight the critical need for implementing health education initiatives across all levels of healthcare to inform patients about the risks associated with diabetes.

The American Diabetes Association recommends that individuals with type 2 diabetes undergo annual eye examinations [38]. However, the current study indicates that only a small fraction of participants, specifically 24.0%, actually attend these annual visits with an eye specialist. One significant factor influencing behaviors such as participation in screening is an individual's level of awareness regarding diabetic retinopathy [39]. The lack of awareness among our participants may contribute to their inconsistent attendance for eye exams.

Interestingly, despite having a good understanding of the importance of eye check-ups, some studies suggest that patients may still lack the motivation to pursue these appointments. This disconnect between awareness and action appears to be a common issue among diabetic patients worldwide. For instance, only about half of the patients in Myanmar attended routine eye exams [33], and approximately two-thirds of diabetic patients in Japan reported similar attendance rates for their check-ups [40]. Furthermore, a study in Turkey revealed that although 77.3% of diabetic patients had previously undergone an eye examination, only 41.9% recognized the necessity of having annual check-ups [31]. We also found that the low rate of visits for eye examinations may be attributed to several barriers, including the unavailability and high cost of eye care services, as well as insufficient information regarding the importance of regular eye exams.

Additional factors contributing to low awareness levels include older age and patients' occupational status. Notably, service holders displayed a higher level of awareness compared to individuals in other professions. These groups warrant greater attention to enhance their understanding of diabetic retinopathy, ultimately improving their quality of life. The findings highlight the necessity for targeted educational interventions that take demographic factors into account. By customizing educational resources and outreach efforts for specific age groups, educational backgrounds, and occupational categories, healthcare providers can effectively improve awareness of diabetic retinopathy among various patients.

The observed increase in awareness over time can be linked to a range of health initiatives and campaigns designed to elevate understanding of diabetes and its associated complications. The Ministry of Health and Family Welfare has introduced guidelines in the form of pamphlets and leaflets to raise awareness about sight-threatening conditions [41]. However, challenges such as the unavailability and high costs of eye care services, alongside a lack of information regarding the importance of regular eye examinations, continue to hinder efforts to improve awareness.

Conclusions

This study reveals a significant gap in awareness and knowledge about diabetic retinopathy (DR) among diabetic patients in northern Bangladesh. Despite the importance of regular eye check-ups, many patients had never undergone an eye examination, and awareness of DR was alarmingly low. These findings highlight the need for targeted education campaigns, enhanced accessibility to eye care, and regular screenings to prevent DR. Community-level awareness initiatives and integrating eye exams into diabetes management protocols are critical. However, this study has limitations. It is cross-sectional, limiting the ability to assess cause-effect relationships. Additionally, future studies should include larger, more diverse patients and consider longitudinal designs to capture changes in awareness and behavior over time. Addressing these challenges will help reduce the burden of diabetic retinopathy and improve visual health outcomes.

Conflict of interest

The authors declare no conflict of interest.

Ethics approval

The approval for this study was obtained from the Ethics Committee of the Bangladesh Open University (approval reference no.: BOU/SST/MPH/13/137/1992).

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