

ORIGINAL ARTICLE

EXPLORING EYE CARE PRACTICES AND SERVICE UPTAKE AMONG DIABETIC INDIVIDUALS - A STUDY FROM A TERTIARY CARE HOSPITAL

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Background: Diabetes mellitus is a leading cause of morbidity and mortality, with many ocular severe complications. This cross-sectional study determined adherence to proper eye care recommendations and regular eye examinations among local diabetic patients and factors associated with non-adherence. **Methods:** This cross-sectional survey assessed the knowledge, attitude, and practices of 200 type I and II diabetic patients. The frequency of patients' regular eye examinations, good knowledge of diabetic eye disease, and measures of the association of periodic eye examination with different variables were calculated. **Results:** There were 116 (58%) males and 84 (42%) females (mean age=55.28 years, SD=13.928 years). The majority belonged to the lower socioeconomic group with little education. 114 (57%) had never had any eye examination. 107 were unaware of the importance of eye examination. Only 35 (17.5%) had good knowledge, and 146 (73%) patients had poor attitudes towards diabetes. Periodic eye examination was significantly associated with occupation, area of residence, and overall knowledge of diabetic eye complications. In contrast, it had no significant association with gender, type of diabetes, presence of eye symptoms, or presence of other diabetes complications. **Conclusion:** The knowledge of our local population about diabetic eye disease is very deficient. An extensive campaign of educating diabetic patients about ocular complications is necessary to address this.

Keywords: Eye care; Knowledge; Attitude and practices; Diabetes

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INTRODUCTION

Diabetes mellitus is one of the leading causes of morbidity and mortality worldwide. More than 460 million adults and 1.1 million children and adolescents were known to have diabetes in 2019, with 79% of adult patients residing in developing countries. Accounting for 4.2 million deaths in 2019, diabetes is also a significant cause of death worldwide, and with these figures only expected to rise based on the current trends, it is predicted that by the year 2045, approximately 700 million adults will be living with the condition.^{1,2}

Type 1 Diabetes is a condition where the immune system destroys insulin-producing cells, causing complete insulin deficiency, and in Type 2 Diabetes, insulin resistance and reduced insulin production, are often linked to lifestyle factors. Diabetes poses a significant public health challenge for both developed and developing countries, with a much more rapid increase in the prevalence of the disease in developing nations, including those in Asia.^{3,4}

Ocular complications of diabetes, including retinopathy, maculopathy, glaucoma, cataracts and ocular surface diseases, are a significant cause of

morbidity among diabetic patients, with diabetic retinopathy being one of the most common causes of blindness worldwide, accounting for visual impairment in 2.6 million individuals in 2015.^{5,6} Most of type 2 and almost all of type 1 diabetics are expected to demonstrate some degree of retinal involvement after 20 years of the disease⁷, and with the ever-increasing prevalence of diabetes, appropriate eye care and effective strategies for prevention, early detection and management of diabetic eye disease are of paramount importance.

It is recommended that a person with type 1 diabetes undergo ophthalmologic examinations at 11 or within 5 years of diagnosis, followed by annual follow-ups. In contrast, type 2 diabetics should have an eye examination with yearly retinal exams upon diagnosis,^{8,9} non-adherence to these recommendations usually results from a lack of awareness about diabetic eye complications and the importance of regular examinations^{10,11}.

Pakistan is among the top 10 countries worldwide for an increase in diabetes prevalence, with the latest figures released by the International Diabetes Federation in 2019 showing that 17.1% of the Pakistani

population is living with the condition.¹ In a recent study, diabetic retinopathy was reported to affect 28.78% of all people with diabetes in Pakistan.¹² Despite this, there is no national public health program for preventing and detecting diabetic eye disease. This study aims to add to the minimal existing literature on preventing diabetic eye disease in Pakistan by determining adherence to proper eye care recommendations and regular eye examinations among local diabetic patients and the factors associated with non-adherence. This study provides valuable information for developing effective public health strategies to prevent diabetic eye complications.

MATERIAL AND METHODS

This hospital-based cross-sectional study was conducted in the Medicine and Endocrinology departments of Ayub Teaching Hospital, Abbottabad, a tertiary care facility in Khyber Pakhtunkhwa, Pakistan. The study was started after approval from the Ethical Review Board of the hospital, and 200 adult diabetic patients (18 years of age or older) consisting of 116 males and 84 females were included in the study during November and December 2020 after obtaining informed consent. Two hundreds consecutive patients attending the outpatient clinics or admitted were included. Unstable/seriously unwell patients, patients with a learning disability, patients who did not understand Urdu, Hindko, or English, and patients with any pre-existing eye condition before the diagnosis of diabetes were excluded from the study. Each patient was given a random.

A detailed questionnaire, consisting of four parts, was used to collect data from each patient. The questionnaire was developed after an extensive literature review, and help was taken from the questionnaires used in previously conducted studies. The first part of the questionnaire covered the patient's demographic characteristics and details about the patient's diabetes (including the type of diabetes, duration, treatment modality, presence or absence of any eye symptoms, presence or absence of any diabetic complications, and control of diabetes mellitus). The second part assessed the patient's practices regarding eye care and prevention/early detection of diabetic eye disease. The third and fourth parts of the questionnaire were used to evaluate the patient's knowledge regarding diabetic eye complications and their overall attitude towards diabetes, both of which were classified as "good" or "poor" based on an overall score. It was pretested twice before adopting a final version for data collection.

The authors administered the questionnaire themselves. Data was entered and analysed using SPSS version 26. Descriptive statistics were obtained, including the frequency of diabetic patients in our study who had regular eye examinations (at least yearly) and patients with good knowledge of diabetic eye disease.

Associations between good eye care practices and other factors (such as demographic characteristics, knowledge of diabetic eye complications, and overall attitude towards diabetes) were analysed. Eye care was stratified by independent variables. Post-stratification Chi-square test was applied with 5% level of significance. Similarly, the point bi-serial correlation coefficient was calculated to find out the association of regular eye examinations with the duration of diabetes. The results were presented in tables and graphs.

RESULTS

The subjects of this study included 116 (58%) males and 84 (42%) females. The age of the patients ranged from 19 years to 88 years, with a mean age of 55.28 ± 13.928 years. Most 63 (31.5%) patients were illiterate or had only primary education 70 (35%) only 67 (33.5%) were above primary. Regarding the socioeconomic condition of the patients, the vast majority 157 (78.5%) were from a low socioeconomic class, defined as people with a monthly income of less than 50,000 rupees per month. 25 (12.5%) of patients had type 1 diabetes, while 175 (87.5%) of patients had type 2 diabetes.

Looking into the practices regarding eye care revealed that among the patients included in the study, 114 (57%) had never had any eye examination after diagnosis of diabetes. In the 86 patients who had at least one eye examination after the onset of diabetes, the first examination was within three months of diagnosis in 13 (15.1%) patients, within a year of diagnosis in 28 (32.6%) patients, within 5 years of diagnosis in 36 (41.9%) patients and after 5 years in 9 (10.5%) patients. 54 (62.8%) patients had their first eye exam because a healthcare professional advised them to do so, 20 (23.3%) patients went for the exam because of an unrelated eye problem, and 12 (14%) patients went for the exam because they knew the importance of having an eye exam in diabetes. 19 (22.1%) patients had an eye exam within the last year, 43 (50%) had it in the previous 2 years, while 24 (27.9%) had it before 2 years. Only 22 (25.6%) patients had periodic eye exams. 34 (39.5%) patients did not have any repeat eye exams after the first one, and 30 (34.9%) patients had repeat exams only in case of an eye problem. Of the 22 patients with periodic eye exams, only 12 (54.5%) visited an ophthalmologist to prevent or treat diabetic eye complications. In contrast, the rest visited an ophthalmologist, optometrist, or another healthcare professional to check the power of glasses. Only 12 patients had eye examinations at least once a year. 6 patients had exams once every two years, while others had them even less frequently. Among the 178 patients who did not have regular eye examinations, an overwhelming majority (107 patients, i.e., 60.1%) were unaware of the importance of regular eye examinations. Similarly, 33 (18.5%) patients felt no need because they had no eye

symptoms, whereas 12 (6.7%) patients felt no need because their blood glucose levels were controlled. 6 (3.4%) patients could not afford regular eye examinations, while the unavailability of local eye facilities was the reason for the lack of regular visits in 15 (8.4%) patients.

As depicted in Table-1, analysing the knowledge of the 200 subjects of the study about diabetic eye complications revealed that 168 (84%) patients knew that diabetes could involve eyesight. Eight (4%) patients thought that diabetes affected taste function, while 3 (1.5%) patients were certain that diabetes did not involve any organ system. Twenty-one (10.5%) patients responded that they did not know which organ system is applied by diabetes. Of the 168 patients who knew that diabetes could affect eyesight, 141 (83.9%) patients knew that diabetes could affect the posterior layer of an eye, but only 21 (12.5%) patients knew that diabetes could cause blindness. One hundred and nineteen (70.8%) of these 168 patients thought that diabetic eye disease always caused eye symptoms and, therefore, the absence of eye symptoms excludes diabetic eye disease. 51 (30.4%) of these patients thought that patients with good glycaemic control cannot have diabetic eye disease, and 107 (63.7%) patients thought that it is not possible to prevent diabetic eye disease or detect it at an early stage. When asked whether regular eye examinations are important for diabetic patients, 92 (54.8%) of these 168 patients responded that it is essential only if there is an eye problem or uncontrolled diabetes, while 46 (27.4%) patients responded that they are unnecessary. Of the 29 patients who responded that regular eye examinations are important, 14 (48.3%) patients responded that these regular examinations should be at least yearly, 7 (24.2%) said that these should be at least two yearly, and 8 (27.6%) thought that less than one examination every two years is needed.

Based on the patient's responses to the questions about knowledge (see the previous paragraph), an overall knowledge score was calculated for each patient as described in the questionnaire. The results showed that 35 (17.5%) of the 200 patients had good knowledge of diabetic eye complications (defined as an overall score of 5 or more out of 7) and 165 (82.5%) of the 200 patients had poor knowledge (defined as an overall score of 4 or less).

Twenty-six (13%) of the 200 patients said that they had not been previously educated in detail about diabetes mellitus, but 154 (77%) of 200 patients said that they had not been previously educated about eye involvement in diabetes mellitus. One hundred and seventy-nine (89.5%) of the 200 patients said that they were never told by a healthcare professional that diabetes can affect eyes without symptoms, and 178 (89%) said that a healthcare professional never told them about the importance of regular eye examinations. 181 (90.5%) out of 200 patients responded in the affirmative when asked whether they wished they knew more about diabetic eye

complications. One hundred and forty-four (72%) patients believed it is okay for people with diabetes to eat sweets once in a while, and 172 (86%) thought that it is okay not to take medications or Insulin regularly or forget to take them if feeling well. Twenty-four (12%) patients did not consider regular sugar level monitoring necessary for all diabetic patients. When specifically asked whether they consider follow-up of diabetes to be important only if they are not feeling well or their blood sugar level is uncontrolled, 69 (34.5%) patients responded in the affirmative.

Of all the 200 patients as shown in Table-2, 112 (56%) said they did not follow a proper diet schedule, while 158 (79%) told us they did not follow an appropriate exercise schedule. 44 (22%) patients responded that they were not compliant with medications or Insulin, whereas 155 (77.5%) patients disclosed that they did not regularly check blood glucose at home (at least twice weekly). Based on all these answers, a combined score was calculated to quantify the overall attitude towards diabetes. Based on this score, 146 (73%) people had poor attitudes towards diabetes (a score of 6 or less out of 9).

The results in Table-3 indicate that the association of Gender, Type of Diabetes, Presence of Eye Symptoms, Presence of other diabetic complications, and Attitude regarding diabetes with Periodic Eye Examination was insignificant. At the same time, occupation was statistically significantly associated with Periodic Eye Examination ($p < 0.001$). Moreover, the Area of Residence was found to be statistically significantly associated with Periodic Eye Examination ($p < 0.001$), and Overall knowledge of diabetic eye complications was also found to be statistically significantly associated with Periodic Eye Examination ($p < 0.001$).

The results as shown in Table-4 indicate that the Periodic Eye Examination was negatively significantly associated with education status $r = -.419$ ($p < .001$); moreover, Periodic Eye Examination was also negatively associated considerably with Socioeconomic Status $r = -.347$ ($p < .001$).

The point bi-serial correlation results shown in Table-5 indicate that the No category in Periodic Eye Examination is positively significantly associated with the Duration of Diabetes, $r_{pb} = .448$ ($p < .001$) and bears a moderate association among the two. Moreover, the other categories are not significantly associated with the Duration of Diabetes. Application of Chi-Square revealed that periodic eye examination was significantly associated with occupation, area of residence and overall knowledge of diabetic eye complications. In contrast, it had no significant association with gender, type of diabetes, presence of eye symptoms or other diabetes complications. The calculation of the point bi-serial correlation coefficient reveals that the "No" category in "Periodic Eye Examination" is positively significantly

associated with the duration of diabetes, $r_{pb}=.448$ ($p<.001$) and bears a moderate association among the two. However, the other categories are not significantly associated with the duration of diabetes.

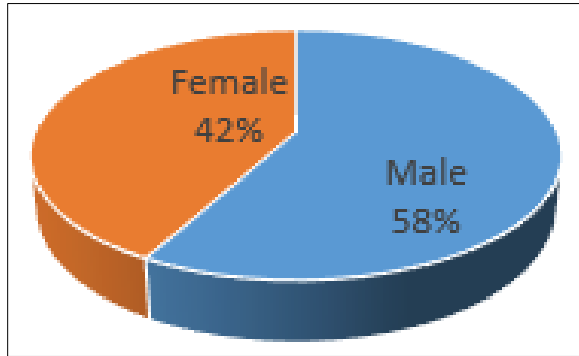


Figure-1: Gender

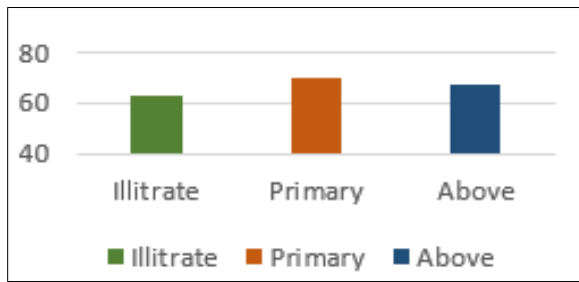


Figure-2: Level of Education

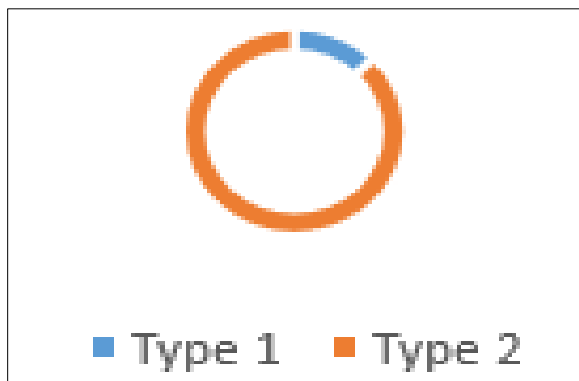


Figure-3: Type of Diabetes

Table-1: Important points of knowledge and percentage

Knowledge	Frequency
Patients knew that diabetes could involve eyesight	168 (84%)
Patients thought that diabetes affected taste function	8 (4%)
Diabetes did not involve any organ system	3 (1.5 %)
Patients responded that they did not know which organ system is applied by diabetes	21 (10.5%)
Patients knew that diabetes could affect the posterior layer of an eye	141 (83.9%)
Patients knew that diabetes could cause blindness	21 (12.5%)
Patients thought that patients with good glycaemic control could not have a diabetic eye disease	51 (30.4%)

Table-2: Important points of practice

Practice	frequency
Did not follow a proper diet schedule	112 (56%)
Did not follow an appropriate exercise schedule	158 (79%)
Not compliant with medications or Insulin	44 (22%)
Did not regularly check blood glucose at home	155 (77.5%)

Table-3: Periodic eye examination chi-square results

	Sig (p-value)
Gender	.853
Occupation	.001
Area of Residence	.005
Type of Diabetes	1.00
Presence of Eye Symptom	.345
Presence of other diabetic complications	1.00
Overall knowledge of diabetic eye complications	.008
Attitude regarding diabetes	.199

Table-4: Periodic eye examination correlation results

Variables	ρ	Sig (p-value)	Remarks
Education Status	-.419**	.000	Negative Correlation
Socioeconomic Status	-.347**	.000	Negative Correlation

Table-5: Duration of diabetes

Response	r_{pb}	Sig (p-value)	Remarks
No	-.070	.323	No Significant Association
Yes	.448	.000	Significantly Associated
Only in case of eye problem	-.122	.085	No Significant Association

DISCUSSION

Pakistan faces a rising prevalence of diabetes, contributing to an increased risk of diabetic retinopathy. The local context is crucial, considering factors such as lifestyle, dietary habits, and genetic predispositions that might impact the prevalence and severity of diabetic eye complications. The specific infrastructure and facilities available in the tertiary care hospital are under consideration. This includes specialized eye care units, state-of-the-art diagnostic equipment, and a team of skilled healthcare professionals, including ophthalmologists and dialectologists.

This cross-sectional study was carried out in the hospital setting. It aimed to investigate the knowledge, attitude and practices of diabetic patients about diabetic retinopathy. Understanding the knowledge, attitudes, and practices of diabetic patients about diabetic retinopathy is foundational for targeted healthcare interventions. Healthcare providers can tailor educational programs, communication strategies, and support mechanisms based on the identified gaps and attitudes, ultimately improving outcomes for diabetic patients and reducing the burden of diabetic retinopathy. Regular assessments and follow-ups are essential to gauge changes in knowledge, attitudes, and practices over time.

The results of this study suggested that the rate of regular eye examinations and ophthalmology follow-

up in diabetic patients in our population is considerably less than that in developed countries. For example, an Australian study published in 1998 showed that 68.2% of patients with diabetes had at least one visit with an ophthalmologist¹³ compared to our research, revealing that only 43% of patients had at least one eye examination by any health professional. Similarly, an American study published in 2017 showed that only 128 (5.87%) out of 2179 diabetic patients visiting the ophthalmology clinic did not have a repeat dilated fundus exam within 30 days (these patients were excluded from the study)¹⁴ as opposed to our research showing that 39.5% among the diabetic patients who had at least one eye exam had never gone for a repeat exam.

This study also shows that the practices regarding diabetic eye care in the studied population are significantly deficient compared to the International Council of Ophthalmology recommendations and guidelines on diabetic eye care. These guidelines, published in 2018, state that the minimum screening examination should include a screening vision examination (before pupil dilation if necessary) and a retinal exam. Moreover, the guidelines also mention that this screening examination must be coupled with access to adequate and timely referral for ophthalmological care.¹⁵ However, our study revealed that 57% of the patients with diabetes mellitus never had any screening eye exam. The guidelines also recommend that even for patients with no apparent diabetic retinopathy on screening eye exam, the re-examination or next screening should be in one to two years.¹⁶ But our study revealed that only 18 out of the 200 patients had regular screening in the recommended one to two years.

The statement suggested that the researchers have conducted a literature review to identify existing studies in neighbouring countries that investigated the knowledge and awareness of diabetic patients, similar to the focus of their research. The key findings from the literature review, particularly referencing an Indian study published in 2017, indicate that the researchers found that, akin to their patient population, patients in neighbouring countries (specifically referencing India) also exhibit suboptimal knowledge and awareness about diabetes. The mentioned Indian study, published in 2017, reported that 42% of patients had "good knowledge" about diabetes. It's important to note that the criteria used to define "good knowledge" in the Indian study might not align with the standards or definitions used in the current research.¹⁷

There are similarities in the level of knowledge and awareness among diabetic patients across borders. However, the researchers acknowledge that differences in criteria for defining "good knowledge" exist between the Indian study and their research. The inclusion of results might suggest that the researchers are aware of the

broader context in which their study is situated. The comparative analysis with neighbouring countries adds depth to their understanding of the knowledge landscape among diabetic patients. The mention of differences in criteria for defining good knowledge may also indicate a potential research gap or the need for further investigation. It highlights the uniqueness of the current study and its contribution to understanding the knowledge and awareness of diabetic patients within the specific context or criteria chosen for the research.¹⁸

In conclusion, this segment of the statement reflects the researchers' effort to contextualize their study within the broader regional landscape, drawing attention to the literature in neighbouring countries and highlighting similarities and differences in the knowledge and awareness among diabetic patients. This comparative approach adds depth to the discussion and underscores the need for a nuanced understanding of knowledge levels in the specific patient population under investigation.^{19,20}

CONCLUSION

In conclusion, our study sheds light on the crucial intersection of diabetes and ocular health within a tertiary care hospital in Pakistan. The findings underscore the significance of eye care and the utilization of related services among diabetic patients in this local setting. Our research reveals a notable gap in the awareness and uptake of eye care services among individuals with diabetes, emphasizing the need for targeted interventions to address this issue. The intricate relationship between diabetes and ocular complications demands proactive measures to enhance preventive strategies, timely screenings, and education about the importance of regular eye examinations.

Moreover, the study underscores the importance of fostering collaborations between healthcare providers, community organizations, and policymakers to develop comprehensive initiatives to promote eye health within the diabetic population. By establishing effective communication channels and educational programs, we can empower healthcare professionals and patients to prioritize and engage in proactive eye care practices. As we move forward, we must integrate our findings into the broader healthcare framework, advocating for policy changes that facilitate increased accessibility and affordability of eye care services for diabetic patients. Additionally, future research should delve deeper into the barriers hindering the utilization of eye care services, allowing for targeted interventions to overcome these challenges.

Ultimately, the insights gained from this study contribute to the ongoing discourse on diabetic care in Pakistan, emphasizing the pivotal role of eye health in the overall well-being of individuals with diabetes. By

addressing the specific needs and challenges outlined in this research, we can work towards a future where diabetic patients receive comprehensive care, preserving their vision and overall quality of life.

AUTHORS' CONTRIBUTION

OU: Conceptualization of study design, write-up, data collection. AA, ZF: Literature review, write-up. MS: Write-up, proof reading. SI: Data analysis, critical analysis of manuscript.

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