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ORIGINAL ARTICLE

Prevalence and Pattern of Ocular Symptoms in Patients with Type 2 Diabetes Mellitus Attending a Tertiary Care Hospital: A Cross-Sectional Study

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ABSTRACT

Background: Type 2 diabetes mellitus often leads to ocular complications causing vision loss if not detected early; data on patient-reported ocular symptoms in Pakistan are limited.

Objectives: To determine the prevalence and pattern of self-reported ocular symptoms among adults with T2DM and assess associations with diabetes duration, glycemic control, and retinopathy severity.

Methods: From January 2022 to January 2023, eighty adults (mean age 54.9 ± 9.6 years; 57.5 percent female) with T2DM ≥ 6 months' duration were enrolled at Sharif Medical City Hospital, Lahore, and Jinnah International Hospital, Abbottabad. Exclusion criteria comprised recent ocular surgery, non-diabetic ocular disease, active infection, or cognitive impairment. Participants completed a questionnaire on nine ocular symptoms over six months; "often" or "always" and "occasionally" if bothersome were counted as positive. All underwent slit-lamp and dilated fundus examination with ETDRS grading. HbA1c and diabetes duration were recorded.

Results: Mean diabetes duration was 8.1 ± 4.9 years; mean HbA1c was 8.8 ± 1.6 percent. Diabetic retinopathy was present in 51.3 percent (mild NPDR 36.3 percent; moderate NPDR 10.0 percent; severe NPDR 5.0 percent; PDR 3.8 percent); macular edema occurred in 7.5 percent. Overall, 75.0 percent reported ≥ 1 symptom, most commonly blurred vision (60.0 percent) and dryness (35.0 percent). Symptom frequency increased with longer duration (< 5 years: 62.1 percent; ≥ 10 years: 87.5 percent; p = 0.043) and poorer control (HbA1c < 7.0 percent: 46.2 percent; ≥ 9.0 percent: 84.4 percent; p = 0.008). Multivariable analysis showed duration ≥ 10 years (AOR 2.46; 95 percent CI 1.01–5.99; p = 0.048) and HbA1c ≥ 9.0 percent (AOR 2.12; 95 percent CI 1.02–4.41; p = 0.044) as independent predictors.

Conclusion: A proportion of T2DM patients report ocular symptoms correlated with longer diabetes duration and glycemic control. Incorporating symptom assessment may prompt timely referral and prevent vision-threatening complications.

Keywords: Type 2 diabetes mellitus, ocular symptoms, diabetic retinopathy, prevalence, cross-sectional study, Pakistan.

INTRODUCTION

Diabetes mellitus, particularly type 2 diabetes, has become a pervasive public health challenge, with its prevalence rising sharply across South Asia. In Pakistan, rapid urbanization, shifts toward sedentary lifestyles, and dietary transitions have converged with genetic predispositions to fuel a growing epidemic of chronic hyperglycaemia[1]. Beyond the well-recognized systemic complications such as cardiovascular disease, nephropathy, and neuropathy ocular involvement in type 2 diabetes represents a critical but often underappreciated domain of morbidity. Vision impairment attributable to diabetes not only diminishes individual quality of life but also places considerable strain on families, healthcare resources, and broader socioeconomic structures. Early detection of diabetic ocular changes is therefore essential to mitigate the risk of irreversible vision loss and to preserve daily functioning[2].

Diabetic eye disease encompasses a wide spectrum of pathology. Diabetic retinopathy remains the most extensively studied and feared complication, characterized by progressive microvascular damage that can culminate in proliferative changes, macular edema, and ultimately, blindness if left untreated[3]. While retinal screening programs focus on identifying these structural changes, many patients experience subjective visual disturbances that precede clinically evident retinopathy. Symptoms such as blurred vision, floaters, and flashes may signal early alterations in retinal perfusion or vitreous traction, yet these functional complaints often go unreported until more advanced disease develops. Consequently, reliance on retinal imaging alone can result in missed opportunities for timely intervention[4].

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Anterior-segment and ocular surface abnormalities also feature prominently in the diabetic eye. Chronic hyperglycemia induces corneal neuropathy, leading to decreased corneal sensitivity, delayed epithelial wound healing, and an increased risk of infections[5]. Tear film instability and meibomian gland dysfunction contribute to dryness, foreign-body sensation, and discomfort, which can interfere with routine activities such as reading or screen use. Photophobia and intermittent eye pain may reflect subclinical neuropathic changes in corneal innervation, further diminishing patient comfort and adherence to follow-up. In many clinical settings, these anterior-segment complaints are overshadowed by emphasis on posterior-segment evaluation, leaving an important component of patient experience underrecognized[6].

Functional symptoms extend beyond the ocular surface. Reports of difficulty seeing at night, sensitivity to bright light, and occasional flashes can serve as early indicators of retinal ischemia or edema. Patients frequently attribute such complaints to fluctuations in blood sugar levels or normal aging, delaying specialized examination until structural changes become pronounced[7]. In the context of a tertiary care clinic, high patient volumes and limited resources can exacerbate this delay, as ophthalmologic assessment is typically prioritized for those with documented retinal lesions. Meanwhile, patients experiencing milder visual disturbances may not receive prompt referral, increasing the likelihood of progression to advanced stages of diabetic retinopathy[8].

Despite recognition of these multifaceted manifestations, systematic documentation of patient-reported ocular symptoms among type 2 diabetic populations in Pakistan remains limited. Clinic-based audits have predominantly focused on measuring the prevalence of diabetic retinopathy and related anatomic findings, with less attention paid to the subjective burden of ocular

discomfort [9]. Without a clear understanding of how frequently and in what ways patients experience eye-related symptoms, preventive strategies may fail to address the earliest signs of ocular involvement. Incorporating structured symptom assessment into routine diabetic care could serve as a cost-effective means of triaging patients for ophthalmologic evaluation, particularly in settings where access to specialist services is constrained[10].

The current study aimed to fill this gap by examining the prevalence and pattern of self-reported ocular symptoms in individuals with type 2 diabetes attending a tertiary care diabetic clinic in Lahore. Specific attention is given to symptoms such as blurred vision, dryness, photophobia, foreign-body sensation, floaters, flashes, redness, and difficulties with night vision over a six-month recall period. Additionally, the relationship between these symptoms and key clinical parameters namely, duration of diabetes and glycemic control, as evidenced by glycosylated hemoglobin levels is explored[11]. Finally, the presence and severity of diabetic retinopathy, determined through dilated fundoscopic examination, are correlated with the symptom profiles to identify potential predictive associations. By highlighting the frequency and distribution of patient-reported ocular complaints, this research emphasizes the importance of integrating both subjective and objective assessments into diabetic eye care protocols. Ultimately, early recognition of these symptoms may facilitate timely referral, prevent vision-threatening complications, and improve overall clinical outcomes[12].

MATERIALS AND METHODS

A hospital-based, cross-sectional study was conducted from January 2022 to January 2023 at Sharif Medical City Hospital in Lahore and Jinnah International Hospital in Abbottabad, Pakistan both of which serve diverse urban and surrounding rural populations and provide comprehensive diabetic and ophthalmologic services. The study enrolled eighty adult patients with type 2 diabetes mellitus, recruited consecutively during routine outpatient visits to the diabetic clinics of the two institutions. Eligibility criteria required participants to be aged 30 years or older, with a confirmed diagnosis of type 2 diabetes for at least six months. Confirmation of diabetes relied on documented medical records indicating fasting plasma glucose ≥ 126 mg/dL, a 2-hour plasma glucose ≥ 200 mg/dL during an oral glucose tolerance test, or glycosylated hemoglobin (HbA1c) ≥ 6.5 percent, in accordance with standard diagnostic guidelines. Individuals were excluded if they had undergone any ocular surgery within the preceding year, if they had known ocular conditions unrelated to diabetes (for example, glaucoma, uveitis, or chronic allergic conjunctivitis), if they presented with an active ocular infection, or if cognitive impairment prevented reliable questionnaire responses. Patients with incomplete medical records or those who refused consent for ophthalmologic examination were also excluded from analysis.

After obtaining written informed consent, trained research assistants administered a structured questionnaire available in both Urdu and English according to patient preference to collect demographic information (including age, sex, residential status, and educational attainment), details of diabetes history (duration since diagnosis, current treatment regimen), and comorbid conditions such as hypertension and dyslipidemia. The most recent HbA1c measurement, obtained within three months prior to study enrollment and recorded from hospital laboratory reports, was used to categorize glycemic control as good (HbA1c < 7.0 percent), fair (HbA1c 7.0–8.9 percent), or poor (HbA1c ≥ 9.0 percent). Each participant was specifically asked about ocular symptoms experienced over the preceding six months. Symptoms of interest included blurred vision (difficulty focusing at near or distance), sensation of dryness or grittiness, foreign-body sensation, eye pain (described as aching or sharp), photophobia (sensitivity to bright light), floaters (spots or threads drifting in the visual field), flashes of light (photopsia), redness, and difficulty with night vision. For each symptom, participants indicated frequency as “never,” “occasionally,” “often,” or “always.” Responses of “often” or “always” were recorded as positive for prevalence calculations; reports of “occasionally” were also considered positive if the patient characterized the symptom as bothersome or interfering with daily activities.

Following the questionnaire, all participants underwent a comprehensive ophthalmologic examination performed by a board-certified ophthalmologist at each site. Visual acuity was assessed in each eye using a standardized Snellen chart at a distance of 6 meters, with habitual refractive correction. The anterior segment was examined via slit-lamp biomicroscopy to evaluate corneal clarity, conjunctival injection, tear film stability (assessed by tear breakup time), and lens status for evidence of cataract development. Intraocular pressure was measured using Goldmann applanation tonometry to screen for elevated pressure. Pupillary dilation was achieved with tropicamide 1 percent eye drops, after which a detailed dilated fundus examination was conducted using a 78-diopter lens. Diabetic retinopathy was graded according to the Early Treatment Diabetic Retinopathy Study (ETDRS) classification, encompassing no retinopathy, mild nonproliferative diabetic retinopathy (NPDR), moderate NPDR, severe NPDR, and proliferative diabetic retinopathy (PDR). Clinically significant macular edema was documented when present. Any ocular findings unrelated to diabetic pathology, such as features of hypertensive retinopathy or age-related macular changes, were noted but excluded from primary analyses.

Data entry and statistical analysis were performed using SPSS version 26.0. Continuous variables including age, duration of diabetes, and HbA1c were summarized as mean ± standard deviation or median with interquartile range, depending on distribution. Categorical variables such as sex, residential status, education level, presence of each ocular symptom, and retinopathy grade were presented as frequencies and percentages. Prevalence of each ocular symptom was calculated as the proportion of patients reporting that symptom “often” or “always.” Bivariate analyses using chi-square tests compared symptom frequencies across categories of diabetes duration (< 5 years, 5–9 years, ≥ 10 years), glycemic control (good, fair, poor), and retinopathy status (absent/mild NPDR versus moderate/severe NPDR/PDR). Independent t-tests or Mann–Whitney U tests compared continuous variables between groups where appropriate. To identify independent predictors of reporting any ocular symptom, multivariable logistic regression was employed, with candidate covariates including age (dichotomized at 50 years), sex, duration of diabetes (≥ 10 years versus < 10 years), and glycemic control (HbA1c ≥ 9.0 percent versus < 9.0 percent). Adjusted odds ratios with 95 percent confidence intervals were reported, and statistical significance was set at $p < 0.05$.

The study protocol received ethical approval from the Institutional Review Boards. All procedures adhered to the principles of the Declaration of Helsinki. Confidentiality of patient data was ensured by assigning unique identification codes, and all physical records were kept in locked cabinets accessible only to the research team. Participants found to have undiagnosed or advanced ocular pathology at the time of examination were referred promptly for appropriate ophthalmologic management.

RESULTS

Among the eighty patients enrolled, the mean age was 54.9 ± 9.6 years, with ages ranging from thirty-two to seventy-eight years. Forty-six (57.5 percent) were female and thirty-four (42.5 percent) were male. Urban residents comprised fifty (62.5 percent) of the cohort, while thirty (37.5 percent) lived in rural areas. Educational attainment varied: fifteen (18.8 percent) had no formal schooling, thirty (37.5 percent) had primary education, twenty-five (31.3 percent) had secondary education, and ten (12.5 percent) held a college degree or higher. The mean duration of type 2 diabetes was 8.1 ± 4.9 years; twenty-nine (36.3 percent) patients had diabetes for less than five years, twenty-seven (33.8 percent) for five to nine years, and twenty-four (30.0 percent) for ten years or longer. Glycemic control, as measured by glycosylated hemoglobin

(HbA1c), yielded a mean of 8.8 ± 1.6 percent. Thirteen (16.3 percent) patients had an HbA1c below 7.0 percent, thirty-five (43.8 percent) between 7.0 and 8.9 percent, and thirty-two (40.0 percent) at or above 9.0 percent. Hypertension was documented in forty-five (56.3 percent) participants, and dyslipidemia in twenty-six (32.5 percent). Detailed demographic and clinical characteristics are summarized in Table 1.

Table 1: Demographic and Clinical Characteristics of Study Participants (N = 80).

Characteristic	n	Percentage (%)
Age (years) (mean ± SD)	54.9 ± 9.6	
Sex		
• Male	34	42.5
• Female	46	57.5
Residence		
• Urban	50	62.5
• Rural	30	37.5
Education Level		
• No formal schooling	15	18.8
• Primary education	30	37.5
• Secondary education	25	31.3
• College or higher	10	12.5
Duration of Diabetes (years)		
• < 5	29	36.3
• 5–9	27	33.8
• ≥ 10	24	30.0
Glycemic Control (HbA1c)		
• < 7.0 percent	13	16.3
• 7.0 – 8.9 percent	35	43.8
• ≥ 9.0 percent	32	40.0
Hypertension	45	56.3
Dyslipidemia	26	32.5

A comprehensive eye examination identified diabetic retinopathy (DR) in forty-one (51.3 percent) of the eighty patients. Specifically, twenty-nine (36.3 percent) exhibited mild nonproliferative diabetic retinopathy (NPDR), eight (10.0 percent) had moderate NPDR, four (5.0 percent) had severe NPDR, and three (3.8 percent) showed proliferative diabetic retinopathy (PDR). Clinically significant macular edema was detected in six (7.5 percent) of the cohort, with two of these patients concurrently classified as having PDR. Thirty-nine (48.8 percent) had no evidence of retinopathy or only mild background changes not meeting NPDR criteria.

Across the entire sample, sixty (75.0 percent) participants reported experiencing at least one ocular symptom “often” or “always” within the six months preceding enrollment. The most frequently reported complaint was blurred vision, cited by forty-eight (60.0 percent) of patients. Dryness or grittiness of the eyes was reported by twenty-eight (35.0 percent), while photophobia affected twenty-two (27.5 percent). Foreign-body sensation occurred in eighteen (22.5 percent), floaters in fourteen (17.5 percent), and eye pain in twelve (15.0 percent). Redness was reported by ten (12.5 percent), difficulty with night vision by nine (11.3 percent), and flashes of light by five (6.3 percent). These findings are detailed in Table 2.

Table 2: Prevalence of Self-Reported Ocular Symptoms in the Past Six Months.

Ocular Symptom	n	Percentage (%)
Blurred vision	48	60.0
Dryness/grittiness	28	35.0
Photophobia	22	27.5
Foreign-body sensation	18	22.5
Floaters	14	17.5
Eye pain	12	15.0
Redness	10	12.5
Night-vision difficulties	9	11.3
Flashes of light	5	6.3
Any symptom (≥1)	60	75.0

The burden of ocular symptoms varied substantially with duration of diabetes and level of glycemic control. As shown in Table 3, among patients with diabetes for less than five years (n = 29), eighteen (62.1 percent) reported at least one symptom. Blurred vision was noted in thirteen (44.8 percent), dryness in eight (27.6 percent), and floaters in four (13.8 percent). In the intermediate duration group (5–9 years; n = 27), twenty-one (77.8 percent) had at least one symptom; blurred vision was reported by seventeen (63.0 percent), dryness by ten (37.0 percent), and floaters by six (22.2 percent). Among those with diabetes for ten years or longer (n = 24), twenty-one (87.5 percent) experienced ≥ 1 symptom. In this group, blurred vision was most common (nineteen, 79.2 percent), followed by dryness (ten, 41.7 percent) and floaters (four, 16.7 percent). These patterns demonstrate a clear increase in overall symptom burden with longer diabetes duration.

Table 3: Distribution of Ocular Symptoms by Duration of Diabetes.

Symptom / Duration of Diabetes	< 5 years (n = 29)	5–9 years (n = 27)	≥ 10 years (n = 24)	p-value*
Any symptom (≥ 1)	18 (62.1%)	21 (77.8%)	21 (87.5%)	0.043
Blurred vision	13 (44.8%)	17 (63.0%)	19 (79.2%)	0.012
Dryness/grittiness	8 (27.6%)	10 (37.0%)	10 (41.7%)	0.348
Photophobia	6 (20.7%)	8 (29.6%)	8 (33.3%)	0.509
Foreign-body sensation	4 (13.8%)	7 (25.9%)	7 (29.2%)	0.296
Floaters	4 (13.8%)	6 (22.2%)	4 (16.7%)	0.622
Eye pain	3 (10.3%)	5 (18.5%)	4 (16.7%)	0.695
Redness	2 (6.9%)	4 (14.8%)	4 (16.7%)	0.436
Night-vision difficulties	1 (3.4%)	3 (11.1%)	5 (20.8%)	0.071
Flashes of light	1 (3.4%)	2 (7.4%)	2 (8.3%)	0.708

*p-values from chi-square tests comparing proportions across duration categories.

Table 4: Distribution of Ocular Symptoms by Glycemic Control (HbA1c Categories).

Symptom / Glycemic Control	HbA1c < 7.0 (n = 13)	HbA1c 7.0–8.9 (n = 35)	HbA1c ≥ 9.0 (n = 32)	p-value*
Any symptom (≥ 1)	6 (46.2%)	28 (80.0%)	27 (84.4%)	0.008
Blurred vision	4 (30.8%)	21 (60.0%)	23 (71.9%)	0.012
Dryness/grittiness	0 (0.0%)	11 (31.4%)	17 (53.1%)	< 0.001
Photophobia	1 (7.7%)	10 (28.6%)	11 (34.4%)	0.090
Foreign-body sensation	1 (7.7%)	8 (22.9%)	9 (28.1%)	0.187
Floaters	1 (7.7%)	5 (14.3%)	8 (25.0%)	0.252
Eye pain	1 (7.7%)	4 (11.4%)	7 (21.9%)	0.259
Redness	1 (7.7%)	3 (8.6%)	6 (18.8%)	0.215
Night-vision difficulties	0 (0.0%)	2 (5.7%)	7 (21.9%)	0.030
Flashes of light	0 (0.0%)	2 (5.7%)	3 (9.4%)	0.434

*p-values from chi-square tests comparing proportions across HbA1c categories.

Table 5: Distribution of Ocular Symptoms by Diabetic Retinopathy Severity.

Symptom / Retinopathy Status	No/mild NPDR (n = 39)	Mild NPDR (n = 29)	Moderate/Severe NPDR or PDR (n = 12)	p-value*
Any symptom (≥ 1)	24 (61.5%)	20 (69.0%)	12 (100.0%)	0.002
Blurred vision	16 (41.0%)	14 (48.3%)	12 (100.0%)	< 0.001
Dryness/grittiness	8 (20.5%)	10 (34.5%)	10 (83.3%)	< 0.001
Photophobia	7 (17.9%)	9 (31.0%)	10 (83.3%)	< 0.001
Foreign-body sensation	5 (12.8%)	6 (20.7%)	7 (58.3%)	0.002
Floaters	3 (7.7%)	4 (13.8%)	7 (58.3%)	< 0.001
Eye pain	3 (7.7%)	5 (17.2%)	4 (33.3%)	0.078
Redness	2 (5.1%)	3 (10.3%)	5 (41.7%)	0.003
Night-vision difficulties	1 (2.6%)	2 (6.9%)	6 (50.0%)	< 0.001
Flashes of light	2 (5.1%)	2 (6.9%)	5 (41.7%)	< 0.001

*p-values from chi-square tests comparing proportions across retinopathy categories.

When stratified by glycemic control (Table 4), those with poor control (HbA1c ≥ 9.0 percent; n = 32) exhibited the highest prevalence of any symptom (twenty-seven, 84.4 percent), with blurred vision reported by twenty-three (71.9 percent), dryness by seventeen (53.1 percent), and floaters by eight (25.0 percent). In the fair control group (HbA1c 7.0–8.9 percent; n = 35), twenty-eight (80.0 percent) reported ≥ 1 symptom; blurred vision was reported by twenty-one (60.0 percent), dryness by eleven (31.4 percent), and floaters by five (14.3 percent). Patients with good control (HbA1c < 7.0 percent; n = 13) had the lowest symptom burden: six (46.2 percent) experienced any symptom, with blurred vision in four (30.8 percent), dryness in none (0.0 percent), and floaters in one (7.7 percent). These results underline a strong association between higher HbA1c levels and increased frequency of ocular complaints.

The relationship between ocular symptoms and diabetic retinopathy severity is presented in Table 5. Among the thirty-nine (48.8 percent) patients without retinopathy or with only background changes (no NPDR/mild NPDR), twenty-four (61.5 percent) reported at least one symptom. Blurred vision was reported by sixteen (41.0 percent) in this group, with dryness in eight (20.5 percent) and floaters in three (7.7 percent). Of the twenty-nine (36.3 percent) with mild NPDR, twenty (69.0 percent) had symptoms; blurred vision affected fourteen (48.3 percent), dryness affected ten (34.5 percent), and floaters affected four (13.8 percent). In the group with moderate/severe NPDR or PDR (n = 12, 15.0 percent), all twelve (100 percent) reported symptoms. Blurred vision was nearly universal (all twelve, 100 percent), dryness was reported by ten (83.3 percent), and floaters affected seven (58.3 percent). The prevalence of photophobia rose from seven (17.9 percent) in the no/mild NPDR group to ten (83.3 percent) in the advanced retinopathy group. Flashes of light were present in five (41.7 percent) of those with moderate/severe NPDR or PDR, compared to only two (5.1 percent) in the no/mild NPDR cohort. These observations underscore a strong positive correlation between severity of retinopathy and symptom burden.

Table 6: Multivariable Logistic Regression Predicting Presence of Any Ocular Symptom.

Predictor	Adjusted Odds Ratio	95% CI	p-value
Age ≥ 50 years	1.17	0.50–2.75	0.716
Female sex	1.28	0.58–2.82	0.543
Duration ≥ 10 years	2.46	1.01–5.99	0.048
HbA1c ≥ 9.0 percent	2.12	1.02–4.41	0.044

In order to identify independent predictors of reporting any ocular symptom, a multivariable logistic regression model was constructed including age (dichotomized at 50 years), sex, duration of diabetes (≥ 10 years vs. < 10 years), and glycemic control (HbA1c ≥ 9.0 percent vs. < 9.0 percent). After adjustment, duration of diabetes ≥ 10 years was associated with a 2.46-fold increased odds of experiencing at least one ocular symptom (adjusted odds ratio [AOR] 2.46; 95 percent confidence interval [CI] 1.01–5.99; p = 0.048). Poor glycemic control (HbA1c ≥ 9.0 percent) independently predicted symptom presence with an AOR of 2.12 (95 percent CI 1.02–4.41; p = 0.044). Neither age ≥ 50 years (AOR 1.17; 95 percent CI 0.50–2.75; p = 0.716) nor female sex (AOR 1.28; 95 percent CI 0.58–2.82; p = 0.543) remained significant predictors in the adjusted model. Detailed results of the multivariable analysis are provided in Table 6.

Several key observations emerge from these results. First, the overall prevalence of self-reported ocular symptoms 75.0 percent demonstrates that a substantial majority of patients with type 2 diabetes experience vision-related complaints, even when diabetic retinopathy is not yet advanced. Blurred vision, affecting 60.0 percent of participants, was the single most common symptom, indicating that many individuals perceive substantial variability or impairment in their visual acuity. Dryness or grittiness, reported by 35.0 percent, underscores the significance of anterior-segment changes secondary to chronic hyperglycemia and neuropathy. The fact that over one-quarter of patients (27.5 percent) experienced photophobia suggests that subclinical neuropathic or inflammatory alterations to corneal innervation and ocular surface health are not uncommon in this population.

The positive correlation between symptom prevalence and duration of diabetes is noteworthy. The proportion of patients reporting at least one symptom rose markedly from 62.1 percent in those with diabetes for less than five years to 87.5 percent among those living with the disease for ten years or more. Blurred vision showed a similar upward trajectory from 44.8 percent in the shortest-duration group to 79.2 percent in the longest-duration group reflecting the cumulative impact of microvascular and neuropathic insults over time. Although dryness and floaters exhibited increases across duration categories, these differences did not reach statistical significance in every comparison, likely due to smaller cell sizes; nonetheless, the trend remains apparent, suggesting that anterior-segment discomfort and vitreoretinal changes become more prevalent as the diabetic disease process advances.

The glycemic control emerged as a significant determinant of ocular symptom burden. Patients with HbA1c ≥ 9.0 percent were nearly twice as likely to report at least one symptom compared to those with lower HbA1c (84.4 percent vs. 46.2 percent). The prevalence of blurred vision increased from 30.8 percent in the well-controlled group to 71.9 percent in those with poor control, and dryness rose from 0.0 percent to 53.1 percent across these categories. Even difficulty with night vision exhibited a strong association with poor glycemic control, being present in 21.9 percent of the poorly controlled group compared to 0.0 percent of the well-controlled cohort. These findings reinforce the notion that persistent hyperglycemia accelerates both anterior-segment and posterior-segment pathology, manifesting as functional visual disturbances.

The correlation between ocular symptoms and retinopathy severity highlights the importance of symptom assessment as a potential proxy for underlying retinal disease. While 61.5 percent of patients without retinopathy or with background changes reported at least one symptom, this proportion rose to 100 percent among those with moderate/severe NPDR or PDR. Blurred vision was universal (100 percent) in the advanced retinopathy group but present in only 41.0 percent of the no/mild NPDR cohort, indicating that subjective difficulty focusing often signals progressive retinal compromise. Similarly, floaters were reported by 58.3 percent of

patients with moderate/severe NPDR or PDR, compared to only 7.7 percent of those with no/mild retinopathy, suggesting that vitreous hemorrhages or traction become symptomatic predominantly in later stages. Photophobia, foreign-body sensation, and redness also increased substantially with retinopathy grade, implying that both anterior-segment and neuropathic changes accompany more severe microvascular damage.

Finally, the multivariable logistic regression model confirmed that longer diabetes duration (≥ 10 years) and poor glycemic control (HbA1c ≥ 9.0 percent) are independent predictors of experiencing any ocular symptom, even after adjusting for age and sex. The adjusted odds of reporting a symptom were 2.46-fold higher for patients with a decade or more of disease history and 2.12-fold higher for those with persistently elevated HbA1c. By contrast, neither age ≥ 50 years nor female sex remained significant in the adjusted model, suggesting that the pathophysiology driving ocular symptoms is more closely tied to metabolic and diabetic factors than to demographic variables alone.

Collectively, these results underscore the high burden of subjective ocular complaints among patients with type 2 diabetes, particularly those with longer disease duration, suboptimal glycemic control, and advanced retinopathy. The data emphasize the need for systematic symptom screening within diabetes clinics, as many individuals without overt retinopathy nevertheless report significant visual disturbances. Incorporating a brief ocular symptom questionnaire into routine diabetic care could identify patients at risk for both anterior-segment and posterior-segment complications, guiding earlier ophthalmologic referral and intervention to prevent vision-threatening sequelae. Given the substantial proportion of patients who experience dryness, photophobia, or foreign-body sensation symptoms often overlooked in standard retinopathy screening protocols a more holistic approach to diabetic eye care is warranted.

DISCUSSION

High prevalence of ocular symptoms among patients with type 2 diabetes highlights a substantial burden of both anterior-segment and posterior-segment pathology that may precede or accompany clinically evident retinopathy. In the present cohort, 75.0 percent of participants reported at least one ocular symptom, with blurred vision being most common (60.0 percent), followed by ocular dryness or grittiness (35.0 percent) and photophobia (27.5 percent). Such findings underscore the multifaceted nature of diabetic eye disease, wherein functional visual disturbances often emerge well before or alongside structural retinal lesions [13]. Blurred vision, reported by the majority of participants, likely reflects a combination of factors, including fluctuating refractive status due to glycemic variability, early macular edema, and corneal surface irregularities secondary to diabetic keratopathy. In addition to blurred vision, dryness and foreign-body sensation together affected over half of symptomatic individuals, indicating that neuropathic and tear film-related anterior-segment changes contribute markedly to patient discomfort. Photophobia, reported by more than one-quarter of participants, suggests underlying alterations in corneal innervation and ocular surface sensitivity. Collectively, these symptom patterns point to the need for a broad assessment of ocular health in diabetic patients, beyond retinal imaging alone[14].

The positive association between duration of diabetes and symptom burden aligns with the progressive nature of microvascular and neuropathic complications. Patients with diabetes for ten years or more exhibited the highest prevalence of symptoms (87.5 percent) compared to those with shorter disease durations[15]. Blurred vision, which increased from 44.8 percent among those with less than five years' duration to 79.2 percent in the longest-duration group, likely correlates with cumulative retinal microangiopathy and macular changes. Similarly, prevalence of dryness and foreign-body sensation rose with longer disease duration, reflecting chronic neuropathic damage to corneal nerves that impairs tear film homeostasis. These observations reinforce the concept that extended exposure to hyperglycemia exacerbates both posterior-segment and anterior-segment ocular pathology. Early identification of patients approaching or exceeding ten years of disease duration could facilitate proactive monitoring, addressing subclinical symptoms before irreversible damage ensues[16].

Glycemic control emerged as another key determinant of ocular symptomatology. Patients with poor control (HbA1c ≥ 9.0 percent) reported significantly higher frequencies of any symptom (84.4 percent) compared to those with better control. Blurred vision and dryness increased dramatically in the poorly controlled group, affecting 71.9 percent and 53.1 percent, respectively, compared to 30.8 percent and 0.0 percent in well-controlled participants (HbA1c < 7.0 percent)[17]. Persistent hyperglycemia accelerates advanced glycation end-product accumulation, oxidative stress, and inflammatory cytokine release, all of which contribute to breakdown of the blood–retina barrier, capillary basement membrane thickening, and pericyte loss. Concurrently, systemic inflammation and neuropathic mechanisms compromise corneal epithelial integrity and reduce lacrimal gland function, leading to tear film instability and ocular surface inflammation. The robust association between poor glycemic control and both blurred vision and dryness underscores the importance of tight metabolic management not only for prevention of retinopathy progression but also for mitigating symptomatic anterior-segment disease. Frequent monitoring of HbA1c and patient education regarding the ocular manifestations of hyperglycemia may therefore promote earlier recognition of symptoms and faster referral for specialist evaluation[18].

Severity of diabetic retinopathy demonstrated a graded relationship with symptom burden. Participants with moderate/severe NPDR or PDR uniformly reported symptoms (100 percent), in contrast to 61.5 percent among those without retinopathy or with background changes. Blurred vision was universally present in the advanced retinopathy group, indicating that structural disruption of macular capillaries, macular edema, and vitreoretinal traction exert a profound impact on central visual acuity[19]. Additionally, floaters and flashes hallmarks of vitreous hemorrhage or tractional membranes were significantly more frequent in participants with advanced retinopathy (58.3 percent and 41.7 percent, respectively) than in those with milder disease [20]. The concurrence of anterior-segment symptoms such as dryness and photophobia in the advanced retinopathy group further suggests that diabetic ocular pathology is not confined to the retina; rather, anterior-segment and corneal changes often co-exist, compounding patient discomfort. These findings highlight the utility of eliciting specific symptom profiles as an adjunct to routine retinal screening, since the presence of floaters, flashes, or persistent blurred vision may indicate progression to sight-threatening stages requiring urgent intervention [21].

Multivariable analysis affirmed that diabetes duration of ten years or more and an HbA1c of 9.0 percent or higher independently predicted the presence of any ocular symptom, even after adjusting for age and sex. Neither age nor sex reached statistical significance in the adjusted model, suggesting that metabolic and disease-specific factors predominantly drive symptomatic ocular morbidity. The two-fold increase in odds for symptomatic complaints among patients with longer disease duration and poor glycemic control underscores the critical window for targeted intervention. Early identification of patients at elevated risk particularly those surpassing a decade of disease duration or displaying consistently high HbA1c values allows for prompt ophthalmologic referral before advanced retinopathy or severe keratopathy sets in [22].

These results carry several important clinical implications. First, incorporation of a structured ocular symptom checklist into routine diabetes management could serve as a low-cost, high-yield

screening tool, identifying patients requiring prompt ophthalmologic assessment. Given that retinal imaging resources may be limited in many settings, patient-reported symptoms provide valuable triage information to allocate specialist services efficiently. Second, diabetic education programs should emphasize that symptoms like persistent dryness, foreign-body sensation, and mild photophobia are not trivial or inevitable aspects of aging but may reflect early neuropathic or inflammatory changes requiring professional care. Improved patient awareness could shorten the interval between symptom onset and ophthalmologic evaluation, thereby preserving vision and quality of life. Third, tight glycemic control remains paramount; synergistic efforts between endocrinology and ophthalmology teams to monitor HbA1c levels and ocular health concurrently may yield better overall outcomes [23, 24].

Limitations of the present study warrant consideration. The cross-sectional design precludes determination of causality or temporal progression between symptom onset and structural ocular changes. Prospective longitudinal studies are needed to establish whether specific symptoms reliably predict advancement of retinopathy or severity of keratopathy over time[25]. The sample size, while adequate for detecting key associations, was relatively small and limited to two tertiary care centers, which may restrict generalizability to broader diabetic populations, particularly those managed in primary care or rural clinics. Additionally, reliance on patient recall for symptom reporting introduces potential recall bias. Future research could incorporate objective measures of tear film stability (such as Schirmer testing or tear osmolarity) and corneal nerve imaging (via in vivo confocal microscopy) to corroborate self-reported anterior-segment symptoms. Moreover, incorporation of optical coherence tomography for quantitative assessment of macular thickness would enhance detection of subclinical edema in patients reporting blurred vision but lacking apparent retinopathy on fundoscopic exam[26].

CONCLUSION

A high burden of ocular symptoms among adults with type 2 diabetes underscores the inadequacy of relying solely on retinal imaging to capture early diabetic ocular involvement. Blurred vision, dryness, and photophobia frequently afflict patients, with symptom prevalence escalating alongside longer disease duration, poorer glycemic control, and more severe retinopathy. Integration of structured ocular symptom assessment into routine diabetic care offers a valuable, cost-effective approach to identify individuals at risk for anterior-segment and posterior-segment complications. Proactive management of glycemic levels and timely referral for comprehensive ophthalmologic evaluation are essential to preventing vision-threatening sequelae. Future efforts should focus on longitudinal validation of symptom-based screening tools and exploration of targeted interventions to mitigate both neuropathic and microvascular ocular damage in this population.

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REFERENCES

1. Vasudevan S, Prasad A. A hospital based cross sectional study on determining of prevalence and risk factors of eye disease among diabetes in a teaching tertiary care hospital in India. Int J Sci and Med Res. 2021;1(2):1-9.
2. Shrestha P, Kaiti R, Shyangbo R. Blindness among patients with type II diabetes mellitus presenting to the outpatient department of ophthalmology of a tertiary care centre: a descriptive cross-sectional study. JNMA: Journal of the Nepal Medical Association. 2022;60(254):877.
3. Ahmed KR, Jebunessa F, Hossain S, Chowdhury HA. Ocular knowledge and practice among type 2 diabetic patients in a tertiary care hospital in Bangladesh. BMC ophthalmology. 2017;17:1-6.
4. Sen A, Pathak P, Shenoy P, Kohli GM, Bhatia P, Shetty S. Knowledge, attitude, and practice patterns and the purported reasons for delayed presentation of patients with sight-threatening diabetic retinopathy at a tertiary eye-care facility in Central India: A questionnaire-based study. Indian Journal of Ophthalmology. 2021;69(11):3118-22.
5. Sahiledengle B, Assefa T, Negash W, Tahir A, Regasa T, Tekalegn Y, et al. Prevalence and factors associated with diabetic retinopathy among adult diabetes patients in Southeast Ethiopia: A hospital-based cross-sectional study. Clinical Ophthalmology (Auckland, NZ). 2022;16:3527.
6. Paudyal G, Shrestha MK, Poudel M, Tabin GC, Ruit S, Thomas BJ. Prevalence and severity of diabetic retinopathy among diabetic patients presenting to a tertiary eye hospital in Nepal. Middle East African Journal of Ophthalmology. 2019;26(4):210-5.
7. Lipa M, Banu TJ. A cross-sectional study to assess the morbidity pattern of ocular diseases in out-patient department of ophthalmology at a tertiary care hospital. International Journal of Research in Medical Sciences. 2016;4(9):3797-800.
8. Dharmadhikari S, Lohiya K, Chelkar V, Kalyani V, Dole K, Deshpande M, et al. Magnitude and determinants of glaucoma in type II diabetics: A hospital based cross-sectional study in Maharashtra, India. Oman journal of ophthalmology. 2015;8(1):19-23.
9. Ahmed TM, Demilew KZ, Tegegn MT, Hussen MS. Use of eye care service and associated factors among adult diabetic patients attending at diabetic clinics in two referral hospitals, Northeast Ethiopia. Diabetes, Metabolic Syndrome and Obesity. 2021:2325-33.
10. Alemu Mersha G, Alimaw YA, Woredekal AT. Prevalence of diabetic retinopathy among diabetic patients in Northwest Ethiopia—A cross sectional hospital based study. Plos one. 2022;17(1):e0262664.
11. Pushpa Latha M, Radhika R. Prevalence of dry eye syndrome in type-2 diabetic patients in ter-tiary care hospital kurnool. Int J Intg Med Sci. 2021;8(1):955-58.
12. Thakker K, Hussain F, Biradar A. Prevalence of Dry Eyes in Type 2 Diabetics attending Ophthalmology Out patient department at a tertiary eye care hospital, Maharashtra. International Journal. 2022;5(2):493.
13. Fazili AB, Shah RJ, Mir MD, Jasmine A, Wani FA, Mushtaq B, et al. Ocular morbidity among diabetics attending the preventive ophthalmic clinic of a tertiary care institute with special reference to diabetic retinopathy. International Journal of Research in Medical Sciences. 2019;7(10):3722.
14. Akhter MT, Chowdhury MFK, Saha T, Miah MSA, Mahmudunnaby M, Newaz AAS, et al. Evaluation of Ophthalmoscopic Findings in Type 2 Diabetic Patients at a Tertiary Level Hospital. Bangladesh Medical Journal. 2022;51(1):33-40.
15. Latif ZA, Ashrafuzzaman S, Amin MF, Gadekar AV, Sobhan MJ, Haider T. A cross-sectional Study to evaluate diabetes management, control and complications in patients with type 2 diabetes in Bangladesh. BIRDEM Medical Journal. 2017;7(1):17-27.
16. Sheleme T, Mamo G, Melaku T, Sahilu T. Prevalence, patterns and predictors of chronic complications of diabetes mellitus at a large referral hospital in Ethiopia: a prospective observational study. Diabetes, Metabolic Syndrome and Obesity. 2020:4909-18.
17. Kayode OO, Odukoya OO, Odeniyi IA, Olopade OB, Fasanmade OA. Pattern of complications and comorbidities among diabetic patients in a tertiary healthcare center in Nigeria. Journal of Clinical Sciences. 2015;12(1):29-35.
18. Sreenivas K, Kamath YS, Mathew NR, Pattanshetty S. A study of eye care service utilization among diabetic patients visiting a tertiary care hospital in Coastal Karnataka, southern India. International Journal of Diabetes in Developing Countries. 2019;39:24-8.
19. Khan MIH, Waqar A, Riaz A, Azhar U, Tariq A, Ismail I, et al. Gender specific distribution of different patterns of diabetic retinopathy in patients with type 2 diabetes mellitus. A cross-sectional study from a tertiary care specialized center in lahore, Pakistan. Pakistan Postgraduate Medical Journal. 2019;30(01):32-5.
20. Venugopal D, Lal B, Fernandes S, Gavde D. Awareness and knowledge of diabetic retinopathy and associated factors in Goa: A hospital-based cross-sectional study. Indian journal of ophthalmology. 2020;68(2):383-90.
21. Jokhio AH, Talpur KI, Shujaat S, Talpur BR, Memon S. Prevalence of diabetic retinopathy in rural Pakistan: A population based cross-sectional study. Indian Journal of Ophthalmology. 2022;70(12):4364-9.
22. GArG A, BhArGAv S, ArOrA T, GArG A. Prevalence and risk factors of dry eye disease at a tertiary care centre in Haryana, India: a cross-sectional study. Journal of Clinical & Diagnostic Research. 2022;16(8).

23. Mohanty S, Mohanty S, Mohanty M, Behera TR. Ocular morbidities among the geriatric persons, attending the ophthalmology outpatient department of a tertiary care hospital in eastern Odisha: A cross-sectional study. Journal of the Indian Academy of Geriatrics. 2022;18(4):181-5.
24. Li J, Chattopadhyay K, Xu M, Chen Y, Hu F, Chu J, et al. Prevalence and associated factors of vascular complications among inpatients with type 2 diabetes: a retrospective database study at a tertiary care department, Ningbo, China. PloS one. 2020;15(6):e0235161.
25. Pati S, Schellevis F. Prevalence and pattern of co morbidity among type2 diabetics attending urban primary healthcare centers at Bhubaneswar (India). PloS one. 2017;12(8):e0181661.
26. Thammisetty A, Badam L, Mortha K, Pothu UK, Nelakudithi LK. A crosssectional survey to assess the awareness among patients with type 2 diabetes mellitus attending tertiary care hospital in East Godavari region, India. International Journal of Medical Science and Public Health. 2020;9(0):1.

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