

Ocular Manifestations in Patients with Diabetes Mellitus Undergoing Elective General Surgical Procedures: A Hospital-Based Observational Study

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Abstract

Background: Diabetes mellitus is associated with various ocular complications, including diabetic retinopathy, cataract, refractive abnormalities, and ocular surface disorders. Early identification of these manifestations is important to prevent avoidable visual morbidity. The present study assessed the frequency and pattern of ocular manifestations among patients with diabetes mellitus undergoing elective general surgical procedures.

Materials and Methods: A hospital-based observational study was conducted at the Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, from May 2025 to May 2026. A total of 80 patients with diabetes mellitus undergoing elective general surgical procedures were included. Relevant demographic and clinical information was recorded, and participants underwent ocular assessment for identification of diabetes-associated ocular manifestations. The findings were documented and analyzed using appropriate descriptive statistical methods.

Results: Among the 80 participants, 37 (46.25%) had at least one ocular manifestation. Diabetic retinopathy was the most common finding, observed in 24 (30.00%) patients, followed by cataract in 18 (22.50%), refractive error in 12 (15.00%), dry eye in 9 (11.25%), and glaucomatous changes in 5 (6.25%). Among patients with diabetic retinopathy, mild non-proliferative diabetic retinopathy was the predominant grade. Ocular manifestations were more frequent among patients with increasing age and longer duration of diabetes.

Conclusion: Ocular manifestations were common among diabetic patients undergoing elective general surgical procedures, with diabetic retinopathy being the predominant finding. Early ocular assessment and appropriate ophthalmic follow-up should be considered as an important component of comprehensive care in patients with diabetes.

Keywords: Diabetes Mellitus; Diabetic Retinopathy; Ocular Manifestations; Cataract; Elective Surgery; Ophthalmic Assessment.

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Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. It is a major global health problem and is associated with progressive complications affecting multiple organ systems, particularly through chronic microvascular and macrovascular injury [1,2].

The eye is an important target organ in diabetes mellitus. Chronic hyperglycaemia can produce structural and functional abnormalities involving the retina, lens, cornea, and ocular surface [6]. Among

these complications, diabetic retinopathy (DR) is one of the most important microvascular complications of diabetes and remains a major cause of visual impairment worldwide [3-5].

Diabetic retinopathy results from progressive retinal microvascular damage associated with prolonged hyperglycaemia. Several mechanisms, including oxidative stress, advanced glycation end-product formation, inflammation, endothelial dysfunction, capillary occlusion, and increased vascular permeability, contribute to retinal injury [4,5]. Clinically, diabetic retinopathy is broadly classified

into non-proliferative and proliferative stages, with progressive disease potentially resulting in significant visual impairment [3-5].

Diabetes-related ocular morbidity is not limited to retinal disease. Patients with diabetes may also develop cataract, refractive abnormalities, dry eye disease, glaucoma, and other corneal or ocular surface abnormalities [6]. Cataract has been associated with diabetes and may occur at a younger age in diabetic individuals. Chronic hyperglycaemia can contribute to lens damage through sorbitol accumulation, osmotic stress, oxidative injury, and alterations in lens proteins [7].

The duration of diabetes is an important determinant of diabetic ocular complications. Longer duration of diabetes is associated with an increased risk of development and progression of diabetic retinopathy [8,9]. Large epidemiological studies have also demonstrated that duration of diabetes is among the major risk factors associated with diabetic retinopathy [9,10].

Diabetes may also be associated with ocular surface abnormalities. Alterations in corneal sensitivity, tear-film stability, and ocular surface function have been described in diabetic patients, and dry eye disease may occur more frequently in individuals with diabetes [6,11].

Patients with diabetes frequently undergo elective surgical procedures for various general surgical conditions. Such hospital admissions provide an opportunity to identify chronic diabetes-related complications that may otherwise remain undetected. Recognition of ocular abnormalities can facilitate appropriate ophthalmic referral and follow-up, particularly in patients without recent ocular evaluation.

Although the ocular complications of diabetes are well established, limited information is available regarding the spectrum of ocular manifestations specifically among diabetic patients undergoing elective general surgical procedures. Therefore, the present study was undertaken to assess the frequency and pattern of ocular manifestations in patients with diabetes mellitus undergoing elective general surgical procedures at Subbaiah Institute of Medical Sciences, Shivamogga.

Materials and Methods

Study Design and Setting: A hospital-based observational study was conducted among patients with diabetes mellitus undergoing elective general surgical procedures at the Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India, during the study period from May 2025 to May 2026. The study was designed to assess the spectrum of ocular manifestations among patients with diabetes mellitus presenting for elective general surgical procedures.

Study Population: The study included adult patients with a documented history of diabetes mellitus who were admitted for elective general surgical procedures during the study period. A total of 80 patients fulfilling the eligibility criteria were included in the study.

Sample Size: The study comprised a total sample of 80 patients with diabetes mellitus undergoing elective general surgical procedures.

Inclusion Criteria

Patients were included if they:

1. Had a documented diagnosis of diabetes mellitus.
2. Were undergoing an elective general surgical procedure.
3. Were willing to participate in the study.
4. Were able to undergo ocular assessment as part of the study evaluation.

Exclusion Criteria

Patients were excluded if they:

1. Had a history of ocular trauma or major ocular surgery that could independently affect ocular findings.
2. Had previously diagnosed ocular conditions unrelated to diabetes that could interfere with assessment.
3. Were undergoing emergency surgical procedures.
4. Were unwilling to participate in the study.

Data Collection: Relevant demographic and clinical information was collected using a structured study proforma. Details regarding age, sex, history of diabetes mellitus, and relevant clinical characteristics were recorded. Information related to the planned elective surgical procedure was also documented.

Ocular Assessment: All eligible participants underwent ocular evaluation for identification of ocular manifestations associated with diabetes mellitus. The ocular examination was performed using standard clinical ophthalmic assessment methods. The examination included assessment of visual status and evaluation for clinically detectable diabetic and other relevant ocular abnormalities.

Particular attention was given to the detection of manifestations suggestive of diabetic retinopathy and other diabetes-associated ocular changes. The findings obtained during the ocular examination were documented systematically in the study proforma.

Preoperative Evaluation: All participants underwent routine preoperative assessment as per institutional protocol before the planned elective surgical procedure. Relevant clinical and laboratory

information available as part of routine preoperative evaluation was recorded for study purposes where applicable.

Outcome Measures: The primary outcome of the study was the frequency and pattern of ocular manifestations among patients with diabetes mellitus undergoing elective general surgical procedures. The ocular findings were categorized according to the clinical diagnosis established during evaluation.

Statistical Analysis: The collected data were entered into a suitable database and analyzed using appropriate statistical methods. Continuous variables were expressed as mean $\pm$ standard deviation or median with appropriate measures of dispersion, while categorical variables were expressed as frequencies and percentages. Associations between relevant clinical variables and ocular manifestations were assessed using appropriate statistical tests. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee of Subbaiah Institute of Medical Sciences, Shivamogga. Written informed consent was obtained from the participants before inclusion in the study. The confidentiality of participant information was maintained throughout the study, and the collected data were used solely for research purposes.

Results and Observations

A total of 80 patients with diabetes mellitus undergoing elective general surgical procedures were included in the present hospital-based observational study conducted at Subbaiah Institute of Medical Sciences, Shivamogga, from May 2025 to May 2026. The study population was evaluated for demographic characteristics, diabetes-related clinical profile, and ocular manifestations.

Table 1: Age-wise distribution of study participants (n=80)

Age group (years)	Number of patients	Percentage (%)
18–30	3	3.75
31–40	8	10.00
41–50	19	23.75
51–60	27	33.75
61–70	18	22.50
>70	5	6.25
Total	80	100.00

The majority of patients belonged to the 51–60 years age group (33.75%), followed by those aged 41–50 years (23.75%).

Table 2: Sex-wise distribution of study participants (n=80)

Sex	Number of patients	Percentage (%)
Male	47	58.75
Female	33	41.25
Total	80	100.00

Males constituted the majority of the study population, accounting for 58.75%, while females constituted 41.25%.

Table 3: Duration of diabetes mellitus among study participants (n=80)

Duration of diabetes	Number of patients	Percentage (%)
<5 years	29	36.25
5–10 years	31	38.75
>10 years	20	25.00
Total	80	100.00

Most participants had diabetes mellitus for 5–10 years (38.75%), followed by those with a duration of less than 5 years (36.25%).

Table 4: Distribution according to type of diabetes mellitus (n=80)

Type of diabetes	Number of patients	Percentage (%)
Type 2 diabetes mellitus	77	96.25
Type 1 diabetes mellitus	3	3.75
Total	80	100.00

Type 2 diabetes mellitus was predominant, accounting for 96.25% of the study participants.

Table 5: Distribution according to ocular status (n=80)

Ocular status	Number of patients	Percentage (%)
No detectable ocular manifestation	43	53.75
Any ocular manifestation	37	46.25
Total	80	100.00

Ocular manifestations were identified in 37 (46.25%) patients, whereas 43 (53.75%) patients had no detectable ocular manifestation on examination.

Table 6: Spectrum of ocular manifestations among study participants (n=80)

Ocular manifestation	Number of patients	Percentage (%)
Diabetic retinopathy	24	30.00
Cataract	18	22.50
Refractive error	12	15.00
Dry eye	9	11.25
Glaucomatous changes	5	6.25
Other ocular findings	4	5.00
No ocular manifestation	43	53.75

Table 7: Distribution of diabetic retinopathy according to severity (n=24)

Grade of diabetic retinopathy	Number of patients	Percentage (%)
Mild non-proliferative diabetic retinopathy	13	54.17
Moderate non-proliferative diabetic retinopathy	7	29.17
Severe non-proliferative diabetic retinopathy	2	8.33
Proliferative diabetic retinopathy	2	8.33
Total	24	100.00

Among the 24 patients with diabetic retinopathy, mild non-proliferative diabetic retinopathy was the most common finding (54.17%).

Table 8: Association between duration of diabetes and ocular manifestations (n=80)

Duration of diabetes	Ocular manifestation present n (%)	Ocular manifestation absent n (%)	Total
<5 years	8 (27.59)	21 (72.41)	29
5–10 years	15 (48.39)	16 (51.61)	31
>10 years	14 (70.00)	6 (30.00)	20
Total	37 (46.25)	43 (53.75)	80

The proportion of patients with ocular manifestations increased with increasing duration of diabetes, being highest among patients with diabetes for more than 10 years (70.00%).

Table 9: Distribution of ocular manifestations according to age group (n=80)

Age group	Ocular manifestation present n (%)	Ocular manifestation absent n (%)	Total
18–30	0 (0.00)	3 (100.00)	3
31–40	2 (25.00)	6 (75.00)	8
41–50	6 (31.58)	13 (68.42)	19
51–60	14 (51.85)	13 (48.15)	27
61–70	11 (61.11)	7 (38.89)	18
>70	4 (80.00)	1 (20.00)	5
Total	37 (46.25)	43 (53.75)	80

Ocular manifestations showed an increasing trend with advancing age, with the highest proportion observed among patients aged >70 years (80.00%).

Table 10: Distribution of ocular manifestations according to sex (n=80)

Sex	Ocular manifestation present n (%)	Ocular manifestation absent n (%)	Total
Male	23 (48.94)	24 (51.06)	47
Female	14 (42.42)	19 (57.58)	33
Total	37 (46.25)	43 (53.75)	80

Ocular manifestations were observed in 48.94% of males and 42.42% of females.

Discussion

The present hospital-based observational study included 80 patients with diabetes mellitus undergoing elective general surgical procedures at

Subbaiah Institute of Medical Sciences, Shivamogga, during May 2025 to May 2026. The study evaluated the demographic characteristics and

spectrum of ocular manifestations among the study participants.

In the present study, 46.25% of participants had at least one detectable ocular manifestation. This finding demonstrates that ocular abnormalities represent an important component of morbidity among patients with diabetes. Diabetes can affect several ocular structures through chronic hyperglycaemia, microvascular injury, oxidative stress, inflammation, and metabolic disturbances [4,6].

Diabetic retinopathy was the most frequently observed ocular manifestation in the present study. Diabetic retinopathy is a major microvascular complication of diabetes and results from progressive retinal vascular dysfunction. Chronic hyperglycaemia contributes to endothelial dysfunction, capillary loss, vascular leakage, and retinal ischemia, which may eventually result in sight-threatening disease [3-5].

The predominance of diabetic retinopathy in the present study is consistent with previous epidemiological evidence. Yau et al. reported a substantial global burden of diabetic retinopathy among adults with diabetes and identified longer duration of diabetes as one of the major associated risk factors [9]. Ting et al. similarly highlighted the global burden of diabetic retinopathy and the importance of screening and appropriate management [10].

In the present study, mild non-proliferative diabetic retinopathy was the most common grade among patients with diabetic retinopathy. Non-proliferative diabetic retinopathy represents an earlier stage of retinal microvascular damage and may remain clinically asymptomatic. Recognition at this stage is important because diabetic retinopathy can progress to more advanced disease and visual impairment [4,5].

A notable finding in the present study was the higher frequency of ocular manifestations among patients with longer duration of diabetes. Participants with diabetes for more than 10 years showed a greater proportion of ocular abnormalities than those with a shorter duration of disease. This finding is consistent with previous studies demonstrating a strong relationship between duration of diabetes and the development or progression of diabetic retinopathy [8,9].

The Wisconsin Epidemiologic Study of Diabetic Retinopathy demonstrated that increasing duration of diabetes was associated with the incidence and progression of diabetic retinopathy [8]. Similarly, the meta-analysis by Yau et al. identified duration of diabetes as one of the major risk factors for diabetic retinopathy [9]. The increased frequency of ocular manifestations with longer disease duration in the

present study therefore supports the importance of regular ocular surveillance in patients with long-standing diabetes.

Cataract was another important ocular abnormality identified in the present study. Diabetes is an established risk factor for cataract, and diabetic individuals may develop cataract at an earlier age than non-diabetic individuals [7,12]. Chronic hyperglycaemia can promote sorbitol accumulation, osmotic stress, oxidative damage, and changes in lens proteins, thereby contributing to lens opacification [7].

The present study also identified refractive errors and dry eye manifestations among diabetic participants. Diabetes can affect corneal structure and function, tear-film stability, and lens hydration, potentially contributing to visual fluctuations and ocular discomfort [6]. Manaviat et al. reported an association between diabetes and dry eye syndrome, supporting the presence of ocular surface abnormalities among diabetic individuals [11].

The frequency of ocular manifestations showed an increasing pattern with advancing age in the present study. Older participants demonstrated a higher proportion of ocular abnormalities compared with younger participants. This observation may reflect the combined effects of increasing age and longer duration of diabetes. Age-related ocular conditions such as cataract may coexist with diabetes-associated retinal and ocular surface abnormalities [7,12].

In the present study, ocular manifestations were observed in both male and female participants, with a slightly higher proportion among males. However, this difference should be interpreted cautiously because of the relatively small sample size. The present study was primarily designed to describe the frequency and pattern of ocular manifestations rather than establish sex as an independent risk factor.

The findings have potential clinical relevance for the preoperative assessment of patients with diabetes. Although preoperative evaluation primarily focuses on factors directly affecting surgical risk, identification of chronic diabetes-related complications can provide a more comprehensive assessment of the patient's health status. Early recognition of ocular abnormalities may facilitate ophthalmic referral and appropriate follow-up.

The importance of ocular screening is particularly relevant because diabetic retinopathy may remain asymptomatic during its early stages [4,5]. Appropriate screening and timely management can therefore help identify retinal disease before substantial visual impairment develops [10].

The present study has several limitations. It was a single-centre observational study involving 80

participants, which may limit the generalizability of the findings. The study population consisted specifically of diabetic patients undergoing elective general surgical procedures and may therefore differ from the general diabetic population. In addition, the observational design does not permit causal relationships to be established. Larger multicentric studies with greater sample sizes and longitudinal ophthalmic follow-up are required to validate the present observations.

Overall, the present study demonstrates that ocular manifestations are common among patients with diabetes undergoing elective general surgical procedures. Diabetic retinopathy was the predominant ocular finding, followed by cataract, refractive abnormalities, and dry eye manifestations. The increasing occurrence of ocular abnormalities with advancing age and longer duration of diabetes emphasizes the importance of early ocular assessment and appropriate ophthalmic follow-up in patients with diabetes.

Conclusion

Ocular manifestations were common among patients with diabetes mellitus undergoing elective general surgical procedures, with diabetic retinopathy being the predominant finding. The increasing frequency of ocular abnormalities with advancing age and longer duration of diabetes highlights the importance of early ocular assessment, timely ophthalmic referral, and regular follow-up in diabetic patients.

References

1. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels: International Diabetes Federation; 2021.
2. American Diabetes Association Professional Practice Committee. 11. Microvascular complications and foot care: Standards of Care in Diabetes—2024. *Diabetes Care*. 2024; 47(Suppl 1): S231-S243.
3. Cheung N, Mitchell P, Wong TY. Diabetic retinopathy. *Lancet*. 2010;376(9735):124-136.
4. Wong TY, Cheung CMG, Larsen M, Sharma S, Simó R. Diabetic retinopathy. *Nat Rev Dis Primers*. 2016;2:16012.
5. Antonetti DA, Klein R, Gardner TW. Diabetic retinopathy. *N Engl J Med*. 2012;366(13):1227-1239.
6. Kiziltoprak H, Tekin K, Inanc M, Goker YS. Ocular manifestations of diabetes mellitus. *World J Diabetes*. 2019;10(4):293-302.
7. Pollreis A, Schmidt-Erfurth U. Diabetic cataract—pathogenesis, epidemiology and treatment. *J Ophthalmol*. 2010;2010:608751.
8. Klein R, Klein BEK, Moss SE, Cruickshanks KJ. The Wisconsin Epidemiologic Study of Diabetic Retinopathy: XVII. The 14-year incidence and progression of diabetic retinopathy and associated risk factors in type 1 diabetes. *Ophthalmology*. 1998;105(10):1801-1815.
9. Yau JWY, Rogers SL, Kawasaki R, Lamoureux EL, Kowalski JW, Bek T, et al. Global prevalence and major risk factors of diabetic retinopathy. *Diabetes Care*. 2012;35(3):556-564.
10. Ting DSW, Cheung GCM, Wong TY. Diabetic retinopathy: global prevalence, major risk factors, screening practices and public health challenges: a review. *Clin Exp Ophthalmol*. 2016;44(4):260-277.
11. Manaviat MR, Rashidi M, Afkhami-Ardekani M, Shoja MR. Prevalence of dry eye syndrome and diabetic retinopathy in type 2 diabetic patients. *BMC Ophthalmol*. 2008;8:10.
12. Becker C, Schneider C, Aballéa S, Bailey C, Bourne R, Jick SS, et al. Cataract incidence and associated risk factors among patients with diabetes mellitus. *Eye (Lond)*. 2018; 32(6): 1028-1035.