

Study of Ocular Manifestations of Diabetes Mellitus in Patients Attending a Medical College in a Rural Area

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Abstract

Background: Diabetes mellitus is associated with several ocular complications, including diabetic retinopathy, cataract, and glaucoma, which may contribute to preventable visual impairment. Early identification of these manifestations is essential for appropriate management and preservation of vision. The aim is to describe the spectrum of ocular manifestations among patients with diabetes mellitus attending a medical college in a rural area of Telangana. **Material and Methods:** A hospital-based observational study was conducted in the Department of Ophthalmology, Medciti Institute of Medical Sciences, Ghanpur, Telangana, from March 2024 to September 2025. Fifty patients with known or newly detected diabetes mellitus were included. Both eyes were examined, yielding 100 eye-level observations. Evaluation included uncorrected and best-corrected visual acuity, slit-lamp examination, intraocular pressure measurement, and dilated fundus examination. Relevant biochemical parameters, including fasting blood glucose, postprandial blood glucose, and HbA1c, were recorded. Data were summarized using descriptive statistics. **Results:** Of the 50 participants, 40% belonged to the 51–59-year age group and 54% were male. Blurring of vision was the most common presenting complaint (46%), followed by diminution of vision (30%); 16% reported no ocular complaints. The mean duration of diabetes was 5.59 ± 5.35 years, mean fasting blood glucose was 148.62 ± 20.55 mg/dL, mean postprandial blood glucose was 219.26 ± 42.58 mg/dL, and mean HbA1c was $7.78 \pm 0.97\%$. Among the 100 examined eyes, cataract was present in 33 (33%) and diabetic retinopathy in 23 (23%). Cortical cataract was the most frequent cataract type (42.42%), followed by posterior subcapsular cataract (27.27%). Mild non-proliferative diabetic retinopathy was observed in 10% of eyes, moderate non-proliferative diabetic retinopathy in 9%, severe non-proliferative diabetic retinopathy in 2%, and proliferative diabetic retinopathy in 2%. Glaucoma was documented in 2% of eyes. Following best correction, 43% of eyes achieved a visual acuity of 6/6. **Conclusion:** Cataract and diabetic retinopathy constituted important ocular findings among patients with diabetes mellitus attending this rural medical college. The identification of ocular abnormalities, including among patients without presenting ocular complaints, highlights the importance of comprehensive ophthalmic examination and timely referral as integral components of diabetes care.

Keywords: Diabetes mellitus, ocular manifestations, diabetic retinopathy, cataract, glaucoma, visual acuity, rural India.

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INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycaemia resulting from impaired insulin secretion, insulin action, or both. Its increasing global prevalence and associated microvascular and macrovascular complications have made it a major public health concern. In India, the growing burden of diabetes, driven by demographic transitions, urbanisation, and lifestyle changes, has significant implications for long-term morbidity and quality of life. Among its various complications, ocular involvement is particularly important because timely detection and appropriate management can prevent or minimise diabetes-related visual impairment. Diabetes can affect multiple ocular structures, including the retina, crystalline lens, cornea, optic nerve, and extraocular muscles. Diabetic retinopathy (DR) is one of the most clinically significant microvascular complications and may progress silently before producing noticeable visual symptoms. Advanced disease can lead to diabetic macular oedema, vitreous haemorrhage, tractional retinal

detachment, and irreversible visual loss. In addition to retinal disease, individuals with diabetes are susceptible to cataract, glaucoma, ocular surface disorders, corneal neuropathy, and ocular motility abnormalities. These manifestations may independently impair visual function and contribute to the overall burden of ocular morbidity. Consequently, limiting ophthalmic assessment to diabetic retinopathy alone may result in the underrecognition of other clinically important abnormalities.^[1,2]

The risk and progression of diabetes-related ocular

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complications are influenced by several factors, including the duration of diabetes, glycaemic control, and associated systemic risk factors. Chronic hyperglycaemia contributes to microvascular damage, oxidative stress, and structural changes in ocular tissues. Importantly, some ocular complications remain asymptomatic during their early stages, making symptom-based assessment inadequate for identifying all affected individuals. A comprehensive ophthalmic examination incorporating visual acuity assessment, anterior segment evaluation, intraocular pressure measurement, and dilated fundus examination is therefore essential for identifying ocular abnormalities at an early stage and facilitating appropriate intervention.^[3,4]

In resource-constrained and rural healthcare settings, systematic assessment of the spectrum of diabetic eye disease is particularly relevant. Differences in healthcare access, awareness, and continuity of follow-up may influence the timely detection and management of ocular complications. Hospital-based studies provide useful clinical information on the ocular conditions encountered among patients attending routine ophthalmic services and can help identify priorities for screening and referral. However, the clinical burden of diabetic retinopathy and non-retinopathic ocular manifestations may vary across populations and healthcare settings, underscoring the importance of documenting local patterns of disease.^[5-7]

Against this background, the present study was undertaken to evaluate the spectrum of ocular manifestations among patients with diabetes mellitus attending the ophthalmology outpatient department of a medical college in a rural setting in Telangana, India. The study assessed visual acuity, anterior and posterior segment findings, intraocular pressure, cataract, diabetic retinopathy, and glaucoma, alongside relevant clinical and biochemical parameters. By examining both eyes of each participant and documenting ocular findings beyond diabetic retinopathy, the study aimed to provide a comprehensive description of diabetes-associated ocular morbidity and emphasise the importance of routine ophthalmic evaluation as an integral component of diabetes care.

MATERIALS AND METHODS

Study Design and Setting: A prospective observational study was conducted in the Department of Ophthalmology at Mediciti Institute of Medical Sciences, Ghanpur, Telangana, India, from March 2024 to September 2025.

Study Population and Sample Size: The study included patients with previously diagnosed diabetes mellitus and those with newly detected diabetes who attended the ophthalmology outpatient department during the study period. A total of 50 patients were enrolled, and both eyes of each participant were examined, yielding 100 eye-level observations.

Sampling Technique: Consecutive sampling was employed. Eligible patients attending the ophthalmology outpatient department during the study period were enrolled until the required sample size of 50 participants was achieved.

Eligibility Criteria: Patients with known or newly detected diabetes mellitus attending the ophthalmology outpatient department were eligible for inclusion. Patients with other systemic diseases were excluded, as specified in the study protocol.

Data Collection and Ophthalmic Evaluation: A structured proforma was used to record demographic characteristics, presenting complaints, relevant medical history, duration of diabetes, clinical examination findings, laboratory parameters, and the management advised.

Biochemical parameters included fasting blood glucose, postprandial blood glucose, glycated haemoglobin (HbA1c), and urine sugar. These parameters were recorded where available to document the participants' glycaemic status.

A comprehensive ophthalmic examination was performed on both eyes. Uncorrected and best-corrected visual acuity were assessed using a Snellen chart. The anterior segment was examined using slit-lamp biomicroscopy. Pupil size was documented before and after pharmacological dilatation. Intraocular pressure was measured using a non-contact tonometer before pupillary dilatation.

Following pharmacological dilatation, the posterior segment was examined using slit-lamp biomicroscopy with a 90-dioptre lens and indirect ophthalmoscopy. Fundus findings were documented, with particular attention to the presence and severity of diabetic retinopathy and other posterior segment abnormalities. Cataract status and type, as well as glaucoma status, were also recorded.

Study Variables and Outcomes: The variables assessed included age, sex, diabetes status, duration of diabetes, fasting and postprandial blood glucose levels, HbA1c, and urine sugar findings. The ophthalmic outcome variables included uncorrected and best-corrected visual acuity, anterior segment findings, pupil size, intraocular pressure, fundus findings, cataract status and type, diabetic retinopathy, and glaucoma.

Statistical Analysis: Data were entered into a database and checked for completeness and consistency before analysis. Categorical variables were summarised as frequencies and percentages. Continuous variables were expressed as mean and standard deviation or median and interquartile range, as appropriate. Statistical analyses were performed using STATA version 14. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The study was conducted after obtaining approval from the institutional ethics committee. The study purpose and procedures were explained to participants, and informed consent was obtained before enrolment. Confidentiality was maintained, and participant information was used for research purposes without disclosure of personal identifiers.

RESULTS

The largest proportion of participants belonged to the 51–59-year age group (40%), followed by the 60–69-year group (28%). Participants aged 41–49 years constituted 22% of the study population. Males constituted 54% of the study population, while females accounted for 46%, indicating a

slight male predominance. Urine sugar was negative in 52% of participants, while 24% had +1 glycosuria and 10% had trace glycosuria. The remaining category frequencies

should be checked against the original results table before submission.

Table 1: Age and Gender distribution of study participants

Age group (years)	n	%
30–39	1	2.00
41–49	11	22.00
51–59	20	40.00
60–69	14	28.00
≥70	4	8.00
Sex		
Male	27	54.00
Female	23	46.00
Urine sugar		
+1	12	24
+2	2	4
+3	4	8
+4	1	2
Negative	26	52
Trace	5	10

Table 2: Distribution of presenting complaints and general examination

Chief complaint	n	%
Blurring of vision	23	46.00
Diminution of vision	15	30.00
No ocular complaints	8	16.00
Redness	2	4.00
Eye pain	1	2.00
Watering	1	2.00
Total	50	100.00
General examination		
Stable vitals; BMI elevated	20	40
Stable vitals; no acute distress	21	42
Stable vitals; overweight	9	18

Blurring of vision was the most common presenting complaint (46%), followed by diminution of vision (30%). Eight participants (16%) reported no ocular complaints,

highlighting the importance of ophthalmic evaluation even in the absence of symptoms. General examination findings were documented as part of the clinical assessment.

Table 3: Distribution of management plans

Management plan	n	%
Routine follow-up and glycaemic control counselling	17	34.00
Cataract work-up and glycaemic control counselling	13	26.00
Retina evaluation, follow-up and glycaemic control counselling	11	22.00
Retina evaluation, cataract work-up and glycaemic control counselling	7	14.00
Glaucoma evaluation and glycaemic control counselling	2	4.00
Total	50	100.00

Routine follow-up with glycaemic control counselling was the most frequently documented management plan (34%), followed by cataract evaluation (26%). Retina evaluation

was advised either alone or alongside cataract work-up in 36% of participants. Glaucoma evaluation was advised in 4%.

Table 4: Summary of continuous variables

Variable	Mean	Standard deviation
Duration of diabetes (years)	5.59	5.35
Fasting blood sugar (mg/dL)	148.62	20.55
Postprandial blood sugar (mg/dL)	219.26	42.58
HbA1c (%)	7.78	0.97

The mean duration of diabetes was 5.59 ± 5.35 years. Mean fasting and postprandial blood glucose levels were 148.62 ± 20.55 mg/dL and 219.26 ± 42.58 mg/dL, respectively. The

mean HbA1c was $7.78 \pm 0.97\%$, describing the glycaemic profile of the study population.

Table 5: Distribution of uncorrected and corrected visual acuity

Visual acuity (Snellen)	Left eye, n (%)	Right eye, n (%)	Total eyes, n (%)
6/6	6 (12.00)	4 (8.00)	10 (10.00)
6/9	16 (32.00)	14 (28.00)	30 (30.00)
6/12	15 (30.00)	11 (22.00)	26 (26.00)
6/18	7 (14.00)	10 (20.00)	17 (17.00)
6/24	4 (8.00)	8 (16.00)	12 (12.00)
6/60	2 (4.00)	3 (6.00)	5 (5.00)
Total	50 (100.00)	50 (100.00)	100 (100.00)
Visual acuity (Snellen)	Left eye, n (%)	Right eye, n (%)	Total eyes, n (%)
6/6	25 (50.00)	18 (36.00)	43 (43.00)
6/9	16 (32.00)	15 (30.00)	31 (31.00)
6/12	2 (4.00)	4 (8.00)	6 (6.00)
6/18	4 (8.00)	7 (14.00)	11 (11.00)
6/24	3 (6.00)	6 (12.00)	9 (9.00)
Total	50 (100.00)	50 (100.00)	100 (100.00)

Uncorrected visual acuity of 6/9 was the most common finding, observed in 30% of eyes, followed by 6/12 in 26%. Visual acuity varied between the two eyes, with 6/9 being more frequent in the left eye than in the right eye. Best-

corrected visual acuity improved to 6/6 in 43% of eyes and 6/9 in 31%. The proportion achieving 6/6 was higher in the left eye (50%) than in the right eye (36%).

Table 6: Pupil size and intraocular pressure

Parameter	Left eye	Right eye	Overall
Pupil size before dilatation (mm)	3.09 ± 0.52	3.39 ± 0.55	3.24 ± 0.55
Pupil size after dilatation (mm)	7.00 ± 0.68	7.36 ± 0.85	7.18 ± 0.79
Intraocular pressure (mmHg)	15.36 ± 2.08	15.78 ± 2.18	15.57 ± 2.13

Mean pupil size increased following pharmacological dilatation in both eyes. The overall mean intraocular pressure measured by non contact tonometry was 15.57 ±

2.13 mmHg, with similar mean values in the left and right eyes.

Table 7: Distribution of anterior segment findings

Finding	Left eye, n (%)	Right eye, n (%)	Total eyes, n (%)
Blepharitis	1 (2.00)	4 (8.00)	5 (5.00)
Chalazion	1 (2.00)	0 (0.00)	1 (1.00)
Conjunctivitis	1 (2.00)	1 (2.00)	2 (2.00)
Dacryocystitis	0 (0.00)	1 (2.00)	1 (1.00)
Dry eye features	1 (2.00)	0 (0.00)	1 (1.00)
Lens opacity category 1*	10 (20.00)	16 (32.00)	26 (26.00)
Lens opacity category 2*	1 (2.00)	1 (2.00)	2 (2.00)
Lens opacity category 3*	2 (4.00)	1 (2.00)	3 (3.00)
Lens opacity category 4*	1 (2.00)	1 (2.00)	2 (2.00)
Recurrent hordeolum	1 (2.00)	0 (0.00)	1 (1.00)
Within normal limits	31 (62.00)	25 (50.00)	56 (56.00)
Total	50 (100.00)	50 (100.00)	100 (100.00)

Anterior segment findings were within normal limits in 56% of eyes. Lens opacity was frequently documented,

while blepharitis, conjunctivitis, and other external ocular conditions were reported less frequently.

Table 8: Distribution of fundus findings

Fundus finding	Left eye, n (%)	Right eye, n (%)	Total eyes, n (%)
No diabetic retinopathy	41 (82.00)	36 (72.00)	77 (77.00)
Mild NPDR	4 (8.00)	6 (12.00)	10 (10.00)
Moderate NPDR	3 (6.00)	6 (12.00)	9 (9.00)
Severe NPDR	1 (2.00)	1 (2.00)	2 (2.00)
Proliferative diabetic retinopathy	1 (2.00)	1 (2.00)	2 (2.00)
Total	50 (100.00)	50 (100.00)	100 (100.00)

No diabetic retinopathy was identified in 77% of eyes. Mild NPDR was present in 10%, moderate NPDR in 9%, severe NPDR in 2%, and proliferative diabetic retinopathy in 2%.

Overall, diabetic retinopathy was documented in 23% of eyes.

Table 9: Distribution of eye findings

Cataract status	Left eye, n (%)	Right eye, n (%)	Total eyes, n (%)
Absent	36 (72.00)	31 (62.00)	67 (67.00)
Present	14 (28.00)	19 (38.00)	33 (33.00)
Diabetic retinopathy			
Absent	41 (82.00)	36 (72.00)	77 (77.00)
Present	9 (18.00)	14 (28.00)	23 (23.00)
Glaucoma status			
Absent	50 (100.00)	48 (96.00)	98 (98.00)
Present	0 (0.00)	2 (4.00)	2 (2.00)

Cataract was present in 33% of eyes, with a higher proportion in the right eye (38%) than in the left eye (28%). No cataract was recorded in the remaining 67% of eyes. Diabetic retinopathy was present in 23% of eyes, including 18% of left eyes and 28% of right eyes. The remaining 77%

showed no diabetic retinopathy on examination. These findings represent eye level observations and should not be interpreted as the percentage of patients affected. Glaucoma was documented in 2% of eyes, with both affected eyes recorded in the right-eye group.

Table 10: Distribution of cataract types among eyes with cataract

Cataract type	Left eye, n (%)	Right eye, n (%)	Total eyes, n (%)
Cortical	5 (35.71)	9 (47.37)	14 (42.42)
Posterior subcapsular	4 (28.57)	5 (26.32)	9 (27.27)
Nuclear	3 (21.43)	2 (10.53)	5 (15.15)
Mixed	2 (14.29)	3 (15.79)	5 (15.15)
Total	14 (100.00)	19 (100.00)	33 (100.00)

Cortical cataract was the most frequent type, accounting for 42.42% of cataract-affected eyes. Posterior subcapsular cataract constituted 27.27%, while nuclear and mixed cataracts each accounted for 15.15%.

DISCUSSION

Diabetes mellitus is a chronic metabolic disorder associated with a broad spectrum of ocular complications, including diabetic retinopathy, cataract, glaucoma, and ocular surface abnormalities. The present study evaluated ocular manifestations among 50 patients with diabetes mellitus attending the Ophthalmology Outpatient Department of Medici Institute of Medical Sciences, Ghanpur, Telangana. The findings were compared with published Indian studies and available literature to understand their clinical significance and implications for ophthalmic care in rural settings.

Age and sex distribution: In the present study, the majority of participants belonged to the 51–59-year age group (40%), followed by the 60–69-year age group (28%). Males constituted 54% of the study population and females 46%. The concentration of participants in the middle-aged and older age groups is clinically relevant because cumulative exposure to hyperglycaemia and age-related ocular changes may contribute to visual morbidity. Brar et al,^[7] in their systematic review and meta-analysis of diabetic retinopathy in India, reported a higher pooled prevalence of diabetic retinopathy among people aged 50–59 years (16.72%) and those aged 60 years or older (16.55%) compared with those aged 40–49 years (13.57%). These findings support the importance of evaluating older adults with diabetes for retinal complications. However, the present study describes the age distribution of patients attending an ophthalmology clinic and does not establish an age-specific risk of ocular disease because age-stratified

outcome analyses were not performed. The slight male predominance in our study should also be interpreted cautiously. It may reflect the characteristics of patients attending the study centre rather than a true sex difference in the occurrence of ocular complications. Further studies with larger samples and appropriate subgroup analyses are required to examine the influence of age and sex on diabetic ocular manifestations.

Duration of diabetes and glycaemic profile: The mean duration of diabetes in our study was 5.59 ± 5.35 years. The mean fasting blood glucose was 148.62 ± 20.55 mg/dL, the mean postprandial blood glucose was 219.26 ± 42.58 mg/dL, and the mean HbA1c was $7.78 \pm 0.97\%$. These findings indicate that the participants had a measurable burden of hyperglycaemia, although individual glycaemic status varied. In the rural study conducted by Nadarajan et al,^[8] in Villupuram District, Tamil Nadu, diabetic retinopathy and its associated factors were evaluated in a community-based population. Their work highlights the relevance of investigating diabetic retinopathy and its determinants in rural Indian settings, where access to routine screening may vary. Similarly, the national survey by Vashist et al,^[9] demonstrated the importance of assessing diabetic retinopathy at a population level to guide eye-care planning in India. In the present study, however, no statistical association between HbA1c, duration of diabetes, and the presence or severity of ocular complications has been established. Therefore, the findings cannot determine whether participants with higher HbA1c or longer diabetes duration were more likely to develop cataract or diabetic retinopathy. Such relationships should be assessed in future studies using appropriate statistical analyses.

Presenting complaints and visual acuity: Blurring of vision was the most common presenting complaint in our study, reported by 46% of participants, followed by diminution of vision in 30%. Notably, 16% of participants reported no ocular complaints. This finding is important because some diabetes-

related retinal changes may remain asymptomatic until the disease becomes more advanced. The emphasis on screening in Indian epidemiological studies, including the national survey by Vashist et al,^[9] and the SMART India study by Raman et al,^[10] supports the need for systematic identification of diabetic retinopathy rather than relying exclusively on symptoms. These studies examined the burden of diabetic retinopathy in broader populations and highlighted the relevance of screening coverage and the characteristics of people with known and previously undiagnosed diabetes. In our study, uncorrected visual acuity was most frequently 6/9 (30% of eyes) and 6/12 (26%). After best correction, 43% of eyes achieved 6/6 vision and 31% achieved 6/9. The improvement following correction suggests that refractive factors contributed to reduced visual acuity in some eyes. Nevertheless, the presence of cataract and diabetic retinopathy indicates that visual impairment in this population was not limited to refractive error. Direct comparison with other studies is limited because visual acuity distributions depend on participant selection, refractive status, cataract severity, retinal involvement, and the methods used to measure vision. Furthermore, the present study did not quantify the proportion of visual impairment attributable to each ocular condition.

Cataract and anterior segment manifestations: Cataract was identified in 33 of the 100 examined eyes (33%). Among cataract-affected eyes, cortical cataract was the most common type (42.42%), followed by posterior subcapsular cataract (27.27%); nuclear and mixed cataracts each accounted for 15.15%. The association between diabetes and cataract has been investigated in Indian clinical research. Raman et al,^[10] in the Sankara Nethralaya diabetic retinopathy epidemiology and molecular genetics study, examined the prevalence and risk factors for cataract in people with diabetes. Their work provides relevant context for considering lens opacity as an important component of ocular morbidity in diabetic populations. The present study similarly identified cataract as a substantial finding among patients attending a rural medical college. This is clinically significant because cataract can cause visual impairment that may be amenable to surgical treatment. Appropriate assessment of lens opacity, visual function, systemic health, and retinal status is important when planning cataract management in patients with diabetes. However, the cataract frequency in our study should not be directly equated with the prevalence reported in population-based studies. Our sample consisted of patients attending an ophthalmology outpatient department, and no non-diabetic control group was included. Thus, the study cannot establish the excess risk of cataract attributable to diabetes or determine whether cataract was more frequent than in an otherwise comparable non-diabetic population.

Diabetic retinopathy: Diabetic retinopathy was detected in 23 of the 100 examined eyes (23%). Fundus examination revealed no diabetic retinopathy in 77% of eyes. Mild non-proliferative diabetic retinopathy (NPDR) was present in 10%, moderate NPDR in 9%, severe NPDR in 2%, and proliferative diabetic retinopathy (PDR) in 2%. Brar et al,^[7]

conducted a systematic review and meta-analysis of population-based studies from India and reported a pooled diabetic retinopathy prevalence of 14.00% (95% confidence interval [CI] 9.13–18.86) among people with diabetes in rural areas and 17.44% (95% CI 14.33–20.55) in urban areas. The difference between rural and urban estimates was not statistically significant. The 23% eye-level proportion observed in our study is numerically higher than these pooled participant-level estimates. However, this difference should not be interpreted as evidence that diabetic retinopathy is more prevalent in rural Telangana. The studies differ in setting, recruitment, sample characteristics, and, importantly, the denominator used for reporting outcomes. Our study included patients attending an ophthalmology outpatient department and calculated the proportion of affected eyes, whereas Brar et al. synthesized population-based estimates among people with diabetes. These estimates are therefore not directly comparable. Nadarajan et al,^[8] specifically investigated diabetic retinopathy in a rural population in Tamil Nadu, providing further evidence of the importance of studying the disease in community settings. Vashist et al,^[9] in the National Survey conducted from 2015 to 2019, assessed diabetic retinopathy and sight-threatening diabetic retinopathy across selected districts in India. Raman et al,^[10] through the SMART India population-based screening study, further examined diabetic retinopathy in relation to known and undiagnosed diabetes, geographical setting, and socioeconomic indices. Collectively, these studies support the public health importance of identifying diabetic retinopathy through organized screening and appropriate referral pathways. In our study, severe NPDR and PDR were each detected in 2% of eyes. Although these proportions were small, their clinical importance is considerable because advanced retinopathy may require specialist assessment and timely treatment. The findings reinforce the value of dilated fundus examination in diabetic patients, including those who do not report visual symptoms. Nevertheless, the study did not assess subsequent progression or treatment outcomes and cannot establish the effectiveness of a screening intervention.

Intraocular pressure and glaucoma: The mean intraocular pressure in our study was 15.57 ± 2.13 mmHg. Glaucoma was documented in two eyes (2%), while 98 eyes (98%) were recorded as having no glaucoma.

Song et al,^[11] investigated the prevalence of glaucoma and ocular hypertension in individuals with type 1 and type 2 diabetes, providing an early clinical reference for examining the relationship between diabetes and intraocular pressure-related disorders. Sayin N et al,^[12] also reviewed the broader spectrum of ocular manifestations associated with diabetes, emphasizing that diabetic eye disease extends beyond retinal changes.

The small proportion of glaucoma cases in our study should be interpreted in the context of the limited sample size. Moreover, a normal mean intraocular pressure does not exclude glaucoma, because diagnosis requires assessment of the optic nerve and, where indicated, visual fields and other relevant investigations. Our findings therefore do not establish that glaucoma is uncommon among all people with diabetes in rural communities.

Implications for rural ophthalmic services: The findings of the present study indicate that cataract and diabetic retinopathy

were important ocular manifestations among patients with diabetes attending a rural medical college. The presence of ocular abnormalities alongside the finding that 16% of participants reported no ocular complaints supports the importance of comprehensive eye examination rather than symptom-based referral alone.

Indian studies by Brar et al., Vashist et al., and Raman et al. provide complementary evidence regarding the burden of diabetic retinopathy and the need for population-level screening strategies.^[7,9,10] Although the present study was not designed to evaluate a screening programme, its findings support the clinical value of integrating visual acuity assessment, anterior segment examination, intraocular pressure measurement, dilated fundus examination, patient education, and timely referral into diabetes care.

In rural settings, coordinated care between physicians managing diabetes and ophthalmologists may help identify patients who need cataract evaluation, retinal follow-up, or further glaucoma assessment. The effectiveness and feasibility of such an integrated model were not directly measured in our study and should be investigated in future research.

Strengths and limitations: An important strength of this study is the comprehensive ophthalmic evaluation of both eyes, including visual acuity, slit-lamp examination, intraocular pressure measurement, and dilated fundus assessment. The recording of biochemical parameters also provides a useful description of the participants' glycaemic profile.

The study nevertheless has several limitations. First, the sample size was small, comprising only 50 participants. Second, the hospital-based design limits generalisation to the wider rural population because patients attending an ophthalmology clinic may differ from community members with diabetes. Third, the absence of a non-diabetic comparison group prevents estimation of the excess risk of ocular complications attributable to diabetes. Fourth, the cross-sectional assessment cannot establish causal relationships or evaluate disease progression. Fifth, both eyes were included in the analysis; these observations are correlated within individuals and should be accounted for in inferential statistical analyses. Finally, the study did not establish statistical associations between demographic or biochemical variables and ocular outcomes.

Future studies involving larger community-based samples, standardized grading of diabetic retinopathy, participant-level and eye-level outcome reporting, and appropriate statistical methods are warranted to establish the burden and determinants of diabetic ocular complications in rural Telangana.

CONCLUSION

The present study identified cataract and diabetic

retinopathy as the principal ocular findings among patients with diabetes mellitus attending a rural medical college in Telangana. Cataract was present in 33% of examined eyes, diabetic retinopathy in 23%, and glaucoma in 2%. Improvement in visual acuity following best correction was also observed. These findings emphasize the clinical value of comprehensive ophthalmic evaluation and timely referral as components of diabetes care. Larger community-based studies are required to establish population-level prevalence and to determine the factors associated with diabetic ocular complications.

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Conflicts of interest

There are no conflicts of interest.

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