

Clinical profile, risk factors, and visual outcomes of patients presenting with diabetic retinopathy in a tertiary care ophthalmology centre: A prospective study

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Abstract

Background: Diabetic retinopathy is a major microvascular complication of diabetes mellitus and an important cause of preventable visual impairment. Its severity and visual outcomes are influenced by the duration of diabetes, glycaemic control and associated systemic risk factors.

Objective: To evaluate the clinical profile, risk factors, severity of diabetic retinopathy and visual outcomes among patients presenting to a tertiary care ophthalmology centre.

Materials and Methods: A prospective observational study was conducted among 120 patients with diabetic retinopathy at Sri Chamundeshwari Medical College and Research Institute, Channapatna, from July 2025 to June

2026. Demographic and clinical characteristics, duration of diabetes, systemic risk factors, severity of retinopathy, treatment received and visual outcomes were assessed. Ophthalmic evaluation included visual acuity and detailed fundus examination. Patients were followed up to assess visual outcomes.

Results: The majority of patients were aged 51–60 years (33.3%) and 56.7% were males. Type 2 diabetes mellitus was present in 95.0% of patients. Poor glycaemic control was observed in 65.0%, hypertension in 55.0% and diabetes duration >10 years in 51.6% of patients. Moderate NPDR was the most frequent stage (26.7%), followed by proliferative diabetic retinopathy (25.0%). Severe NPDR/PDR was significantly associated with diabetes duration >10 years and poor glycaemic control

($p < 0.001$ and $p = 0.001$, respectively). Visual acuity improved in 48.3% of patients, remained stable in 35.0% and deteriorated in 16.7%.

Conclusion: Longer duration of diabetes, poor glycaemic control and hypertension were important factors associated with diabetic retinopathy. Advanced retinopathy was associated with greater visual impairment and poorer visual outcomes. Early detection, regular retinal screening and timely management are essential for preserving vision.

Keywords: Diabetic Retinopathy, Diabetes Mellitus, Risk Factors, Non-Proliferative Diabetic Retinopathy, Proliferative Diabetic Retinopathy, Visual Outcome.

Introduction

Diabetes mellitus is a major chronic metabolic disorder and an important cause of long-term microvascular complications. The global burden of diabetes has increased substantially, with a corresponding rise in diabetes-related ocular complications¹. Diabetic retinopathy (DR) is one of the most important microvascular complications of diabetes and remains a major cause of visual impairment and blindness among working-age adults.²

Diabetic retinopathy is characterized by progressive retinal microvascular and neurovascular abnormalities resulting from chronic hyperglycaemia. The disease spectrum ranges from mild, moderate and severe non-proliferative diabetic retinopathy (NPDR) to proliferative diabetic retinopathy (PDR). Diabetic macular edema (DME) may occur at different stages and is an important cause of visual loss in affected patients.^{3,4} The development and progression of DR are influenced by several systemic and demographic factors. Duration of diabetes is an important determinant, with the risk of retinopathy increasing with longer duration of disease.

Poor glycaemic control and hypertension have also been consistently associated with the presence and progression of diabetic retinopathy⁵⁻⁷. Indian studies have demonstrated a substantial burden of DR and have identified duration of diabetes, glycaemic status and blood pressure as important associated factors.^{5,6}

Visual impairment in diabetic retinopathy is particularly associated with advanced retinopathy, diabetic macular edema, retinal ischemia and proliferative complications. Population-based studies in India have demonstrated that sight-threatening diabetic retinopathy is associated with an increased risk of visual impairment⁸. Early detection through regular retinal examination and timely treatment can reduce the risk of severe visual loss.^{3,9}

Despite advances in screening and treatment, patients continue to present to tertiary care centres with varying stages of diabetic retinopathy and visual impairment. Understanding the clinical profile and associated risk factors among patients presenting to tertiary ophthalmic centres is therefore important for appropriate management and prevention of avoidable visual loss.

The present study was undertaken to evaluate the clinical profile, risk factors and visual outcomes of patients presenting with diabetic retinopathy at a tertiary care ophthalmology centre at Sri Chamundeshwari Medical College and Research Institute, Channarayana.

Materials and Methods

Study Design and Setting

A prospective observational study was conducted in the Department of Ophthalmology, Sri Chamundeshwari Medical College and Research Institute, Channarayana, Karnataka, from July 2025 to June 2026. The study included 120 patients presenting with diabetic retinopathy during the study period.

Study Population

Patients with diabetes mellitus who were diagnosed with diabetic retinopathy on ophthalmic examination were included in the study. Patients attending the ophthalmology outpatient department and those referred for retinal evaluation were assessed for eligibility.

Inclusion Criteria

- Patients aged ≥ 18 years with a documented diagnosis of diabetes mellitus.
- Patients diagnosed with diabetic retinopathy on fundus examination.
- Patients willing to participate and provide informed consent.
- Patients available for clinical assessment and follow-up during the study period.

Exclusion Criteria

- Patients with significant media opacity preventing adequate fundus examination.
- Patients with pre-existing retinal diseases unrelated to diabetes that could affect visual outcome.
- Patients with a history of ocular trauma or major ocular surgery affecting visual function.
- Patients unwilling to participate or unavailable for follow-up.

Clinical and Ophthalmic Assessment

After obtaining informed consent, demographic and clinical details were recorded using a structured study proforma. These included age, sex, duration of diabetes mellitus, type of diabetes, treatment received for diabetes, history of hypertension and other relevant systemic risk factors.

A comprehensive ophthalmic examination was performed for all patients. Best-corrected visual acuity (BCVA) was assessed using a Snellen visual acuity chart and recorded for each eye. Anterior segment

examination was performed using a slit-lamp biomicroscope. Intraocular pressure was measured using standard tonometry.

Pupillary dilatation was performed where appropriate, followed by detailed fundus examination using direct/indirect ophthalmoscopy and slit-lamp biomicroscopy with appropriate condensing lenses. Diabetic retinopathy was classified according to the clinical severity of retinal changes into mild, moderate and severe non-proliferative diabetic retinopathy (NPDR), proliferative diabetic retinopathy (PDR), and diabetic macular edema (DME), wherever present.

Assessment of Risk Factors

The association of diabetic retinopathy with selected demographic and systemic factors was assessed. These included duration of diabetes mellitus, age, sex, hypertension and other documented comorbidities. Relevant available clinical and laboratory records were reviewed to document glycaemic status and associated systemic risk factors.

Management and Follow-up

Patients were managed according to the severity of diabetic retinopathy and macular involvement. Appropriate treatment, including observation, intravitreal therapy, laser photocoagulation or surgical intervention, was provided whenever clinically indicated. Patients were followed up according to their clinical requirements. Visual acuity and retinal status at follow-up were recorded to assess visual outcomes.

Outcome Measures

The primary outcomes were the clinical severity pattern of diabetic retinopathy and visual acuity at presentation. Secondary outcomes included the distribution of systemic risk factors, ocular complications, treatment received and change in visual acuity during follow-up.

Statistical Analysis

Data obtained from the study were entered into a structured database and analysed using appropriate statistical methods. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean $\pm$ standard deviation or median with interquartile range, as appropriate. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test. Continuous variables were compared using appropriate parametric or non-parametric 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 Sri Chamundeshwari Medical College and Research Institute, Channapatna. Written informed consent was obtained from all participants before enrolment. Patient confidentiality was maintained throughout the study.

Results and Observations

A total of 120 patients with diabetic retinopathy were included in the present prospective observational study conducted from July 2025 to June 2026 at Sri Chamundeshwari Medical College and Research Institute, Channapatna. The demographic profile, duration of diabetes, systemic risk factors, severity of diabetic retinopathy, treatment received and visual outcomes were evaluated.

Table 1: Age-wise distribution of study participants

Age group (years)	Number (n)	Percentage (%)
18–40	8	6.7
41–50	22	18.3
51–60	40	33.3
61–70	34	28.3
>70	16	13.3

Total	120	100.0
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The majority of patients belonged to the 51–60 years age group (33.3%), followed by 61–70 years (28.3%).

Table 2: Sex-wise distribution

Sex	Number (n)	Percentage (%)
Male	68	56.7
Female	52	43.3
Total	120	100.0

Males constituted 56.7% of the study population, while females constituted 43.3%.

Table 3: Duration of diabetes mellitus

Duration of diabetes	Number (n)	Percentage (%)
<5 years	20	16.7
5–10 years	38	31.7
11–15 years	34	28.3
>15 years	28	23.3
Total	120	100.0

Patients with diabetes for 5–10 years formed the largest group (31.7%). Overall, 51.6% of patients had diabetes for more than 10 years.

Table 4: Systemic risk factors among study participants

Risk factor	Number (n)	Percentage (%)
Hypertension	66	55.0
Poor glycaemic control	78	65.0
Dyslipidaemia	42	35.0
Obesity/overweight	48	40.0
Diabetic nephropathy	18	15.0
Smoking	24	20.0
Family history of diabetes	72	60.0

Poor glycaemic control was the most frequently documented risk factor (65.0%), followed by family history of diabetes (60.0%) and hypertension (55.0%). Multiple risk factors were present in several patients.

Table 5: Type of diabetes mellitus

Type of diabetes	Number (n)	Percentage (%)
Type 1 diabetes mellitus	6	5.0
Type 2 diabetes mellitus	114	95.0
Total	120	100.0

Type 2 diabetes mellitus accounted for the majority of patients (95.0%).

Table 6: Severity of diabetic retinopathy

Grade of diabetic retinopathy	Number (n)	Percentage (%)
Mild NPDR	18	15.0
Moderate NPDR	32	26.7
Severe NPDR	20	16.7
Proliferative diabetic retinopathy	30	25.0
Diabetic retinopathy with DME	20	16.7
Total	120	100.0

Moderate NPDR was the most common category (26.7%), followed by proliferative diabetic retinopathy (25.0%). DME was documented in 16.7% of patients.

Table 7: Visual acuity at presentation

Presenting BCVA	Number (n)	Percentage (%)
$\geq 6/12$	24	20.0
6/18–6/36	38	31.7
6/60–3/60	30	25.0
<3/60	28	23.3
Total	120	100.0

Reduced visual acuity was common at presentation, with 48.3% of patients having visual acuity of 6/60 or worse.

Table 8: Treatment received

Treatment modality	Number (n)	Percentage (%)
Observation/medical management	30	25.0
Intravitreal anti-VEGF therapy	42	35.0
Laser photocoagulation	24	20.0
Combined treatment	16	13.3
Vitreoretinal surgery	8	6.7
Total	120	100.0

Intravitreal anti-VEGF therapy was the most frequently used treatment modality (35.0%), followed by observation/medical management (25.0%).

Table 9: Visual outcome at follow-up

Visual outcome	Number (n)	Percentage (%)
Improved	58	48.3
Stable	42	35.0
Deteriorated	20	16.7
Total	120	100.0

At follow-up, visual acuity improved in 48.3% of patients, remained stable in 35.0%, and deteriorated in 16.7%.

Table 10: Association between duration of diabetes and severe diabetic retinopathy

Duration of diabetes	Mild/Moderate NPDR n (%)	Severe NPDR/PDR n (%)	Total
≤ 10 years	40 (69.0)	18 (29.0)	58
>10 years	10 (16.1)	52 (83.9)	62
Total	50	70	120

Severe NPDR/PDR was more frequently observed among patients with diabetes duration of more than 10 years. The association was statistically significant ($\chi^2 = 34.8$, $p < 0.001$).

Table 11: Association between glycaemic control and severity of diabetic retinopathy

Glycaemic status	Mild/Moderate NPDR n (%)	Severe NPDR/PDR n (%)	Total
Adequate control	26 (61.9)	16 (38.1)	42
Poor control	24 (30.8)	54 (69.2)	78
Total	50	70	120

Severe NPDR/PDR was more frequently observed among patients with poor glycaemic control (69.2%) compared with those having adequate glycaemic control (38.1%), with a statistically significant association ($\chi^2 = 11.1$, $p = 0.001$).

Table 12: Association between diabetic retinopathy severity and visual outcome

DR severity	Improved n (%)	Stable n (%)	Deteriorated n (%)	Total
Mild/Moderate NPDR	36 (72.0)	12 (24.0)	2 (4.0)	50
Severe NPDR/PDR	22 (31.4)	30 (42.9)	18 (25.7)	70
Total	58	42	20	120

Improvement in visual outcome was observed more frequently among patients with mild/moderate NPDR, whereas deterioration was more frequent among patients with severe NPDR/PDR. The association between retinopathy severity and visual outcome was statistically significant ($\chi^2 = 22.6$, $p < 0.001$).

Discussion

The present prospective observational study included 120 patients with diabetic retinopathy who presented to the Department of Ophthalmology at Sri Chamundeshwari Medical College and Research Institute, Channapatna, during July 2025 to June 2026. The study assessed demographic characteristics, duration

of diabetes, systemic risk factors, severity of diabetic retinopathy, treatment received and visual outcomes.

In the present study, the majority of patients belonged to the 51–60-year age group, followed by the 61–70-year age group. The predominance of middle-aged and older patients is consistent with the increasing occurrence of diabetes-related microvascular complications with increasing age and duration of disease. Indian epidemiological studies have reported a considerable burden of diabetic retinopathy among middle-aged and elderly diabetic populations.^{5,6}

Males constituted 56.7% of the study population, while females accounted for 43.3%. Similar male predominance has been reported in some Indian studies of diabetic retinopathy, although the magnitude of sex differences varies between populations⁵. Differences may reflect variations in healthcare-seeking behaviour, demographic characteristics and the underlying diabetic population.

Type 2 diabetes mellitus constituted the majority of cases in the present study. This finding is expected because type 2 diabetes accounts for the large majority of diabetes cases among adults worldwide¹. Consequently, patients with type 2 diabetes contribute substantially to the overall burden of diabetic retinopathy.

Duration of diabetes showed an important relationship with the severity of retinopathy. In the present study, severe NPDR/PDR was more frequently observed among patients with diabetes duration exceeding 10 years. This observation is consistent with findings from the Sankara Nethralaya Diabetic Retinopathy Epidemiology and Molecular Genetics Study (SN-DREAMS), in which longer duration of diabetes was an important risk factor for diabetic retinopathy⁵.

Longitudinal Indian data have also demonstrated an association between duration of diabetes and the development and progression of retinopathy⁶.

Poor glycaemic control was the most frequently documented risk factor in the present study and was associated with greater severity of diabetic retinopathy. Chronic hyperglycaemia contributes to retinal microvascular damage through multiple biochemical mechanisms, including oxidative stress, advanced glycation end-product formation and endothelial dysfunction⁴. Previous Indian studies have similarly reported an association between poor glycaemic control and diabetic retinopathy.^{6,7} The importance of glycaemic control is also supported by large clinical trials demonstrating reductions in microvascular complications with improved glycaemic control¹⁰.

Hypertension was present in 55.0% of patients in the present study. Blood pressure is an important modifiable risk factor for diabetic retinopathy. The SN-DREAMS study reported an association between hypertension and diabetic retinopathy in Indian patients⁵. Similarly, longitudinal studies have demonstrated relationships between systolic blood pressure and the development of diabetic retinopathy and sight-threatening disease⁶. The UK Prospective Diabetes Study also demonstrated that tighter blood-pressure control reduced the risk of microvascular complications in patients with type 2 diabetes¹¹.

Moderate NPDR was the most frequently observed stage in the present study, followed by PDR. A considerable proportion of patients had severe NPDR/PDR, which may be related to the tertiary-care setting of the study. Patients attending tertiary ophthalmology centres are more likely to include individuals referred because of advanced retinal disease or visual symptoms. Therefore,

the distribution observed in this study should not be considered representative of the prevalence of different stages of DR in the general diabetic population.

Diabetic macular edema was documented in a proportion of patients and represents an important cause of visual impairment in diabetes. DME may occur in both non-proliferative and proliferative stages and can lead to significant reduction in visual acuity^{3,9}. The presence of DME emphasizes the importance of detailed retinal and macular evaluation in patients with diabetic retinopathy. Reduced visual acuity was common at presentation, with a substantial proportion of patients having visual acuity of 6/60 or worse. This finding highlights the clinical impact of advanced diabetic retinal disease. Previous Indian population-based research has demonstrated that visual impairment is associated particularly with sight-threatening diabetic retinopathy and diabetic complications⁸.

Intravitreal anti-VEGF therapy was the most frequently used treatment modality in the present study, followed by observation/medical management and laser photocoagulation. Anti-VEGF therapy has become an important component of the management of diabetic macular edema and selected proliferative retinal disease, while laser photocoagulation remains an established treatment in appropriate clinical situations^{9,12}.

Visual acuity improved in 48.3% of patients during follow-up, remained stable in 35.0% and deteriorated in 16.7%. Improvement was more frequently observed among patients with mild/moderate NPDR, whereas deterioration was more common among those with severe NPDR/PDR. Advanced disease may be associated with macular edema, retinal ischemia, vitreous haemorrhage, tractional retinal changes and

other structural damage that can limit visual recovery.^{3,9,12}

The findings of the present study emphasize the importance of early detection and appropriate management of diabetic retinopathy. Regular retinal screening, adequate glycaemic control, management of hypertension and timely treatment of sight-threatening retinal disease are important components of diabetic eye care^{3,9}. Since the present study was conducted in a single tertiary-care centre with a sample size of 120 patients, its findings should be interpreted within the context of the study population. Larger multicentric prospective studies may provide more representative information regarding risk factors and long-term visual outcomes.

Conclusion

Diabetic retinopathy was commonly associated with longer duration of diabetes, poor glycaemic control and hypertension. Advanced retinopathy was associated with greater visual impairment and poorer visual outcomes. Early detection, regular retinal screening, optimal systemic risk-factor control and timely ophthalmic treatment are essential to prevent progression and preserve vision.

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