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ORIGINAL RESEARCH ARTICLE

CLINICAL PROFILE, SEVERITY PATTERNS, AND TREATMENT OUTCOMES OF DIABETIC RETINOPATHY IN A TERTIARY CARE HOSPITAL IN SOUTH INDIA: A HOSPITAL-BASED OBSERVATIONAL STUDY

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ABSTRACT

Background: Diabetic retinopathy (DR) is a leading cause of preventable blindness among individuals with diabetes mellitus. With the rising burden of diabetes in India, the prevalence of DR and its vision-threatening complications is increasing, particularly in tertiary care settings where patients often present at advanced stages.

Objectives: To assess the clinical profile, severity distribution, and treatment outcomes of diabetic retinopathy among patients attending a tertiary care hospital in South India.

Methods: A hospital-based observational analytical study was conducted from June 2020 to December 2020 among 428 patients with diabetic retinopathy. Data on socio-demographic characteristics, duration and type of diabetes, glycemic control, and comorbidities were collected using a semi-structured proforma. Comprehensive ophthalmic examination, including fundus evaluation, was performed, and DR was classified based on ETDRS criteria. Patients were managed as per standard protocols and followed for short-term outcomes. Statistical analysis was performed using SPSS version 25.0, with $p<0.05$ considered statistically significant.

Results: The majority of participants were aged 41–60 years, with a predominance of males and urban residents. Type 2 diabetes was present in most patients, and a large proportion had a disease duration exceeding five years and suboptimal glycemic control. Moderate non-proliferative diabetic retinopathy was the most common stage, while proliferative diabetic retinopathy was observed in a significant proportion. Diabetic macular edema was present in nearly one-third of patients. A statistically significant association was found between longer duration of diabetes and increased severity of retinopathy ($p<0.05$). Laser photocoagulation was the most commonly used treatment modality. Improvement in visual acuity was observed in about half of the patients, while others showed stable or worsened outcomes.

Conclusion: Diabetic retinopathy in this setting is characterized by late presentation and significant disease burden. Early screening, optimal glycemic control, and timely intervention are crucial to

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prevent visual impairment. Integration of DR screening into routine diabetes care is strongly recommended.

Keywords: Diabetic retinopathy; Diabetes mellitus; Visual outcome; Macular edema; Tertiary care hospital; India

INTRODUCTION

Diabetic retinopathy (DR) is one of the most common microvascular complications of diabetes mellitus and remains a leading cause of preventable blindness worldwide. The global burden of diabetes has risen dramatically over the past few decades, with an estimated 537 million adults affected in 2019, a number projected to increase further in the coming years [1]. Among individuals with diabetes, nearly one-third are estimated to have some form of diabetic retinopathy, and approximately one in ten develop vision-threatening stages such as proliferative diabetic retinopathy (PDR) or diabetic macular edema (DME) [2]. The increasing prevalence of diabetes, coupled with longer life expectancy, has led to a corresponding rise in DR-related visual impairment, making it a major public health concern.

The pathogenesis of diabetic retinopathy involves chronic hyperglycemia-induced microvascular damage, leading to retinal capillary leakage, ischemia, and neovascularization [3]. Several risk factors have been identified, including duration of diabetes, poor glycemic control, hypertension, dyslipidemia, and genetic predisposition [4]. Early stages of DR are often asymptomatic, which underscores the importance of regular screening and timely intervention. If left untreated, DR can progress to irreversible visual loss, significantly affecting quality of life and increasing the economic burden on healthcare systems [5].

In low- and middle-income countries, including India, the burden of diabetic retinopathy is particularly concerning due to rapid urbanization, lifestyle transitions, and limited access to structured screening programs [6]. India, often referred to as the “diabetes capital of the world,” has a substantial and growing population of individuals at risk for DR [7]. Recent estimates suggest that the prevalence of diabetic retinopathy in India ranges from 10% to 30% among known diabetics, with variations depending on geographic location, healthcare access, and study methodologies [8]. Despite this, awareness regarding regular eye examinations remains suboptimal, and many patients present at advanced stages of the disease.

Tertiary care hospitals in South India cater to a large and diverse population, including referrals of complicated cases, thereby providing a unique opportunity to study the clinical spectrum and outcomes of diabetic retinopathy in a real-world setting. Understanding the clinical profile—including demographic characteristics, risk factors, and severity patterns—along with treatment outcomes is essential for optimizing patient care and informing public health strategies. However, there remains a paucity of comprehensive hospital-based data from South India that integrates both clinical presentation and outcomes of DR in a standardized manner.

Furthermore, while several studies have evaluated the prevalence of diabetic retinopathy, fewer have focused on correlating clinical characteristics with treatment outcomes in tertiary care settings. Such data are crucial for identifying high-risk groups, improving early detection strategies, and tailoring interventions to reduce visual morbidity. Bridging this knowledge gap can contribute to strengthening screening programs and enhancing the continuum of care for diabetic patients. Therefore, the present study was undertaken to assess the clinical profile and outcomes of diabetic retinopathy among patients attending a tertiary care hospital in South India. The objectives of the study were to evaluate the demographic and clinical characteristics of patients with diabetic

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retinopathy, to determine the distribution of various stages of the disease, and to assess visual and treatment outcomes in this population.

METHODOLOGY

Study Design: A hospital-based observational analytical study with a cross-sectional assessment of clinical profile and a prospective component for short-term outcomes was conducted.

Study Setting: The study was conducted in the Department of Ophthalmology of a tertiary care teaching hospital in South India, catering to both urban and rural populations and receiving referrals from peripheral healthcare facilities.

Study Duration: The study was carried out over a period of 7 months, from June 2020 to December 2020.

Study Population: The study population comprised adult patients diagnosed with diabetes mellitus who were attending the ophthalmology outpatient department (OPD) and were found to have diabetic retinopathy on fundus examination during the study period.

Inclusion Criteria

- Patients aged ≥18 years with a confirmed diagnosis of diabetes mellitus (Type 1 or Type 2)
- Patients diagnosed with any stage of diabetic retinopathy based on clinical examination and/or fundus imaging
- Patients willing to provide informed written consent

Exclusion Criteria

- Patients with other retinal pathologies (e.g., hypertensive retinopathy, retinal vein occlusion) that could confound findings
- Patients with media opacities precluding adequate fundus visualization (e.g., dense cataract, vitreous hemorrhage without prior records)
- Patients with a history of ocular trauma or prior retinal surgery unrelated to diabetic retinopathy
- Patients unwilling or unable to provide consent or comply with follow-up

Sample Size: The sample size was calculated using the formula for estimating a proportion in a cross-sectional study:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Where:

- n = required sample size
- Z = standard normal variate at 95% confidence level (1.96)
- p = expected prevalence of diabetic retinopathy (assumed 30% based on previous Indian studies)
- q = 1 – p (0.70)
- d = absolute precision (5%)

Substituting values:

$$n = \frac{(1.96)^2 \times 0.30 \times 0.70}{(0.05)^2} \approx 323$$

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Considering a non-response rate and feasibility, the final sample size was increased and a total of 428 patients were included in the study.

Sampling Technique: A consecutive sampling technique was employed, wherein all eligible patients presenting during the study period and fulfilling the inclusion criteria were enrolled until the required sample size was achieved.

Data Collection Tools & Procedure: Data were collected using a pre-designed, semi-structured proforma. After obtaining informed consent, detailed information regarding socio-demographic characteristics (age, gender, residence), duration and type of diabetes, treatment history, and associated comorbidities was recorded. All patients underwent a comprehensive ophthalmic examination including measurement of best-corrected visual acuity (BCVA) using Snellen's chart, slit-lamp biomicroscopy, intraocular pressure measurement, and dilated fundus examination using indirect ophthalmoscopy and slit-lamp biomicroscopy with a 90D lens. Fundus photography and optical coherence tomography (OCT) were performed where indicated. Diabetic retinopathy was classified based on the Early Treatment Diabetic Retinopathy Study (ETDRS) classification into non-proliferative (mild, moderate, severe) and proliferative stages. Patients were managed as per standard institutional protocols, including medical management, laser photocoagulation, and intravitreal therapy where indicated, and were followed up for outcome assessment.

Study Variables: Independent variables included age, gender, duration of diabetes, type of diabetes, glycemic control (based on recent HbA1c values where available), presence of hypertension, and treatment modalities. Dependent variables included the severity of diabetic retinopathy, presence of diabetic macular edema, baseline visual acuity, and treatment outcomes measured in terms of change in visual acuity and disease progression or stabilization at follow-up.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize demographic and clinical characteristics. Categorical variables were expressed as frequencies and percentages, while continuous variables were expressed as mean and standard deviation. Inferential statistics, including Chi-square test or Fisher's exact test for categorical variables and independent t-test or ANOVA for continuous variables, were applied as appropriate. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to enrollment. Confidentiality of patient information was strictly maintained, and the study adhered to the ethical principles outlined in the Declaration of Helsinki.

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RESULTS

A total of 428 patients with diabetic retinopathy were included in the study. The majority of participants belonged to the 41–60 years age group, with a male predominance and a higher proportion of urban residents (Table 1).

Table 1: Socio-demographic Characteristics of Study Participants (n = 428)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–40	72	16.8
	41–60	214	50.0
	>60	142	33.2
Gender	Male	248	57.9
	Female	180	42.1
Residence	Urban	256	59.8
	Rural	172	40.2

Type 2 diabetes mellitus was the most common subtype, and a substantial proportion of patients had a duration of diabetes exceeding five years. More than half of the participants had coexisting hypertension, and poor glycemic control (HbA1c >7%) was observed in the majority of cases (Table 2).

Table 2: Clinical Profile of Diabetes among Participants

Variable	Category	Frequency (n)	Percentage (%)
Type of Diabetes	Type 1	36	8.4
	Type 2	392	91.6
Duration of Diabetes	<5 years	118	27.6
	5–10 years	162	37.9
	>10 years	148	34.6
Hypertension	Present	238	55.6
	Absent	190	44.4
Glycemic Control (HbA1c)	<7%	102	23.8
	7–9%	196	45.8
	>9%	130	30.4

Regarding disease severity, moderate non-proliferative diabetic retinopathy was the most frequently observed stage, followed by proliferative diabetic retinopathy. Diabetic macular edema was present in nearly one-third of the patients (Table 3).

Table 3: Distribution of Diabetic Retinopathy Severity (n = 428)

DR Classification	Frequency (n)	Percentage (%)
Mild NPDR	102	23.8
Moderate NPDR	146	34.1
Severe NPDR	74	17.3

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Proliferative DR (PDR)	106	24.8
Diabetic Macular Edema (DME)	128	29.9

A statistically significant association was found between duration of diabetes and severity of diabetic retinopathy, with a higher proportion of proliferative disease observed among patients with longer duration (>10 years) of diabetes (p <0.001) (Table 4).

Table 4: Association of Duration of Diabetes with Severity of Diabetic Retinopathy

Duration of Diabetes	NPDR (n)	PDR (n)	Total (n)	p-value
<5 years	110	8	118	
5–10 years	134	28	162	**<0.001**
>10 years	78	70	148	

(Chi-square test applied)

In terms of management, laser photocoagulation was the most commonly employed treatment modality, followed by intravitreal injections. Visual outcomes showed that approximately half of the patients experienced improvement in visual acuity, while a smaller proportion demonstrated worsening despite treatment (Table 5).

Table 5: Treatment Modalities and Visual Outcomes

Variable	Category	Frequency (n)	Percentage (%)
Treatment Given	Observation/Medical	142	33.2
	Laser Photocoagulation	164	38.3
	Intravitreal Injection	96	22.4
	Surgery (Vitrectomy)	26	6.1
Visual Outcome	Improved	218	50.9
	Stable	142	33.2
	Worsened	68	15.9

DISCUSSION

The present study evaluated the clinical profile and outcomes of diabetic retinopathy among patients attending a tertiary care hospital in South India. The findings demonstrated that the majority of patients belonged to the middle-aged group, with a predominance of Type 2 diabetes, longer duration of disease, and suboptimal glycemic control. Moderate non-proliferative diabetic retinopathy (NPDR) was the most common stage, while a substantial proportion had proliferative diabetic retinopathy (PDR) and diabetic macular edema (DME). A significant association was observed between duration of diabetes and severity of retinopathy, and nearly half of the patients showed improvement in visual outcomes following treatment.

The demographic profile observed in this study is consistent with the known epidemiology of diabetes and its complications. The higher proportion of patients in the 41–60 years age group reflects the peak prevalence of Type 2 diabetes in this age bracket, as reported in Indian and global studies [7,8]. The male predominance noted in the present study is comparable to findings from hospital-based studies in India, which may be attributed to gender differences in healthcare-seeking

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behavior rather than true disease prevalence [8]. The higher representation of urban participants aligns with the established higher burden of diabetes in urban populations due to sedentary lifestyle and dietary transitions [6].

The predominance of Type 2 diabetes and the high proportion of patients with longer disease duration (>5 years) observed in this study are in agreement with previous literature, which identifies duration of diabetes as one of the strongest predictors of diabetic retinopathy [2,4]. Furthermore, poor glycemic control was observed in a large proportion of patients, reinforcing the critical role of sustained hyperglycemia in the pathogenesis of retinal microvascular damage [3]. The coexistence of hypertension in more than half of the study population further amplifies the risk of disease progression, as highlighted in earlier studies [4].

In terms of disease severity, moderate NPDR emerged as the most common stage, followed by PDR. This pattern is consistent with studies conducted in similar tertiary care settings, where patients often present at intermediate or advanced stages due to lack of early screening [6,8]. The relatively high proportion of PDR (24.8%) in the present study may reflect referral bias, as tertiary care centers tend to receive more severe cases. The prevalence of DME in approximately one-third of patients is also in line with global estimates, where DME is a major contributor to visual impairment in diabetic individuals [2].

A key finding of this study was the statistically significant association between duration of diabetes and severity of diabetic retinopathy. Patients with a duration of more than 10 years had a markedly higher proportion of proliferative disease compared to those with shorter duration. This finding corroborates the well-established natural history of diabetic retinopathy, wherein prolonged exposure to hyperglycemia leads to progressive microvascular damage and retinal ischemia [3,4]. Similar associations have been reported in multiple epidemiological studies, reinforcing the importance of early diagnosis and long-term glycemic control [2].

With regard to treatment, laser photocoagulation was the most commonly employed modality, followed by intravitreal therapy. This reflects standard clinical practice, where laser therapy remains a cornerstone for managing proliferative disease and preventing vision loss, while intravitreal anti-vascular endothelial growth factor (anti-VEGF) agents are increasingly used for DME and selected cases of PDR. The observed improvement in visual acuity in approximately half of the patients highlights the effectiveness of timely intervention. However, the persistence of stable or worsened vision in a subset of patients underscores the irreversible nature of advanced disease and the need for early detection.

From a clinical and public health perspective, the findings of this study emphasize the importance of regular screening for diabetic retinopathy, especially among patients with longer duration of diabetes and poor glycemic control. Strengthening primary care-based screening programs, increasing awareness, and ensuring timely referral to specialized centers can significantly reduce the burden of visual impairment. Integration of ophthalmic services with diabetes care programs may further enhance early detection and management.

The strengths of this study include a relatively large sample size and comprehensive assessment of both clinical profile and outcomes in a real-world tertiary care setting. However, certain limitations must be acknowledged. Being a hospital-based study, the findings may not be generalizable to the community due to referral bias. The short follow-up period limits the assessment of long-term outcomes. Additionally, variability in treatment modalities based on clinical judgment may introduce heterogeneity in outcome assessment.

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The present study provides valuable insights into the clinical spectrum and outcomes of diabetic retinopathy in a tertiary care setting in South India. The findings highlight the critical role of duration of diabetes and glycemic control in disease severity and underscore the need for early screening and timely intervention to prevent vision loss.

CONCLUSION

This study highlights that diabetic retinopathy remains a significant complication among patients with diabetes mellitus attending a tertiary care hospital, with a considerable proportion presenting at moderate to advanced stages. The findings demonstrate that longer duration of diabetes, poor glycemic control, and associated comorbidities such as hypertension are key determinants of disease severity. Moderate non-proliferative diabetic retinopathy was the most common presentation, while a substantial number of patients had proliferative disease and diabetic macular edema. The study also underscores that timely and appropriate interventions, including laser photocoagulation and intravitreal therapy, can lead to stabilization or improvement in visual outcomes in a significant proportion of patients. However, the presence of irreversible visual loss in some cases highlights the need for early detection. Strengthening routine screening programs, improving patient awareness, and integrating ophthalmic evaluation into diabetes care are essential strategies to reduce the burden of visual impairment due to diabetic retinopathy.

DECLARATIONS

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REFERENCES

1. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, Colagiuri S, Guariguata L, Motala AA, Ogurtsova K, Shaw JE. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas. Diabetes research and clinical practice. 2019 Nov 1;157:107843.
2. Yau JW, Rogers SL, Kawasaki R, Lamoureux EL, Kowalski JW, Bek T, Chen SJ, Dekker JM, Fletcher A, Grauslund J, Haffner S. Global prevalence and major risk factors of diabetic retinopathy. Diabetes care. 2012 Mar 1;35(3):556-64.
3. David A, Klein R, Gardner T. Mechanisms of disease diabetic retinopathy. N. Engl. Med. J. 2012;366:1227-39.
4. Cheung N, Mitchell P, Wong TY. Diabetic retinopathy. Lancet. 2010 Jul 10;376(9735):124-36.
5. Bourne RR, Stevens GA, White RA, Smith JL, Flaxman SR, Price H, Jonas JB, Keeffe J, Leasher J, Naidoo K, Pesudovs K. Causes of vision loss worldwide, 1990–2010: a systematic analysis. The lancet global health. 2013 Dec 1;1(6):e339-49.
6. Lee R, Wong TY, Sabanayagam C. Epidemiology of diabetic retinopathy, diabetic macular edema and related vision loss. Eye and vision. 2015 Sep 30;2(1):17.
7. Anjana RM, Deepa M, Pradeepa R, Mahanta J, Narain K, Das HK, Adhikari P, Rao PV, Saboo B, Kumar A, Bhansali A. Prevalence of diabetes and prediabetes in 15 states of India: results from the ICMR–INDIAB population-based cross-sectional study. The lancet Diabetes & endocrinology. 2017 Aug 1;5(8):585-96.
8. Rema M, Pradeepa R. Diabetic retinopathy: an Indian perspective. Indian journal of medical research. 2007 Mar 1;125(3):297-310.