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Research Article

Diabetic Retinopathy

Prevalence of diabetic retinopathy in type 2 diabetic patients at Tertiary Hospital, Bangalore, India

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Introduction: Diabetic retinopathy is a common microvascular complication seen in diabetic patients. The global prevalence is estimated to be 22.27 %. (1).

Objective: This study aimed to assess the prevalence of diabetic retinopathy in type 2 diabetic patients visiting our institute – Karnataka Institute of Endocrinology and Research. Furthermore, we evaluated the severity of diabetic retinopathy and factors associated with diabetic retinopathy like gender and age group.

Methods: A total of 5,363 diabetic patients attending the vitreoretinal OPD at our Institute from November 1st, 2022 to October 31st, 2023 were included in our study. Data was collected using a questionnaire and a detailed dilated examination was done by an ophthalmologist (vitreoretina specialist).

Result: A total of 5,363 diabetic patients were included in the study. The prevalence of diabetic retinopathy was 30.84 % (95% CL: 29.66-32.12). Among5,363 patients, 3705 patients had no diabetic retinopathy (69.15%),812 had mild NPDR (15.14%), 438 had moderate NPDR (8.16%), 152 had severe NPDR (2.83%) and 252 patients had PDR (4.69 %). The prevalence of diabetic retinopathy was higher in males (34.82%) compared to females (25.01%). The odds ratio was 1.60. The prevalence of diabetic retinopathy was higher in the age group above 45 years.

Conclusion: The prevalence of diabetic retinopathy in our study was 30.84%, higher than global figures. Screening of all diabetic patients regularly and good glycemic control should be an integral part of diabetic care management to reduce the burden of diabetic retinopathy.

Keywords: Diabetes Mellitus, Diabetic Retinopathy, Prevalence

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Introduction

Diabetes mellitus is a chronic metabolic condition characterized by high blood sugar values, caused by to inability to produce adequate insulin insulin resistance or both. According to the International Diabetes Federation, 77 million people above the age of 18 years are suffering from type 2 diabetes in India [1].

The number of diabetic patients in India and worldwide has been increasing at an alarming rate due to lifestyle changes. Preventing the rise in number of diabetic patients and diabetic complications is very important. Diabetic retinopathy is a common microvascular complication seen in two-thirds of all Type 2 diabetic patients. Indians develop diabetes a decade earlier than Caucasians, with a higher number of Indians suffering from diabetes, a higher burden of diabetic retinopathy is expected. [2]

Diabetic Retinopathy (DR) is a chronic progressive disease affecting the retinal microvasculature leading to vision loss. DR occurs secondary to chronic hyperglycaemia and long-standing uncontrolled diabetes. Uncontrolled hypertension and dyslipidemia worsen DR.

Diabetic retinopathy and diabetic macular edema are graded based on the international classification of DR. Mild NPDR is characterized by the development of microaneurysms (MA) which is the earliest sign of DR. Dot and blot haemorrhages, hard exudates, cotton wool spots are seen along with MA in moderate NPDR. Severe NPDR is characterized by intra-retinal microvascular abnormalities (IRMA), venous beading and venous dilatation which eventually progresses to the development of new blood vessels on the disc, retina and anterior segment in proliferative diabetic retinopathy (PDR). Anterior segment neovascularisation in PDR can lead to the development of neovascular glaucoma which will eventually lead to a painful blind eye if left untreated.

Advanced diabetic retinopathy is characterised by significant gliosis with tractional retinal detachments and vitreous haemorrhage causing decreased visual acuity.

Any of these stages can be associated with diabetic macular edema(DME) decreasing visual acuity.

Vision-threatening diabetic retinopathy is categorised as severe NPDR, PDR and any stage of DR associated with diabetic macular edema (moderate or severe centre involved)

The purpose of this study was to assess the prevalence of diabetic retinopathy in patients visiting our institute in Bangalore, Karnataka. An average of 150 to 200 diabetic patients visit our institute daily to avail of diabetic treatment. Patients come from Bangalore City and the surrounding villages and towns of Bangalore. There is a rising prevalence of diabetes in India leading to many diabetic patients developing complications. There are not many studies addressing the prevalence of diabetic retinopathy and underlying risk factors in Karnataka. This study is aimed at studying the prevalence and risk factors of DR in diabetic patients visiting our institute.

Material and Methods

Study design:

A total of 5,363 diabetic patients attending the vitreoretinal OPD at our Institute from November 1st, 2022 to October 31st, 2023 were included in our study. This is an institution-based cross-sectional study which was conducted at our Institute in Bangalore, Karnataka. Type 2 diabetic patients above 30 years were included in this study. Data was collected by utilizing a semi-structured questionnaire and a detailed dilated examination was done by an ophthalmologist (vitreoretina specialist). The prevalence of diabetic retinopathy was estimated.

All of them underwent a detailed ophthalmological evaluation which included best-corrected visual acuity (BCVA), intraocular pressure (IOP) and dilated fundoscopy with slit lamp biomicroscopy at the vitreoretinal department of Karnataka Institute of Endocrinology and Research. They were graded based on the international classification of DR into no diabetic retinopathy, mild non-proliferative diabetic retinopathy (NPDR), moderate nonproliferative diabetic retinopathy and proliferative diabetic retinopathy (PDR). All the patients received treatment and were advised to follow up according to the International Council of Ophthalmology guidelines.

The presence of diabetes and hypertension was based on a diagnosis made by the physician and noted in the medical file.

Inclusion criteria: All diabetic patients above 30 years visiting our institute for diabetes management during the study period were included in the study.

Exclusion criteria: Diabetic patients below 30 years and type 1 patients were excluded from the study.

Results

Socio-demographic characteristics of diabetic patients

A total of 5363 diabetic patients with a mean age of 53.89 years (SD 11.01) were included in this study. Most of the patients included in the study were male 3228 (60.19%) with a mean duration of diabetes 8.41 years (SD 7.52). Demographic features are detailed in the following table.

Table 1: General Profile of Subjects with Diabetes

Gender	Number of patients	Percentage
Male	3228	60.19 %
Female	2135	39.80 %
Age Group		
30-45 years	1282	23.90 %
45-60 Years	2560	47.73 %
60-75 Years	1392	25.95%
>75 Years	129	2.40%
Duration of Diabetes		
<6 Months	767	14.30 %
6 Months-5 Years	1908	35.57%
5Yrs – 10 Years	1380	25.73%
>10 Years	1308	24.39%

Table 2: Prevalence of Diabetic retinopathy

	Number of Cases	Prevalence	95 % C. I
No Diabetic Retinopathy	3709	69.15	
Diabetic Retinopathy	1654	30.84	29.66 – 32.12
Total	5363		

Table 3: Severity of Diabetic Retinopathy

	Number of Cases	Prevalence	95 % C. I
No NPDR	3709	69.15	
Mild NPDR	812	15.14	14.19 – 16.13
Moderate NPDR	438	8.17	7.45 – 8.93
Severe NPDR	152	2.83	2.41 – 3.31
PDR	252	4.69	4.14 – 5.29
Total	5363		

Prevalence and severity of Diabetic retinopathy:

From total diabetic patients included in the study, the prevalence of DR was 30.84 % (95% CI). Among the patients with diabetic retinopathy 15.14 % had mild NPDR, 8.17 % moderate NPDR, 2.83% severe NPDR and 4.69% PDR.

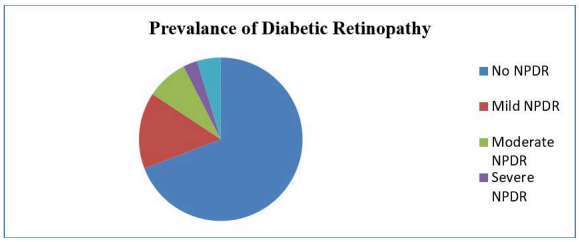

Table 4: Gender-wise distribution

	Number of Cases	DR	Prevalence	95 % C. I
Male	3228	1124	34.82	33.17 – 36.49
Female	2135	534	25.01	23.18 – 26.91

	OR	95%. C. I	P-Value
Female	Reference		
Male	1.60	1.42 – 1.82	<0.001

3228 male (60%) and 2135 female (40%) diabetic patients were included in the study. The prevalence of diabetic retinopathy was higher in males (34.82%) compared to females (25.01%). The odds ratio was 1.60

Among the male patients with diabetic retinopathy, 16.08% had mild NPDR, 9.85% mod. NPDR, 3.44 % severe NPDR and 5.42% PDR.

Among the female patients with diabetic retinopathy, 13.72% had mild NPDR, 5.62% mod. NPDR, 1.92 % severe NPDR and 3.61% PDR.

Table 5: Severity of diabetic retinopathy in male and female Subjects

	NO NPDR	Mild NPDR	Moderate NPDR	Severe NPDR	PDR	Total	P-Value
Male	2105 (65.21%)	519 (16.08%)	318 (9.85%)	111 (3.44%)	175 (5.42%)	3228	<0.001
Female	1604 (75.13%)	293 (13.72%)	120 (5.62%)	41 (1.92%)	77 (3.61%)	2135	
Total	3709	812	438	152	252	5363	

Duration of Diabetes: With regards to the duration of diabetes, 14.30% of patients had diabetes for less than 6 months,

35.57% had diabetes between 6 months to 5 years, 25.73 % had diabetes between 5 years to 10 years, and 24.38% had diabetes above 10 years. The mean duration of diabetes was 8.41 years.

Table 6: Duration of Diabetes

	Number of Cases	Percentage
<6 Months	767	14.30%
6 Months-5 Years	1908	35.57%
5Yrs – 10 Years	1380	25.73%
>10 Years	1308	24.38%
Total	5363	

The mean duration of diabetes	8.41 Years
Median	7 Years
SD	7.52 yrs

Table 7: Age of patients

	Number of Cases	Percentage
30-45 years	1282	23.90%
45-60 Years	2560	47.73%
60-75 Years	1392	25.95%
>75 Years	129	2.40%
Total	5363	

Mean Age	53.89
SD	11.01
Min-Max	30-92

With regards to age, the highest numbers of patients were in the age group of 45 to 60 years which constituted about 47.73%. The lowest numbers of the patients were in the age group above 75 years which constituted about 2.40%. The mean age in the study was 53.89 yrs.

Comparison of age with Diabetic retinopathy and severity of Diabetic retinopathy:

In the age group of 30 – 45 years, 80 % of the patients had no diabetic retinopathy compared to the age group of 45 – 60 years only 67 % had no diabetic retinopathy. The prevalence of diabetic retinopathy was 20 % in the age group of 30 – 45 years but in the age group of above 75 years, the prevalence of diabetic retinopathy was 37 %.

The higher the age group – the higher the prevalence of diabetic retinopathy – probably relating to the longer duration of diabetes and the presence of more comorbidities.

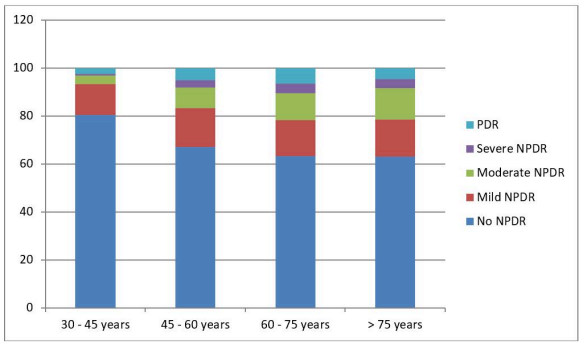

Table 8: Comparison of age with Diabetic retinopathy and severity of Diabetic retinopathy

	NO NPDR	Mild NPDR	Moderate NPDR	Severe NPDR	PDR	Total	P-Value
30-45 Years	1033 (80.51%)	164 (12.78%)	46 (3.59%)	10 (0.78%)	30 (2.34%)	1283	<0.001
45-60 Years	1713 (66.97%)	420 (16.42%)	220 (8.60%)	79 (3.09%)	126 (4.93%)	2558	
60-75 Years	881 (63.29%)	208 (14.94%)	155 (11.14%)	58 (4.17%)	90 (6.47%)	1392	
>75 Years	82 (63.08%)	20 (15.38%)	17 (13.08%)	5 (3.85%)	6 (4.62%)	130	
Total	3709	812	438	152	252	5363	
	69.15	15.14%	8.16%	2.83%	4.68%		

Table 9: Univariate analysis for predicting diabetic retinopathy by age

	OR	95%. C. I	P-Value
30-45 Years	Reference		
45-60 Years	2.04	1.74 – 2.40	<0.001
60-75 Years	2.40	2.01 – 2.86	<0.001
>75 Years	2.42	1.65 – 3.54	<0.001

The prevalence of diabetic retinopathy was higher in the age group above 45 years compared to the age group of 30 – 45 years. The odds ratio in the age group 45-60 years was 2.04, the age group 60-75 years was 2.40 and above 75 years were2.42.

Discussion

India has a high burden of type 2 diabetes mellitus. According to the IDF Diabetes Atlas 9th Edition (International Diabetes Federation), 77 million people above the age of 18 years are suffering from type 2 diabetes in India and it is predicted to increase to 101 million by 2030 and 134.2 million by 2045. Approximately 1 in 11 adults in India is a diabetic and every one of them is at risk of developing diabetic retinopathy.

More than 50% of people are unaware of their diabetes status. There are an increasing number of prediabetics (25 million) adding to the burden.

DR is a common microvascular complication seen in diabetic patients. If not recognized early and treated can lead to blindness. According to World Health Organisation (WHO), diabetic retinopathy is the 3rd leading cause of blindness globally. Most of the patients do not get evaluated for diabetic retinopathy due to a lack of awareness and lack of availability of an Ophthalmologist (vitreoretinal specialist).

The diabetic retinopathy prevalence in this study was 30.84 % (95% CI), which was higher than the global prevalence estimated to be 22.27 %(1). It is higher compared to earlier studies done in south India – Rema et. al – a prevalence of 24% [3], Dandona et. al – a prevalence of 22.4% [4], V. Narendran et al – 26.2 % [5]. Similarly, studies done in other parts of India showed huge variability in prevalence rate ranging between 10. 3% to 21.7% - as shown in the table 10 below.

The higher prevalence noted in our study is probably because our institute is an endocrinology centre and a large number of diabetic patients with complications like diabetic foot wounds, nephropathy and retinopathy are being referred to our centre for complete diabetic care management. Our study has also included diabetic patients over 30 years as we are observing an increase in the prevalence of diabetes in the younger population. There is an increasing trend of prevalence of diabetes with decreasing age as shown in this study- by Bhavesh Patel et al (6). The average age of onset of diabetes during 1991- 1995 was 48.53 years, 42.70 years in 1996-2000, 41.98 years in 2001-2005, 39.5 years in 2006-2010, 35.79 in 2011-2015 and 36.14 in 2016-2018.

Most patients with diabetic retinopathy had mild NPDR - 15.14 %. Moderate NPDR was observed in 8.16%, Severe NPDR in 2.83% and PDR in 4.68% of patients with diabetic retinopathy

Similar to other studies, in this study DR prevalence was significantly higher in patients above 45 years (OR 2.04 - 2.42) as compared to patients below 45 years of age.

The prevalence of diabetic retinopathy was higher in males (34.92%) compared to females (25.01%). The odds ratio was 1.60.

Table 10: Comparison with some of the other studies done in India

Study		Prevalence	VTDR	Interpretation
1. Prevalence of diabetic retinopathy in India stratified by known and undiagnosed diabetes, urban–rural locations, and socioeconomic indices: results from the SMART India population-based cross-sectional screening study [11]	The Lancet;vol 10; Issue 12;Dec 2022 42,146 individuals aged40yearsand older	12·5%	4·0%	3 million people aged 40 years or older have VTDR in IndiaHyperglycaemia was the strongest modifiable risk factor.
2. Prevalence of diabetic retinopathy in India: Results from the National Survey2015-19-Praveen Vashist et al [16]	Indianjournal of ophthalmology 2021Nov; 69(11): 3087–3094 63,000 patients aged >50 yrs	16.9% Urban 20.7% Rural 15.5%	3.6%	Risk factors for DR Duration of diabetes (>10 years, OR 4.8, 95% CI: 3.3–6.9),poor glycemic control (≥200 mg/dL, OR: 1.5, 95% CI: 1.2–1.7) and insulin treatment (OR: 2.6, 95% CI: 1.7–4.1Increased prevalence in the sixth decade
3. Prevalence and risk factors for diabetic retinopathy in India. SankaraNethralaya Diabetic Retinopathy Epidemiology and Molecular Genetic Study III (SN-DREAMS III),-Rajiv Raman et al; [18, 23]	BMJ Open Diabetes Res Care;2014 Jun 6;2Study report 213,079 participants Rural population of South India Ophthalmology Feb 2009 116(2);311-8 study report 25,999 participants Urban population older than 40 yrs	10.3% 18%	4.6% to 6.8%	Men at greater risk; OR- 1.52The strongest predictor-duration of diabetes.
4. Diabetic retinopathy among diabetic patients seen at tertiary carecentrein Andaman and Nicobar Islands Shipra Gupta, Sutapa Das, Abhishek Onkar2Tushar Vashisht [20]	Ophthalmology Journal;vol 8 2023 600 patients	18.67%		Higher prevalence of DRMales (p = 0.011),Duration of diabetes >10 years (p = 0.008),People aged 61 to 70 (p = 0.001), Poorly controlled diabetes with glycated haemoglobin (HbA1c) values > 5 % (p = 0.001).
5. Prevalence of vitreoretinal disorders in a rural population of southern India: the Aravind Comprehensive Eye StudyNirmalan PK et al [22]	Arch ophthalmology· 2004 Apr;122(4):581-6.	10.5%		
6. Prevalence of diabetic retinopathy in India: The All India Ophthalmological Society Diabetic Retinopathy Eye Screening Study 2014; Salil S Gadkari, Quresh B Maskati, and Barun-Kumar Nayak [21]	Indian journal of ophthalmology 2016 Jan; 64(1): 38–44 Pan-India DR Eye Screening Study in Diabetes clinics and camps>80% urban population - 5130 known diabetic patients	21.7% 12.27% central zone and 34.06% in the north zone		Higher prevalence with an increase in age (OR: 2.367) and duration of diabetes (OR: 3.318) Males (OR: 1.212) were more affected

Previous studies have shown different results about the prevalence of diabetic retinopathy and gender. Some studies have shown a higher prevalence of DR in females (7-8) and in other studies done in India like the Cures Eye Study (9), Hyderabad study (10), all India study (11) and a European study (12), have shown higher prevalence in men.

Conclusion

DR is a vision-threatening complication that can affect every diabetic patient. Many patients have good vision even in advanced stages of diabetic retinopathy hence do not find the need to get themselves evaluated for diabetic retinopathy.

Our study shows a higher prevalence of DR compared with the global and national prevalence. This highlights the fact that screening for diabetic retinopathy in every diabetic patient at diagnosis and thereafter irrespective of the duration of diabetes is paramount. This will help identify all diabetic patients at risk of developing sight-threatening diabetic retinopathy at the earliest. Once identified these patients can receive timely treatment, helping in preventing progression and preserving vision.

Diabetic retinopathy screening should become an integral part of diabetic care management as it is a preventable and treatable complication of diabetes.

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