

**Assessment of Diabetic Ocular Complications with Emphasis on Diabetic Retinopathy: A 2009 Retrospective Study**Kukadia Gautamkumar Maganlal<sup>1</sup>, Rashmita Gautam Kumar<sup>2</sup><sup>1</sup>Assistant Professor, Department of Ophthalmology, ICARE Institute of Medical Sciences and Research, Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India<sup>2</sup>Assistant Professor, Department of Ophthalmology, ICARE Institute of Medical Sciences and Research and Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India

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**Abstract****Background:** Diabetes Mellitus is an important global health problem that is associated with many complications such as the diabetic retinopathy, which is the leading cause of blindness.**Aim:** To identify ocular complications among diabetics emphasizing diabetic retinopathy and the association of diabetic retinopathy with demographic characteristics and longevity of diabetes.**Methodology:** This study was a retrospective observational study done within a year at a tertiary eye hospital. Records from 150 patients suffering from diabetes mellitus were analyzed for the study. Data analysis was done using MS Excel and SPSS (version 24). Descriptive statistics and chi-square test were used.**Results:** Prevalence rate for diabetic retinopathy was 60%, where non-proliferative diabetic retinopathy (NPDR) was seen in 66.7% of cases and proliferative diabetic retinopathy (PDR) in 33.3%. Diabetic macular edema was seen in 16.7% of cases. Longer duration of diabetes, particularly more than 10 years duration, showed increased prevalence for retinopathy. Predominant age group affected was between 51-60 years (30.0%) and males had slight dominance (56.7%).**Conclusion:** Diabetic retinopathy is among the most frequent eye diseases that patients with diabetes suffer from. The severity of diabetic retinopathy varies based on the length of the time the patient has been living with diabetes as well as the age of the person.**Keywords:** Diabetic Retinopathy, Diabetes Mellitus, Ocular Complications, NPDR, PDR, Diabetic Macular Edema.

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**Introduction**

Diabetes mellitus is now one of the major health concerns around the world and due to its many complications, it impacts significantly the quality of life in a negative way. One such complication includes complications to the eyes, and the most serious one is diabetic retinopathy, which is the leading cause of blindness in the workforce due to diabetes [1]. Prolonged hyperglycemia results in complications to the microvessels, which develop progressively in the retina with resultant anatomical and physiological changes to the eye, hence resulting in permanent blindness if not intervened in early stages [2]. The importance of diagnosing retinopathy becomes increasingly relevant due to the increasing prevalence rate of diabetes particularly in the developing nations where it is difficult to do routine screenings. Other eye problems related to diabetes include macular edema, hence making eye examinations important for diabetes patients [3]. Therefore, it is crucial that

these complications are diagnosed in order to minimize morbidity rates and ultimately prevent blindness. This explains why this study was carried out on diabetic ocular complications and their associated risk factors especially retinopathy.

**Background of the Study**

Diabetic eye problems are a serious and growing global health issue due to the rising number of people suffering from diabetes mellitus [4]. Hyperglycemia results in progressive damage of microvasculature, specifically retinal blood vessels, causing retinopathy that is the commonest cause of blindness and poor eyesight. Diabetic eye disorders are more common and severe with longer duration of diabetes mellitus and absence of proper diabetes management and aging [5]. Furthermore, other conditions such as diabetic macular edema also contribute to poor eyesight and quality of life [6]. Despite the progress in diagnostic methods and treatment strategies, many diabetic patients are

usually detected late when the condition reaches the advanced stage, especially in areas with limited resources [7]. The importance of understanding the epidemiology, prevalence, and associated factors of diabetic eye disease lies in improving early detection, clinical management, and minimizing unnecessary blindness [8].

#### **Pathophysiology of Diabetic Retinopathy:**

Diabetic retinopathy is a result of the damage caused to the microvascular system of the retina by chronic high blood sugar levels and is a combination of metabolic, biochemical, and inflammatory responses [9]. Chronic hyperglycemia triggers several processes such as polyol pathway [10], production of AGEs, activation of protein kinase C and elevation of oxidative stress, which play a role in endothelial dysfunction and pericyte loss-specific cells that ensure capillary stability [11]. This causes capillary wall weakening, which causes microaneurysm, vascular permeability, and the destruction of blood-retinal barrier, causing the leakage of plasma constituents and retinal edema [12]. Thickening of the basement membrane and increased adhesion of leukocytes (leukostasis) will result in capillary occlusion, leading to ischemia of the retina [13]. Ischemia of the retina will trigger hypoxia-inducing factors and thus stimulate the production of VEGF, resulting in pathological neovascularization as seen in proliferative diabetic retinopathy [14]. These vessels tend to be fragile and hence prone to bleeding, thus causing complications like vitreous hemorrhage and retinal traction detachment [15]. Besides, the accumulation of fluid in the macula results in macular edema, which is responsible for the loss of visual acuity in diabetic patients. As such, the evolution of non-proliferative diabetic retinopathy into proliferative diabetic retinopathy is part of the continuum of microvascular disease as a consequence of metabolic disorder.

#### **Research Objectives**

The objectives of the study are:

- To determine the prevalence of diabetic retinopathy among those who suffer from diabetes mellitus.
- To classify the type of diabetic retinopathy (non-proliferative or proliferative) in the affected patients.
- To determine the relationship between the duration of the disease and its severity.
- To examine demographic profile (age and gender) of diabetic ocular complications patients.

**Methodology:** The aim of this study was to perform a systematic assessment of the diabetic ocular complications and specifically diabetic retinopathy using general clinical data in

retrospective fashion. A systematic methodology was used to bring reliability, reproducibility and clinical relevance of results.

**Study Design:** This study design is retrospective observation. Ocular complications, particularly diabetic retinopathy, were examined by analyzing medical history of diabetic patients in order to estimate the incidence of such complications.

**Study Area:** The study was carried out at the Department of Ophthalmology, ICARE Institute of Medical Sciences and Research, Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India.

**Study Duration:** The study was conducted over a period of one year.

#### **Study Participants**

##### **Inclusion Criteria:**

- Patients diagnosed with Type 1 or Type 2 Diabetes Mellitus.
- Patients who had undergone an extensive examination of their eye(s) within the duration of the study.
- Patients who possess complete and accessible medical histories.

##### **Exclusion Criteria:**

- Patients without adequate information regarding their eyes.
- Patients with non-diabetic conditions affecting the eye (such as trauma and congenital conditions).
- Patients with past ocular surgery which could affect examination of the retina (with the exception of cataracts).

**Sample Size:** Totally, 150 patient files were selected for the research depending on their availability and meeting specific criteria. Convenience sampling was carried out in order to determine the number of patients who could be included into the sample depending on age and the period of disease.

**Procedure:** Hospital medical records and ophthalmology registers were used to gather data. Extracted variables included:

- Demographic details (age, gender)
- Duration of diabetes
- Blood glucose levels (fasting/random, if available)
- Visual acuity measurements
- Fundoscopic examination findings

Standard clinical criteria were used to classify diabetic retinopathy into:

- Non-Proliferative Diabetic Retinopathy (NPDR)
- Proliferative Diabetic Retinopathy (PDR)

- Diabetic Macular Edema (DME), where applicable

Any fundus examination results were founded on the reported ophthalmoscopy or fundus photography reports as taken by qualified ophthalmologists.

**Statistical Analysis:** The results obtained were entered into Microsoft Excel where they were analysed using IBM SPSS Statistics (version 24).

- Frequency, percent, mean, and standard deviation were calculated for the descriptive analysis.

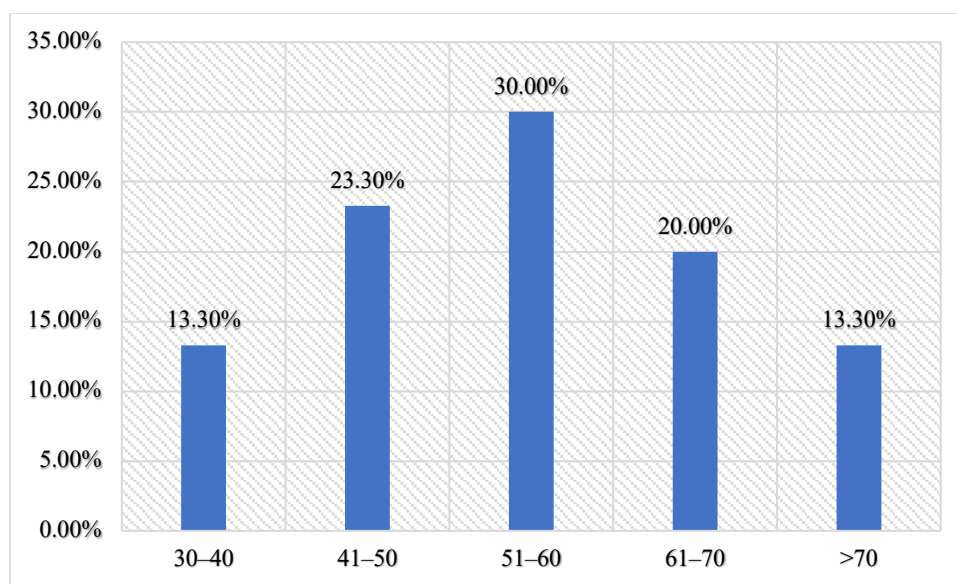
- Chi-square tests were conducted to analyze relationships among variables (for instance, between the duration of diabetes and retinopathy's seriousness).
- A p-value < 0.05 was considered statistically significant.

**Results**

This study involved the use of data from 150 patients' records for the purpose of establishing the prevalence rates of ocular complications among diabetic patients, focusing more on the diabetic retinopathy. This is illustrated using the following descriptive statistics. The following are the results obtained from the study subjects.

**Table 1: Participants' Age Distribution (n = 150)**

Age Group (years)	n	%
30-40	20	13.3%
41-50	35	23.3%
51-60	45	30.0%
61-70	30	20.0%
>70	20	13.3%
<b>Total</b>	<b>150</b>	<b>100%</b>



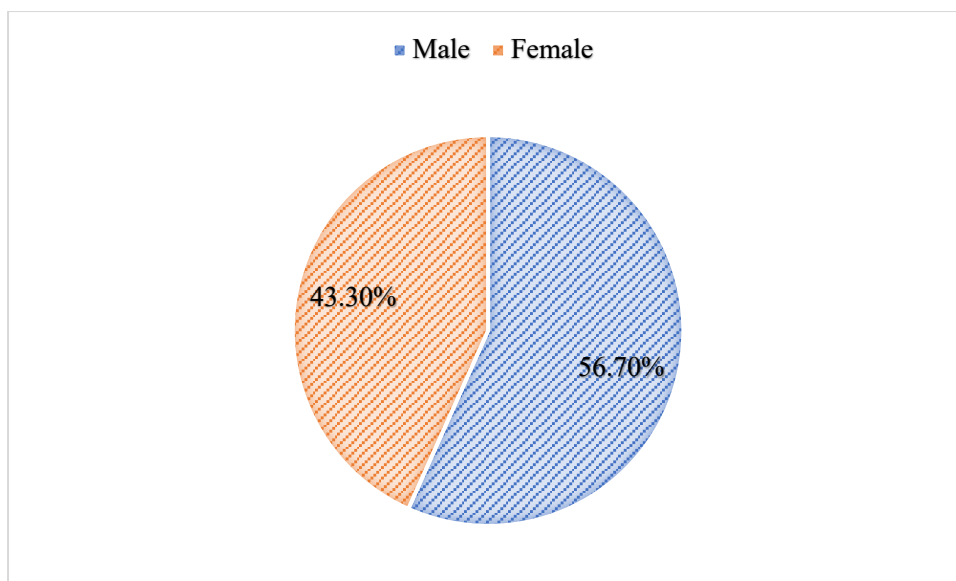
**Figure 1: Visual Representation of Age Distribution of Participants**

The biggest proportion was found to be from the age category 51-60 years (45, 30.0%), followed by 41-50 years (35, 23.3%). Even a high presence in the older category (61-70 years: 30, 20.0%) is quite positive since it shows that the occurrence of

diabetic eye disease is more common in middle and older adults. However, the least commonly observed category was 30-40 years and >70 years (20, 13.3% each).

**Table 2: Gender Distribution of Participants (n = 150)**

Gender	n	%
Male	85	56.7%
Female	65	43.3%
<b>Total</b>	<b>150</b>	<b>100%</b>



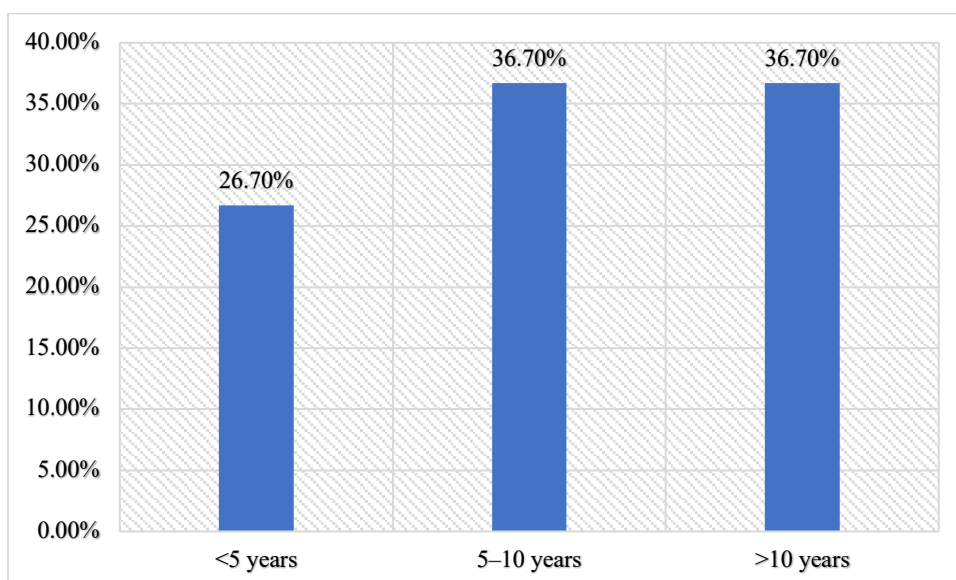
**Figure 2: Visual Representation of Gender Distribution**

Male respondents (85, 56.7%) were higher compared to female respondents (65, 43.3%), hence indicating that male patients constituted slightly more than half of the sample population. The differences could arise due to easy access to

health care services among men or complications linked with diabetes among the male population. However, the presence of substantial male and female respondents indicates that diabetic eye complications affect both genders.

**Table 3: Distribution Based on Duration of Diabetes**

Duration (years)	n	%
<5	40	26.7%
5-10	55	36.7%
>10	55	36.7%
<b>Total</b>	<b>150</b>	<b>100%</b>



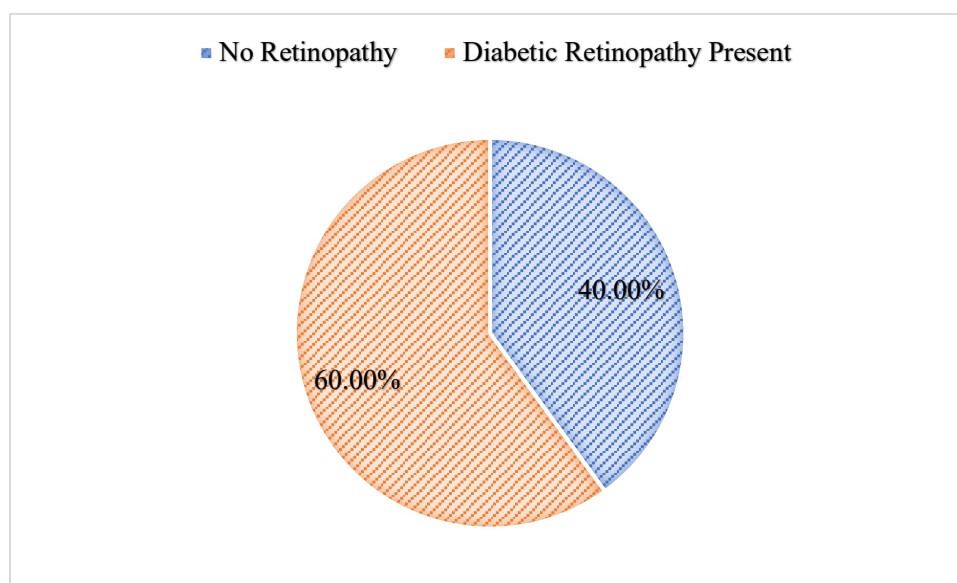
**Figure 3: Visual Representation of Distribution Based on Duration of Diabetes**

A larger percentage of patients had 5-10 years and more than 10 years duration of diabetes (55 and 36.7%), as opposed to < 5 years (40 and 26.7%, respectively). This suggests that the subjects had

been having diabetes for a longer period of time. The distribution reflects the clinical expertise of diabetes chronicity being a very significant factor in developing eye-related problems.

**Table 4: Prevalence of Diabetic Retinopathy**

Condition	n	%
No Retinopathy	60	40.0%
Diabetic Retinopathy Present	90	60.0%
<b>Total</b>	<b>150</b>	<b>100%</b>

**Figure 4: Visual Representation of Prevalence of Diabetic Retinopathy**

The total number of diabetic retinopathy was 90 (60.0%), whereas the total number of diabetic patients without retinopathy signs was 60 (40.0%). This clearly shows that the occurrence of diabetic

retinal disease is comparatively higher. Therefore, the findings clearly show that diabetic patients need to be screened regularly.

**Table 5: Classification of Diabetic Retinopathy (n = 90)**

Type of Retinopathy	n	%
NPDR	60	66.7
PDR	30	33.3
<b>Total</b>	<b>90</b>	<b>100</b>

Out of the total of 90 individuals suffering from diabetic retinopathy, 60 had NPDR (66.7%), while 30 had PDR (33.3%). It means that most cases were in the early stages. Nevertheless, the large

number of individuals with PDR indicates the serious risk of sight-threatening conditions if not handled in good time.

**Table 6: Presence of Diabetic Macular Edema (DME)**

DME Status	n	%
Present	25	16.7
Absent	125	83.3
<b>Total</b>	<b>150</b>	<b>100</b>

Diabetic macular edema was found in 25 patients (16.7%), and the rest (125, 83.3%) had no DME. Even though less common, DME is still a serious complication because of its direct effect on the

central vision. The results show that there is a significant segment of patients who are at risk of vision impairment.

**Table 7: Association Between Duration of Diabetes and Severity of Retinopathy**

Duration (years)	NPDR (n)	PDR (n)	Total
<5 years	10	2	12
5–10 years	25	10	35
>10 years	25	18	43
<b>Total</b>	<b>60</b>	<b>30</b>	<b>90</b>

An increasing trend in severity of retinopathy was observed with longer duration of diabetes. The PDR cases were higher among the patients who had >10 years duration (18 out of 43) than those with <5 years (2 out of 12). The PDR was on the rise, and NPDR was prevalent in the older times. This trend indicates that there is a close relationship between long-term diabetes and progressive retinal damage.

### Discussion

The current analysis has shown that diabetic retinopathy is very common (60%) in diabetic patients and this implies that ocular complication is a big burden. This result is greater than a number of population-based studies, in which the prevalence of diabetic retinopathy in the globe has been estimated at about 35% (Sim et al., 2015) [16]. The increased prevalence of this study could be due to the fact that the study was conducted in a hospital setting which usually involves more symptomatic or advanced cases. In the same vein, a study in India found that the prevalence was approximately 30.8, which is significantly lower than what is being reported, which further indicates the possibility of referral bias in tertiary care (Sim et al., 2016) [17]. In this way, the findings support the significance of frequent screening, particularly in clinical groups at risk.

As far as classification is concerned, the most prevalent one was non-proliferative diabetic retinopathy (NPDR) (66.7%), whereas proliferative diabetic retinopathy (PDR) became 33.3%. Such results are in line with the earlier literature, where NPDR has been identified as the most common retinopathy stage, and PDR is a less but clinically meaningful percentage (Thomas et al., 2012) [18]. Moreover, the incidence of diabetic macular edema (16.7%) in the current study is consistent with the previous studies that have shown that DME occurs in about 7-11% of diabetic patients with time. This is, again, higher compared to the relatively high, but this is indicative of the nature of the sample (hospital based). These results underscore the idea that although NPDR is more common, such complications as PDR and DME play an important role in causing vision-threatening outcomes.

The duration of diabetes and severity of retinopathy were found to be strongly associated with cases of PDR rising to 18 in patients with >10 years duration in comparison to 2 with < than 5 years. The trend is in agreement with the prior literature, which has uniformly found longer duration of diabetes as a significant risk factor in both the development and progression of diabetic retinopathy (Whitehead et al., 2018) [19]. Also, the demographic analysis in the current study revealed that prevalence increases with middle-aged and elderly groups, which is consistent with current

evidence that an age increase and chronic exposure to hyperglycemia increase the risk of retinal damage (Zhao et al., 2012) [20]. In general, the study results can be compared to the existing literature, which supports the idea that age and duration of being diabetic are the most important factors that define the severity of the disease.

### Conclusion

The current research proved that diabetic eye disorders and particularly diabetic retinopathy were an immense burden for patients with diabetes mellitus. It was observed that there existed a high rate of diabetic retinopathy (60%) and non-proliferative diabetic retinopathy was more prevalent; however, a considerable number of diabetic retinopathy cases progressed to proliferative diabetic retinopathy and diabetic macular edema, indicating risk factors associated with the danger of blindness. It was evident that the more a patient had diabetes, the higher the degree of retinopathy became and chronic hyperglycemia was one of the factors contributing to the occurrence of the disease. Furthermore, the participation of mid-aged and elderly patients was more pronounced, demonstrating the role of age as a factor. Overall, the article stressed the necessity of early diagnostics, eye examinations, and immediate therapy to prevent complications and reduce the probability of the emergence of vision problems in diabetics.

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