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PREVALENCE OF PROLIFERATIVE DIABETIC RETINOPATHY IN ISLAMABAD AND RAWALPINDI: A CROSS-SECTIONAL STUDY

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Abstract

Background: Proliferative diabetic retinopathy (PDR) is the advanced stage of diabetic retinal disease that can lead to severe vision loss. Global estimates indicate that diabetes mellitus affects over 529 million people. In Pakistan, which ranks among the countries with the highest diabetes prevalence, DR is a significant public health problem. This study aimed to determine the prevalence of PDR among diabetic patients aged ≥40 years in the twin cities of Islamabad and Rawalpindi. **Methods:** We conducted a hospital-based cross-sectional study of 200 diabetic patients (128 from Rawalpindi and 72 from Islamabad) between April 2024 and July 2024. All participants underwent a comprehensive ophthalmic examination to grade retinopathy. Demographic and clinical data (age, sex, duration of diabetes, co-morbid conditions, treatment type) were recorded. Descriptive statistics were calculated. **Results:** The study sample had a mean age of 57 years; 110 (55%) were male, and 90 (45%) were female. 40% of patients had hypertension, 15% dyslipidemia, and 10% reported poor long-term glycemic control. Overall, 50% had some form of DR: 76 (38%) with non-proliferative DR and 24 (12%) with PDR. Thus, the prevalence of PDR in this cohort was 12%. PDR was more common in patients with longer diabetes duration and those with poor glycemic control. **Conclusions:** The Study concluded that PDR prevalence among diabetic patients was 12%, underscoring the need for aggressive screening and management. Given that even a few percent of vision-threatening retinopathy represent a major burden, our findings support intensified DR screening programs and risk factor control in Pakistani diabetes care.

Keywords: Diabetic Retinopathy, Proliferative Diabetic Retinopathy, Prevalence, Diabetes Mellitus, Pakistan.

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INTRODUCTION

Diabetic retinopathy (DR) is a microvascular complication of diabetes mellitus and a leading cause of vision impairment worldwide [1]. With the rapid rise in diabetes prevalence now >529 million adults globally, the burden of DR, especially its sight-threatening stages, has grown [2]. Recent meta-analyses estimate that roughly 25–30% of people with diabetes have any DR, with substantial geographic variation [1],[3]. For example, pooled analyses report DR prevalence of 28% in South Asian populations, compared to lower rates (20%) in Europe and higher rates (36%) in parts of Africa [4],[5]. In Pakistan, where over one-quarter of adults have diabetes, DR prevalence among diabetics has been reported in the 20–30% range [5],[6]. However, data on proliferative DR (PDR) specifically are scarce. PDR is characterized by neovascularization and can lead to vitreous hemorrhage and tractional retinal detachment if untreated. In industrialized countries, it remains a leading cause of blindness among working-age adults [4]. Identifying how common PDR is in Pakistani diabetic patients is critical for eye-care planning. Key risk factors for DR progression include longer diabetes duration, poor long-term glycemic control, hypertension, and dyslipidemia [7]. For instance, recent studies show that patients with ≥10 years of diabetes have several-fold higher odds of DR, and uncontrolled blood sugar and hypertension significantly increase progression risk [4],[7]. Understanding local prevalence and risk profiles helps prioritize screening and prevention. We therefore conducted a cross-sectional study to determine the prevalence of PDR among diabetic patients in a tertiary care hospital of Islamabad/Rawalpindi, and to evaluate the associations of PDR with clinical factors (diabetes duration, glycemic control, hypertension, dyslipidemia).

METHODS

This observational cross-sectional study was conducted during April-July 2024 in the ophthalmology department of a tertiary care hospital in Islamabad. A total of 200 diabetic patients aged ≥40 years were recruited using non-probability purposive sampling. The sample size was guided by Creswell's (2017) recommendation that 10–20% of a large population provides an adequate sample for meaningful analysis [8], making 200 participants appropriate for this study. Participants aged 40 years and above with a confirmed diagnosis of diabetes mellitus, irrespective of gender, were included to ensure a comprehensive assessment of PDR prevalence. Patients younger than 40 years, those without diagnosed retinopathy, and individuals with coexisting ocular pathologies unrelated to diabetic retinopathy were excluded to maintain the study's focus. Each patient underwent a comprehensive ocular examination: slit-lamp biomicroscopy, indirect ophthalmoscopy, and dilated fundus examination by a retinal specialist, using standard slit lamps and a 90D lens. Grading of retinopathy (no DR, NPDR, or PDR) was based on the Early Treatment Diabetic Retinopathy Study (ETDRS) criteria. PDR was defined by the presence of any neovascularization on the disc or elsewhere in the retina. Clinical and demographic data were collected using a structured form. Variables included age, sex, duration of diabetes, type of diabetes, treatment modality, history of hypertension or

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dyslipidemia, and evidence of glycemic control (most recent HbA1c). For “poor glycemic control,” we used an HbA1c ≥8% or fasting glucose repeatedly >180 mg/dL. The data were entered into SPSS Version 26 for analysis. Descriptive statistics (means, frequencies) were computed for all variables. The primary outcome was the prevalence of PDR (proportion of patients with PDR). We also calculated the prevalence of any DR (NPDR or PDR) to contextualize our findings. The study protocol conformed to the Declaration of Helsinki and was approved by the institutional review board vide letter no: XXX-HI-PUB-ERC/123 of the participating hospitals. Written informed consent was obtained from all participants before examination.

RESULTS

A total of 200 diabetic patients were enrolled; 128 (64%) were from Rawalpindi and 72 (36%) from Islamabad. The mean age was 57±10 years (range 40–76); 110 (55%) were male and 90 (45%) female. The age distribution was broad: 27% were 40–49 years, 32% 50–59 years, 27% 60–69 years, and 14% ≥70 years. Most patients (57%) had type 2 diabetes, and 43% had type 1. The duration of diabetes varied; 30% had it for ≤5 years, 25% for 6–10 years, and the remainder over 10 years. Common comorbidities included hypertension in 80 (40%) patients and dyslipidemia in 30 (15%). Poor long-term glycemic control was identified in 20 (10%) patients (Table 01)

Table 1: Demographic and clinical characteristics of study participants (N=200).

Variable	n(%)
Age group (years)	
40–49	54 (27.0%)
50–59	64 (32.0%)
60–69	54 (27.0%)
≥70	28 (14.0%)
Sex	
Male	110 (55.0%)
Female	90 (45.0%)
Type of diabetes	
Type 1	86 (43.0%)
Type 2	114 (57.0%)
Duration of diabetes	
0–5 years	60 (30.0%)
6–10 years	50 (25.0%)
11–15 years	40 (20.0%)
16–20 years	30 (15.0%)
>20 years	20 (10.0%)
Hypertension history	
Yes	80 (40.0%)
No	120 (60.0%)
Dyslipidemia history	
Yes	30 (15.0%)
No	170 (85.0%)
Poor glycemic control	
Yes	20 (10.0%)
No	180 (90.0%)

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Overall, half of the patients (100/200, 50%) had evidence of diabetic retinopathy on exam. Among these, 76 (38% of all patients) had non-proliferative DR (NPDR) and 24 (12% of all patients) had proliferative DR (PDR). Thus, the prevalence of PDR in this cohort was 12%. No DR was observed in the remaining 100 patients (50%). Table 2 summarizes the distribution of retinopathy stages. The 12% PDR rate indicates that about one in eight diabetic patients in our urban sample has vision-threatening disease.

Table 2: Prevalence of diabetic retinopathy among participants (N=200).

Retinopathy status	n (%)
No DR	100 (50.0%)
Non-proliferative DR (NPDR)	76 (38.0%)
Proliferative DR (PDR)	24 (12.0%)

DISCUSSION

In this urban Pakistani cohort, the prevalence of proliferative diabetic retinopathy was 12%. This rate is noteworthy given that PDR is the vision-threatening stage of DR. For comparison, a recent large Ethiopian clinic study reported only a 3.1% PDR prevalence among 1,219 diabetic patients [9]. The higher rate in our study may be related to differences in the patient population, as our sample was somewhat older and possibly more advanced. Conversely, a recent Pakistani hospital-based series (n=366) found PDR in 27.2% of diabetics, as reported by, which is considerably higher; that discrepancy might reflect referral bias or regional variability [6]. Globally, meta-analyses suggest much lower average PDR rates [10],[11]. For instance, a systematic review estimated that roughly 6–7% of diabetics have PDR based on the global DR prevalence of 25% with 30% of those having PDR [11], [12], [13]. Thus, our 12% is above the typical global average and highlights a substantial burden in these Pakistani cities. The overall DR prevalence in our cohort was 50%, which aligns with findings from rural Pakistan (24% DR) when accounting for differences in setting and methodology [14],[15]. Jokhio et al. reported 24% DR prevalence in a rural Sindh population [5], but our higher 50% likely reflects our sampling of older clinic patients. National estimates in Pakistan suggest that about 28.8% of people with diabetes have DR [6],[15]. The study finding confirms that among those with DR, a non-negligible fraction has progressed to PDR. Although this analysis was not powered for detailed modeling, the results of this analysis suggest that known risk factors play a role. Patients with PDR tended to have longer diabetes duration and poorer glycemic control (e.g., higher HbA1c and fasting glucose, unshown), consistent with the literature [16],[17],[18]. For example, Wondmeneh and Mohammed's meta-analysis identified diabetes duration ≥10 years (adjusted OR 4.4) and poor glycemic control (OR 3.8) as strong predictors of any DR. Similarly, Shumye et al. found that hypertension (AOR 4.3), long diabetes duration (≥10 years, AOR 5.3), nephropathy, neuropathy, insulin use, and poor medication adherence were significantly associated with PDR [10], [11], [19]. These findings highlight that PDR tends to develop in patients with long-standing, poorly controlled diabetes and concomitant vascular comorbidities. Hypertension was

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present in 40% of our patients and is a well-known cofactor: uncontrolled blood pressure exacerbates retinal microvascular damage [20], [21].

Strengths and Limitations

This study provides much-needed PDR prevalence data from Pakistan, using direct fundus examination by optometrists/ophthalmologists. However, limitations include non-random sampling and modest sample size (N=200), which may limit generalizability. The cross-sectional design precludes inference about incidence or temporal progression. We relied on a one-time clinical exam rather than fundus photography, which might slightly underestimate mild DR cases. Data on glycemic control and lipids were based partly on history, so measurement error is possible. Despite these limitations, the relatively high PDR rate found suggests a genuine public health concern.

CONCLUSION

In conclusion, among diabetic patients in the twin cities of Islamabad and Rawalpindi, 12% had proliferative diabetic retinopathy. This relatively high prevalence of advanced DR underscores the need for strengthened screening programs in Pakistan's urban centers. Early detection of retinopathy through regular retinal examinations is essential to prevent vision loss. In addition, aggressive management of systemic risk factors, particularly long-term blood glucose control and hypertension, should be emphasized in diabetic care. The findings support national efforts to implement comprehensive diabetic eye care, including patient education, periodic retinal screening, and integrated data registries. With diabetes prevalence rising, such strategies are critical to mitigate the burden of blinding retinopathy in Pakistan.

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