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DIABETIC RETINOPATHY, FREQUENCY, SEVERITY, AND RISK CORRELATES AT DIR LOWER

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Abstract

To determine the frequency and severity of DR in people aged 30 and older, this community-based cross-sectional survey was conducted in several rural and urban regions of District Dir Lower, Khyber Pakhtunkhwa, Pakistan, between June 2024 and March 2025. All 697 patients underwent a thorough eye examination that included dilated funduscopy, intraocular pressure measurement, and fundus imaging where necessary. With 92.7% having non-ins positive Dependent Diabetes Mellitus (NIDDM) and 7.3% having Insulin Dependent Diabetes Mellitus (IDDM), there were 110 people (15.8%) with diabetes. The prevalence of diabetic retinopathy was 15.4%, and it was considerably higher in patients with IDDM (50%) and in those who had had diabetes for more than ten years. While severe DR, proliferative DR, and maculopathy were less frequent, mild and moderate, non-proliferative DR accounted for the majority of DR cases. DR was more common in men, although diabetes was more common in women (59.1%). The prevalence of DR was also linked to occupation and length of disease, with individuals with longer durations of diabetes and those who were working experiencing higher rates. Some individuals needed more regular follow-ups or interventions (such as laser treatment), although the majority merely received yearly follow-ups. These findings emphasize the need for continuous diabetes management, preventative intervention, and routine DR screening, especially in semi-rural locations where access to specialized care may be limited.

INTRODUCTION

One of the main consequences of diabetes mellitus The cause of vision loss in people of working age, is diabetic retinopathy (DR). Finding clinical signs of retinal vascular anomalies is how DR is diagnosed. Proliferative diabetic retinopathy (PDR) and non-proliferative diabetic retinopathy (NPDR) are the two clinical phases of DR. Increased vascular permeability, and capillary obstruction are two significant findings in the retinal vasculature of NPDR, the early stage of DR. Fundus photography can identify retinal abnormalities such microaneurysms, hemorrhages, and hard exudates, even though patients may not exhibit any symptoms the condition that continues to be the most common

at this time. Neovascularization is a feature of PDR, a more severe form of DR. Patients may suffer from significant visual impairment at this stage if there is tractional retinal detachment or if the new aberrant arteries bleed into the vitreous (vitreous hemorrhage). Diabetic macular edema is the most frequent cause of visual loss in DR patients. The collapse of the blood-retinal barrier (BRB) causes intra- and sub-retinal fluid buildup in the macula, which leads to edema or swelling of the macula [1]. Visual image distortion and a reduction in visual acuity can result from DME, which can happen at any point during DR. Managing microvascular problems is the aim of modern DR treatment approaches, including intravitreal pharmacological medications, laser photocoagulation, and vitreous surgery. Currently, the mainstay of treatment for both early and severe stages of DR is intravitreal infusion of anti-VEGF drugs. Conventional laser therapy just stabilizes visual acuity, but anti-VEGF therapy can enhance vision with fewer negative ocular effects. However, only 29% of DME patients who received anti-VEGF medication for two years experienced a ≥3-line improvement in best-corrected visual acuity (BCVA), per the Diabetic Retinopathy Clinical Research Network (DRCR.net) research (Protocol I) [2]. Studies into the fundamental mechanisms of DR are crucial because they may offer potential targets for the development of innovative alternative therapeutics. The insufficient response to anti-VEGF may be explained by the involvement of molecular pathways other than VEGF in the pathophysiology of DR. Here, we sumarise the state of knowledge and recent discoveries about the pathophysiology of DR, and we also talk about novel targets for treatment and possible pharmacological drugs that are now being studied in clinical settings. The risk of blindness is 25 times higher for people with diabetes than for people without the condition. Diabetic retinopathy is the most common cause of new blindness and visual impairment in adults between the ages of 20 and 74 in many developed nations. In the first five years of life, roughly 25% of patients with type 1 diabetes develop diabetic retinopathy, and in the next twenty years, nearly 100% do. Over 60% of individuals with type 2 diabetes acquire diabetic retinopathy within the first 20 years of the disease, and about 21% of those with the disease are diagnosed with retinopathy. 2. South Asian nations have diabetes at a far younger age than Western nations. One hundred fifty-four million people live in Pakistan. Over 10% of individuals have diabetes. 3–5 Although Pakistan has the sixth-highest diabetes burden, there are few population-based statistics on the prevalence of diabetic retinopathy and the visual impairment caused by the illness. Hospital data is available.

METHODOLOGY

Eye Free camps Attended. Participants in the research had to be at least 30 years old and have attended the eye clinics. Every one of the 697 participants gave their permission to participate in the research. The sample size of 110 diabetic participants was calculated using the standard formula for estimating sample size in prevalence studies:

$$n = \frac{Z^2 \cdot p \cdot (1 \quad p)}{d^2}$$

Where Z = 1.96 for a 95% confidence interval, p = 0.15 (anticipated prevalence of diabetic retinopathy), and d = 0.07 (margin of error). This yielded a required sample size of approximately 100. To account for possible data loss or variation, we selected 110 participants to ensure statistical validity. The patients were referred to a specialized eye hospital in Timergara for further diabetic retinopathy screening after their diabetes examination. Everyone gave their verbal, informed consent before taking part. An ophthalmologist used an applanation tonometer to measure intraocular pressure, a Topcon slit lamp to do a thorough inspection of the anterior region, and a 90-dioptre handheld fundus lens for dilated funduscopy. If peripheral abnormalities were noticed or suspected, in Binocular slit lampexmination 90Dwas also carried out. It was documented whether diabetic retinopathy was present or not. Non-proliferative diabetic retinopathy (NPDR) and severe NPDR are the two types of diabetic retinopathy. Indirect and Binocular slit lampexmination 90Dwas used to evaluate proliferative diabetic retinopathy (PDR) and

clinically significant macular edema (CSMO). A Topcon fundus camera was used to take stereoscopic pictures of the macula and optic disc of participants who had any symptoms of diabetic retinopathy. However, only the most important information was collected for classification purposes; typical fundus photographic fields were not captured. Clinical evaluation served as the basis for grading, and pictures were taken to document the outcomes. Epi Info 6.0 software was used to enter and analyze all of the data. The dependent variable's simple frequencies and proportions were computed and compared between groups according to diabetes type and sex.

RESULTS

A community-based study conducted in District Dir Lower, Pakistan, investigated the prevalence of diabetes and diabetic retinopathy (DR) in a rural population. Out of 697 individuals screened, **15.8% were found to have diabetes**, with the majority (14.1%) having **non-insulin-dependent diabetes mellitus (NIDDM)** and a smaller portion (1.7%) with **insulin-dependent diabetes mellitus (IDDM)**. Most diabetic individuals were **middle-aged (40–59 years)**, and a higher proportion were **female (59.1%)**, especially homemakers (54.5%), suggesting limited access to care and education in this group. Chronicity was notable, with **44.5% having diabetes for over 5 years**, indicating the importance of sustained management. Among diabetics, **15.4% had diabetic retinopathy**, with the **highest DR rate (33.3%) found in the 30–39 age group**, possibly due to poor glycemic control or early onset of diabetes. DR was **more common among working individuals** (20%) than housewives or the unemployed and was slightly **more prevalent in females (16.6%) than males** (14%). DR was more severe in **IDDM patients (50%)** compared to NIDDM (13.7%), underlining faster progression in insulin-dependent cases. DR risk rose sharply with disease duration: from **12.1% (<5 years)** to **44.4% (≥15 years)**. Most cases were **mild or moderate non-proliferative DR**, with few showing severe forms or maculopathy. Treatment needs were minimal—only **0.9% required pan-retinal photocoagulation**, and **3.6% needed targeted laser therapy**. Most patients (77.3%) required **annual follow-up**, while others needed more frequent monitoring.

Table 1: Prevalence of Diabetes Mellitus by Type Among Selected Subjects (n=697) in a Study in District Dir Lower, Pakistan

Type of DM	Frequency (n = 697)	%
IDDM	12	1.7
NIDDM	110	15.8
Non-diabetics	575	82.5

The study in District Dir Lower revealed that the majority of participants (82.5%) were non-diabetic. In comparison, 15.8% had Non-Insulin Dependent Diabetes Mellitus (NIDDM), and only 1.7% were diagnosed with Insulin Dependent Diabetes Mellitus (IDDM). This distribution shows a significantly higher number of non-diabetic individuals compared to those with diabetes, highlighting the generally low prevalence of diabetes in the area.

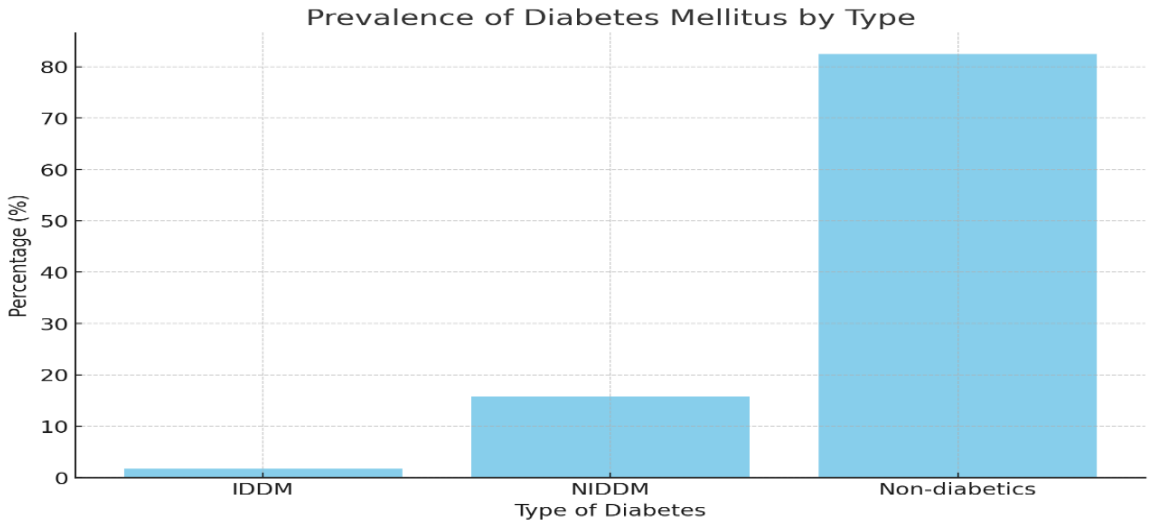


Table 2: Characteristics of Selected Individuals with Diabetes (n=110) in a Study in District Dir Lower, Pakistan

Characteristics	No	%
Age group (in years)		
30-39	10	9.1
40-49	35	31.8
50-59	33	30.0
60-69	25	22.7
≥70	7	6.4
Sex		
Male	45	40.9
Female	65	59.1
Occupation		
Housewife	60	54.5
Employed	30	27.3
Unemployed	20	18.2
Type of diabetes		
IDDM	8	7.3
NIDDM	102	92.7
Duration of Diabetes		
Newly diagnosed	18	16.4
< 5 years	33	30.0
5-9 years	32	29.1
10-14 years	18	16.4
≥ 15 years	9	8.2

Among the 110 diabetic participants, the majority were aged between 40 and 59 years, with 61.8% of individuals falling within this age group. Females made up 59.1% of the diabetic population, while males accounted for 40.9%. The study also found that 54.5% of the diabetic individuals were homemakers, 27.3% were employed, and 18.2% were unemployed. Most participants had NIDDM (92.7%), and a significant portion had been diagnosed with diabetes for less than five years (30%).

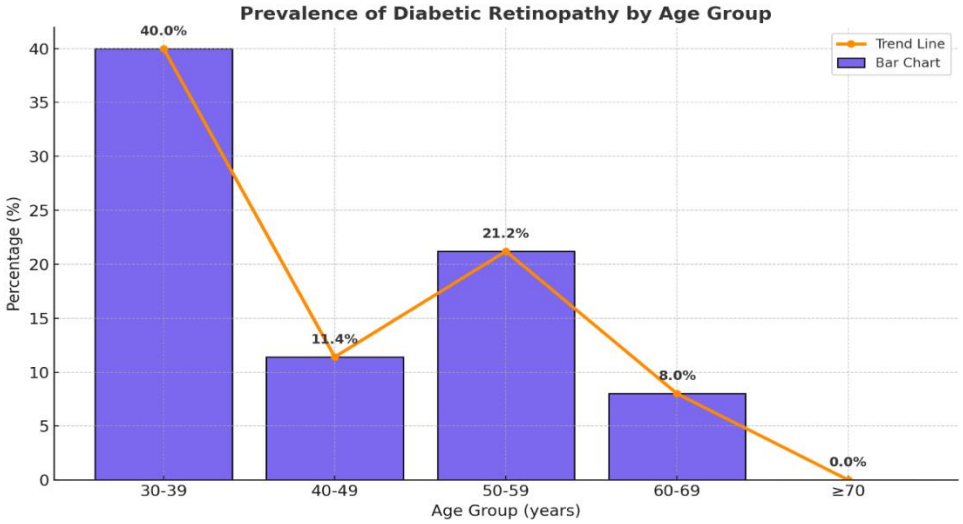


Table 3: Prevalence of Diabetic Retinopathy by Age Group, Sex, and Type of Diabetes Among Diabetics (n=110) in a Study in District Dir Lower, Pakistan.

Diabetic Group	Diabetic Retinopathy	%
Diabetic Retinopathy	110	15.4%
Age group (in years)		
30-39	10	40.0%
40-49	35	11.4%
50-59	33	21.2%
60-69	25	8.0%
≥70	7	0%
Sex		
Male	45	14.0%
Female	65	16.6%
Occupation		
Housewife	60	16.0%
Employed	30	20.0%
Unemployed	20	8.0%
Type of diabetes		
IDDM	8	50.0%
NIDDM	102	13.7%
Newly diagnosed	18	0%
< 5 years	33	12.1%
5-9 years	32	18.8%
10-14 years	18	36.4%
≥ 15 years	9	44.4%

The prevalence of diabetic retinopathy among diabetic individuals was found to be 15.4%. Diabetic retinopathy was most prevalent in the 30-39 age group (40%) and decreased in older age groups. Males had a slightly lower prevalence of retinopathy

(14%) compared to females (16.6%). Retinopathy was more common among IDDM patients (50%) than NIDDM patients (13.7%), showing a clear association between the type of diabetes and the likelihood of developing retinopathy.

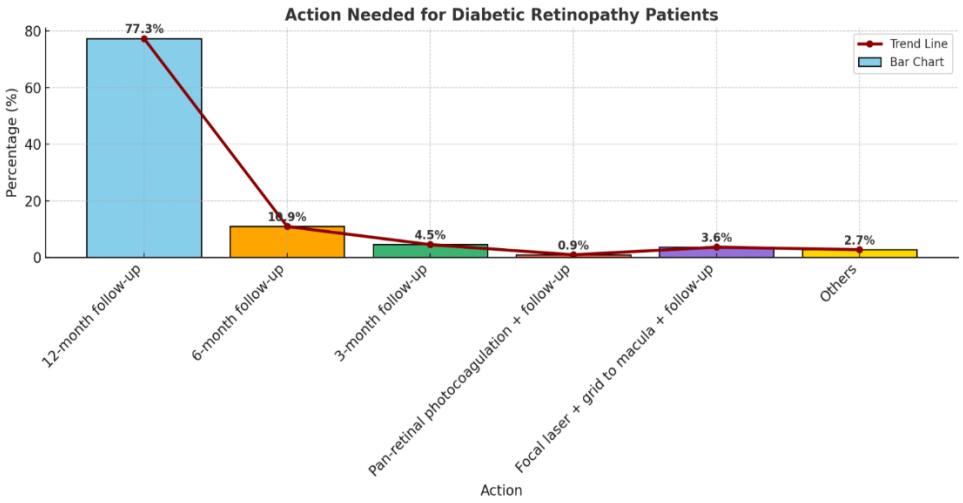


Table 4: Types of Diabetic Retinopathy Observed Among Diabetics (n=110) in District Dir Lower, Pakistan

Type of Diabetic Retinopathy	No.	%
Mild Non-Proliferative Diabetic Retinopathy	8	7.3
Moderate Non-Proliferative Diabetic Retinopathy	6	5.5
Severe Non-Proliferative Diabetic Retinopathy	4	3.6
Proliferative Diabetic Retinopathy	2	1.8
Maculopathy*	1	0.9

Among the 110 diabetic individuals with retinopathy, mild non-proliferative diabetic retinopathy was the most common type (7.3%), followed by moderate non-proliferative diabetic retinopathy (5.5%). Severe non-proliferative diabetic retinopathy and proliferative diabetic retinopathy were less frequent, at 3.6% and 1.8%, respectively. Additionally, maculopathy was observed in 0.9% of the diabetic participants, indicating that most retinopathy cases were relatively mild in severity.

Table 5: Action Needed for Diabetic Retinopathy Patients (n=110) in District Dir Lower, Pakistan

Action Needed	Frequency (n=110)	%
12-month follow-up	85	77.3
6-month follow-up	12	10.9
3-month follow-up	5	4.5
Pan-retinal photocoagulation + follow-up	1	0.9
Focal laser + grid to the macula + follow-up	4	3.6
Others	3	2.7

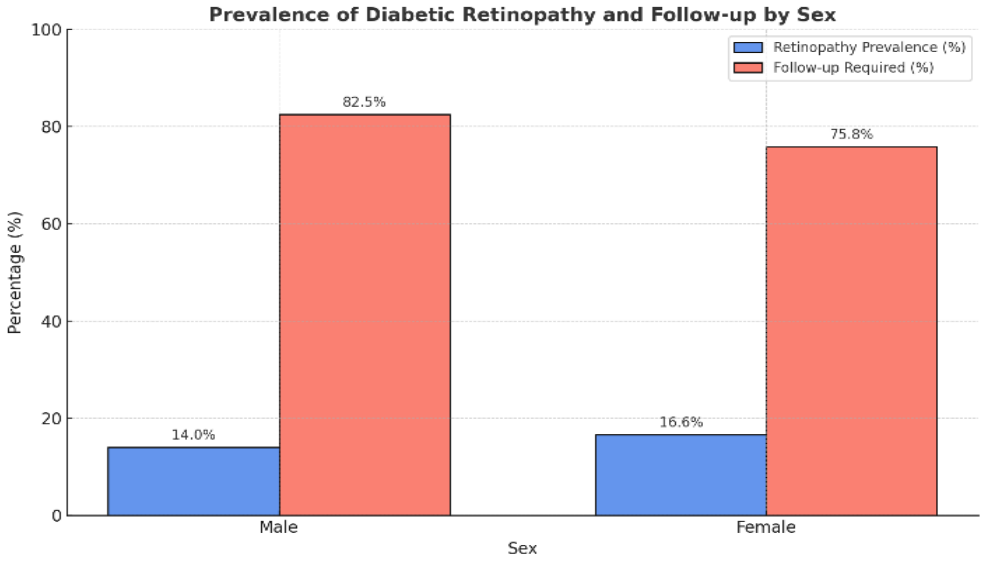
A majority of diabetic retinopathy patients (77.3%) required a 12-month follow-up, indicating the need for long-term monitoring and care. Fewer patients (10.9%) needed a 6-month follow-up. At the same time, a smaller portion required more immediate interventions, including focal laser treatment and pan-retinal photocoagulation, which were necessary for 3.6% and 0.9% of the patients, respectively. These findings suggest that ongoing follow-up care is

critical for managing diabetic retinopathy in the study population.

Table 6: Prevalence of Diabetic Retinopathy and Action Needed by Sex in District Dir Lower, Pakistan

Sex	Prevalence of Diabetic Retinopathy (%)	Follow-up Required (%)
Male	14.0%	82.5%
Female	16.6%	75.8%

In terms of sex differences, 14% of male diabetic patients and 16.6% of female diabetic patients were diagnosed with diabetic retinopathy. Regarding the required follow-up, 82.5% of males and 75.8% of females required a 12-month follow-up, highlighting the need for regular care across both genders. The results show a slightly higher prevalence of retinopathy in females, although the follow-up requirements were similar for both sexes.



DISCUSSION

Gender-wise, although DR was **slightly more common in women (16.6%) than men (14.0%)**, the difference was **not statistically significant**, consistent with other studies. The most common form observed was **non-proliferative diabetic retinopathy (NPDR)**, accounting for **76.4% of DR cases**, similar to findings in Karachi but slightly lower than reports from Australia, India, and Oman (89.3%–94%). The **prevalence of proliferative diabetic retinopathy (PDR)** was low (5.8%), likely due to the **younger average age and shorter diabetes duration** in the study group. A **strong correlation** was found between the **duration of diabetes and DR prevalence**. DR rates increased progressively with longer disease duration, peaking at **44.4% in individuals with diabetes for 15 years or more**, confirming the chronic and progressive nature of diabetic eye disease. These findings highlight the urgent need for **early diagnosis, regular eye exams, and long-term diabetes management** to prevent irreversible vision loss.

Conclusion: The study underscores the importance of **population-based, epidemiological research** to better understand DR in rural settings and guide **public health interventions**. Targeted efforts in **education, screening accessibility, and follow-up care** are essential to reduce the burden of diabetic retinopathy in Pakistan.

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