

The Prevalence of Diabetic Retinopathy and Associated Risk Factors among Diabetic Patients in a Tertiary Care Hospital

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Abstract

Background: One of the most serious complications of diabetes that places an enormous strain on the patient, the healthcare system, and the world economy is diabetic retinopathy (DR). It includes long-term exposure to the metabolic changes linked to diabetes, which cause damage to the retina's microvasculature. **Objectives:** The aim of the study was to assess the prevalence of diabetic retinopathy and associated risk factors among diabetic patients in a tertiary care hospital. **Methods:** This cross-section observational study was carried out in the Department of Ophthalmology, North Bengal medical College. Convenience sampling technique was followed. Face to face interview was done to collect data with a semi-structured questionnaire. After collection, the data were checked and cleaned, followed by editing, compiling, coding and categorizing according to the objectives and variable to detect errors and to maintain consistency, relevancy and quality control. Statistical evaluation of the results used to be obtained via the use of a window-based computer software program devised with Statistical Packages for Social Sciences (SPSS-24). The duration of the period from July 2018 to July 2022. A total of 120 patients were participate in the study. **Results:** About 58.33% respondents were male and 41.67% were female. Majority (33.33%) of the respondents were within the age group of 50-59. 33.33% were service holder, 41.67% were businessman, 12.5 were day labor, 6.67% were farmer. 75% were from urban area and 25% from rural area. The prevalence of DR in this study was 41.1%. About 90% had DM of <5 years, 55% had 6-10 years, 40% had 15-20 Years, 30% had 16-20 years and only 7% had >21 years. About 50% had normal grade of diabetic retinopathy in the worse eye, 15% had Mild NPDR, 8.33% had Moderate NPDR, 6.67% had Mild to moderate NPDR with non-CSME, 2.5% Moderate NPDR with CSME, Severe NPDR with non-CSME Severe NPDR with CSME and Advanced PDR respectively. Mean FBS (mg/dl) was 160.86±70.6, Total cholesterol (mg/dl) was 183.2 ± 2.1, Triglycerides (mg/dl) was 161.2 ± 2.6, Systolic BP was 130.56±15.7 and Diastolic BP was 80.86±13.4. Patients with baseline age of <60 years were three times (AOR = 3.2:95% CI: 1.19–8.63) more likely to develop DR. The odds of DR is about 3 times (AOR = 2.91:95% CI: 1.01–8.35) higher for patients with disease duration of ≥6 years as compared to disease duration of <6 years. Systolic blood pressure also had statistically significant association with patients having blood pressure of <140 mmHg being about 3.6 times (AOR = 0.28:95% CI: 0.09–0.82) less likely to have DR as compared to hypertensive patients with systolic blood pressure of ≥140 mmHg. The other cofactors, history of hypertension, and total cholesterol level were not independent significant factors for the development of DR in our study. **Conclusion:** Systolic hypertension, being on insulin alone or in combination with OHA, and having diabetes for a longer period of time were all independently linked to the occurrence of DR. The significant DR prevalence our study suggests that routine patient care, including treatment facilities, has to be improved. Healthcare practitioners must make a consistent effort to educate diabetic patients about the importance of blood sugar control and hypertension management in lowering the risk of the start and progression of DR. It is advised that diabetic patients get health education regarding the importance of routine eye exams for the early detection and treatment of diabetes-related eye problems.

Keywords: Diabetic Retinopathy, Risk Factors, PDR (proliferative diabetic retinopathy), NPDR (non-proliferative diabetic retinopathy), Clinically-significant macular edema (CSME).

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INTRODUCTION

One of the most serious complications of diabetes that places an enormous strain on the patient, the healthcare system, and the world economy is diabetic retinopathy (DR). It includes long-term exposure to the metabolic changes linked to diabetes, which cause damage to the retina's microvasculature [1]. The quality of life of patients with DR is significantly impacted, and it may be difficult for them to successfully manage their diabetes mellitus (DM), which may have a positive effect on the occurrence of other diabetic complications but a negative effect on overall life expectancy and productivity. A meta-analysis of population studies that were published between 1990 and 2012 yielded estimates that, in 2010, DR was responsible for 1.9% of all moderate-to-severe vision impairment and 2.6% of all blindness globally [2]. According to research, DR is accountable for 2.8% of blindness in sub-Saharan Africa [3]. The retinal circulation's vascular alterations are thought to be the cause of diabetic retinopathy. Approximately 2% of patients with diabetes go blind after 15 years, while another 10% acquire significant visual impairment. According to the World Health Organisation (WHO), DR is thought to be to blame for 5% of the 5 million instances of blindness worldwide. An estimated 300 million people will have diabetes by 2025, with retinopathy projected to affect half of them [4]. DR is recognized as the primary cause of blindness in the working-age population in developed nations (20–74 years of age), accounting for 12% of all new instances of blindness each year [5]. The burden of diabetes-related blindness will undoubtedly present enormous problems to the sustainable health care system because to the rising expense of care as the number of people with type 2 diabetes (T2D), particularly in emerging nations, rises. The duration of diabetes, systolic blood pressure (SBP), glycemic management, and urine albumin have all been identified by epidemiological data as risk factors for the emergence of DR. Research investigating additional factors, such as body mass index (BMI), smoking, serum lipids, and C-peptide, has produced a range of outcomes. [6]. Globally, 34.6% of persons with diabetes were expected to have DR. According to population-based research, the prevalence ranges for DR, proliferative DR (PDR), and any maculopathy in diabetic individuals were 30.2%–31.6%, 0.9%–1.3%, and 1.2%–4.5%, respectively. According to surveys conducted at diabetes clinics, the prevalence ranges for DR, PDR, and any maculopathy were 7.0%–62.4%, 0%–6.9%, and 1.2%–31.1%, respectively [7]. Pregnancy-related retinopathy is more likely to occur in women with diabetes. When a woman becomes pregnant, if she already has retinopathy, the problem may get worse. Even though DR can occur in anybody with diabetes, some ethnic groups are more likely than others to get the disease. It is now understood that the risk factors for both the onset of diabetes and its complications vary [8]. In the developing world, DR is an emerging reason of blindness. Finding the incidence of DR and its risk factors in a particular community may help clinicians

determine where to concentrate their attention while monitoring and caring for diabetic patients. Effective screening, prompt laser treatment, intraocular injection of antivasular endothelial growth factor medications, and intraocular surgery can all help preserve vision in DR patients [9, 10]. Thus the aim of the study was to assess the prevalence of diabetic retinopathy and associated risk factors among diabetic patients in a tertiary care hospital.

METHODOLOGY

This cross-section observational study was carried out in the Department of *Ophthalmology*, North Bengal medical College. The duration of the period from July 2018 to July 2022. A total of 120 patients were participate in the study. Convenience sampling technique was followed. All medically diagnosed diabetic patients of any age who visited the eye care department and gave consent to be included in the study. Diabetic patients with opaque ocular media due to corneal abnormalities or cataract obscuring adequate visualization of the posterior segment of the eye were excluded. Face to face interview was done to collect data with a semi-structured questionnaire. After collection, the data were checked and cleaned, followed by editing, compiling, coding and categorizing according to the objectives and variable to detect errors and to maintain consistency, relevancy and quality control. Statistical evaluation of the results used to be obtained via the use of a window-based computer software program devised with Statistical Packages for Social Sciences (SPSS-24).

RESULT

Table 1: Distribution of the respondents by Socio-demographic criteria

Socio-demographic criteria	N=120	%
Sex		
Male	70	58.33
Female	50	41.67
Age group		
20-29	10	8.33
30-39	20	16.67
40-49	35	29.16
50-59	40	33.33
60-69	10	8.33
70 and above	5	6.67
Mean age \pm SD	53.4 (\pm 14.5) years	
Occupation		
Service holder	40	33.33
Businessman	50	41.67
Day labor	15	12.5
Farmer	5	6.67
Unemployed	10	8.33
Residence		
Urban	90	75
Rural	30	25

Table 1 shows that, 58.33% respondents were male and 41.67% were female. Majority (33.33%) of the respondents were within the age group of 50-59. 33.33%

were service holder, 41.67% were businessman, 12.5% were day labor, 6.67% were farmer. 75% were from urban area and 25% from rural area. 90% had DM of <5

years, 55% had 6-10 years, 40% had 15-20 Years, 30% had 16-20 years and only 7% had >21 years.

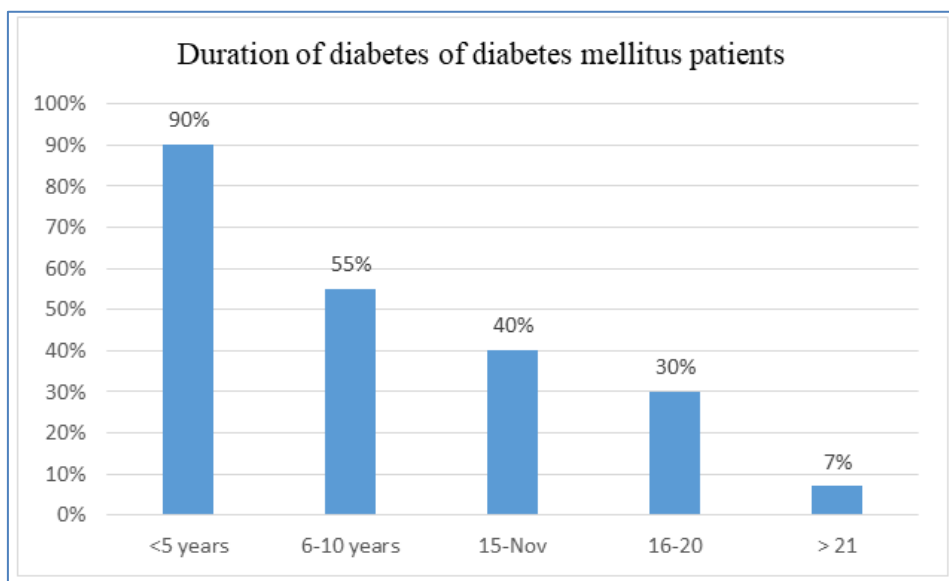


Fig 1: Distribution of the respondents by duration of DM

Table 2: Distribution of the respondents by visual acuity

Visual acuity	N=120	%
6/6-6/18	70	58.33
<6/18-6/60	30	25
<6/60-3/60	15	12.5
<3/60	5	6.67

58.33% had a visual acuity of 6/6-6/18, 25% had <6/18-6/60, 12.5% had <6/60-3/60 and 6.67 had <3/60.

Table 3: Types of retinopathy

	Diabetic retinopathy	%
Yes	52	43
No	68	57
	Grade of diabetic retinopathy in the worse eye	
Normal	60	50
Mild NPDR	18	15
Moderate NPDR	10	8.33
Mild to moderate NPDR with non-CSME	5	6.67
Moderate NPDR with CSME	3	2.5
Severe NPDR	2	1.67
Severe NPDR with non-CSME	3	2.5
Severe NPDR with CSME	3	2.5
Early PDR	1	.83
High risk PDR	3	2.5
High risk PDR with non-CSME	5	6.67
High risk PDR with CSME	4	3.33
Advanced PDR	3	2.5

PDR (proliferative diabetic retinopathy), NPDR (non-proliferative diabetic retinopathy), Clinically-significant macular edema (CSME)

About 50% had normal grade of diabetic retinopathy in the worse eye, 15% had Mild NPDR, 8.33% had Moderate NPDR, 6.67% had Mild to moderate NPDR with non-CSME, 2.5% Moderate

NPDR with CSME, Severe NPDR with non-CSME Severe NPDR with CSME and Advanced PDR respectively.

Table 4: Mean values of selected parameters

FBS (mg/dl)	160.86±70.6
Total cholesterol (mg/dl)	183.2 ± 2.1
Triglycerides (mg/dl)	161.2 ± 2.6
BP (mmHg)	
Systolic	130.56±15.7
Diastolic	80.86±13.4

SD: Standard deviation, BP: Blood pressure, FBS: Fasting blood sugar

Mean FBS (mg/dl) was 160.86±70.6, Total cholesterol (mg/dl) was 183.2 ± 2.1, Triglycerides (mg/dl) was 161.2 ± 2.6, Systolic BP was 130.56±15.7 and Diastolic BP was 80.86±13.4.

Table 5: Ocular co-morbidities

Ocular condition	N=120 (%)
Cataract	112 (49.8)
Glaucoma	9 (0.04)
Pathologic myopia	6 (0.027)
Hypertensive retinopathy	5 (0.02)
Age related macular degeneration	3 (0.013)
Central retinal vein occlusion	2 (0.01)

About 112 (49.8) respondents had ocular co-morbidities of Cataract, 9 (0.04) had Glaucoma, 6 (0.027) had Pathologic myopia, 5 (0.02) had

Hypertensive retinopathy, 3 (0.013) had Age related macular degeneration and 2 (0.01) had Central retinal vein occlusion.

Table 6: Multivariate logistic regression analysis of factors associated with diabetic retinopathy

Variable	Diabetic retinopathy		COR (95% CI)	AOR (95% CI)	P
	Yes, n (%)	No, n (%)			
Age					
<60	60 (50)	40 (33.3)	1.94 (1.12-3.34)	3.2 (1.19-8.63)	0.011
≥60	10 (8.33)	10 (8.33)	1.00	1.00	
Sex					
Male	40 (33.3)	30 (25.6)	1.00	1.00	0.527
Female	30 (25.6)	58 (16.67)	1.586 (0.92-2.74)	0.75 (0.31-1.83)	
Duration of DM					
<6	28 (23.33)	67 (55.83)	1.00	1.00	0.047
≥6	68 (56.67)	44 (436.67)	2.59 (1.48-4.56)	2.91 (1.01-8.35)	
Insulin					
No	40 (52.6)	36 (47.4)	1.89 (1.09-3.32)	0.323 (0.12-0.86)	0.023
Yes	55 (36.9)	94 (63.1)	1.00	1.00	
Combination					
No	17 (65.4)	9 (34.6)	2.93 (1.24-6.9)	0.2 (0.05-0.80)	0.022
Yes	78 (39.2)	121 (60.8)	1.00	1.00	
Hypertension					
No	51 (51.0)	49 (49.0)	1.92 (1.12-3.28)	0.69 (0.26-1.84)	0.458
Yes	44 (35.2)	81 (64.8)	1.00	1.00	
SBP (mmHg)					
<140	60 (37.0)	102 (63.0)	2.13 (1.78-3.84)	0.28 (0.09-0.82)	0.02
≥140	35 (55.6)	28 (44.4)	1.00	1.00	
Total cholesterol					
Normal	31 (37.3)	52 (62.7)	1	1	0.29
Borderline	6 (30.0)	14 (70.0)	0.72 (0.25-2.06)	0.51 (0.15-1.72)	
High	10 (62.5)	6 (37.5)	2.79 (0.93-8.45)	1.74 (0.45-6.72)	

OR: Odds ratio, COR: Crude OR, AOR: Adjusted OR, CI: Confidence interval, DM: Diabetes mellitus, BP: Blood pressure, SBP: Systolic BP.

Multivariable logistic regression analysis was done for factors with preset *P* value cut point of <0.2 on univariate logistic regression; it showed that baseline age, duration of diabetes, modality of treatment with

insulin or combination of OHA with insulin, and systolic blood pressure were significantly associated with DR.

Patients with baseline age of <60 years were three times (AOR = 3.2; 95% CI: 1.19–8.63) more likely to develop DR. The odds of DR is about 3 times (AOR = 2.91; 95% CI: 1.01–8.35) higher for patients with disease duration of ≥ 6 years as compared to disease duration of <6 years. Systolic blood pressure also had statistically significant association with patients having blood pressure of <140 mmHg being about 3.6 times (AOR = 0.28; 95% CI: 0.09– 0.82) less likely to have DR as compared to hypertensive patients with systolic blood pressure of ≥ 140 mmHg. The other cofactors, history of hypertension, and total cholesterol level were not independent significant factors for the development of DR in our study.

DISCUSSION

This cross-section observational study was carried out in the Department of *Ophthalmology*, North Bengal medical College. The duration of the period from July 2018 to July 2022. A total of 120 patients were participate in the study. The prevalence of DR in this study was 41.1% which is higher than most of the results of previous studies [11- 15]. This variation may be attributable to various sampling strategies, sample sizes, and diagnostic approaches. The prevalence in the current study was also higher than the findings from Spain, and USA where rates of 14.9%, and 14.7% were reported, respectively [16, 17]. The extremely large sample size in those studies, the disparity in socioeconomic position, or both may be the reason for this variance. Numerous studies conducted in other parts of the world also indicated prevalence rates that were higher than those found in the current study [18- 20]. The variation could have been caused by a variety of elements, such as different sampling techniques, sample sizes, study settings, screening methodologies, participant awareness levels, glycemic control levels, and diabetes patient care.

Longer duration of diabetes was significantly associated with the occurrence of DR in this study and patients with disease duration of 6 years or more were more likely to develop DR (AOR = 2.91; 95% CI; 1.01–8.35) as compared to those with disease duration of <6 years. This result was in line with significant global meta-analyses [21, 22]. In this study, there was a relationship between DR and the kind of medication, and diabetes patients receiving insulin therapy alone or in combination with OHA had a higher prevalence of DR. In contrast, a report from Cameroon (2011) indicated a higher frequency among people receiving OHA therapy [11]. In this study mean FBS (mg/dl) was 160.86 ± 70.6 , Total cholesterol (mg/dl) was 183.2 ± 2.1 , Triglycerides (mg/dl) was 161.2 ± 2.6 , Systolic BP was 130.56 ± 15.7 and Diastolic BP was 80.86 ± 13.4 . It is widely known that systemic hypertension has an impact on the onset and progression of DR in diabetic individuals. A strong correlation between the prevalence of DR and systolic blood pressure below 140 mmHg was found in our investigation. This is consistent with research from various contexts [22, 23].

In this current study about 50% had normal grade of diabetic retinopathy in the worse eye, 15% had Mild NPDR, 8.33% had Moderate NPDR, 6.67% had Mild to moderate NPDR with non-CSME, 2.5% Moderate NPDR with CSME, Severe NPDR with non-CSME Severe NPDR with CSME and Advanced PDR respectively.

In this study, 58.33% respondents were male and 41.67% were female. Majority (33.33%) of the respondents were within the age group of 50-59. 33.33% were service holder, 41.67% were businessman, 12.5 were day labor, 6.67% were farmer. 75% were from urban area and 25% from rural area. About 90% had DM of <5 years, 55% had 6-10 years, 40% had 15-20 Years, 30% had 16-20 years and only 7% had >21 years. The mean age of diabetes patients in this study was 53.4 (± 14.5) years which was similar to studies done in other parts of the world [22, 23]. In our study 58.33% had a visual acuity of 6/6-6/18, 25% had <6/18-6/60, 12.5% had <6/60-3/60 and 6.67 had <3/60. About 50% had normal grade of diabetic retinopathy in the worse eye, 15% had Mild NPDR, 8.33% had Moderate NPDR, 6.67% had Mild to moderate NPDR with non-CSME, 2.5% Moderate NPDR with CSME, Severe NPDR with non-CSME Severe NPDR with CSME and Advanced PDR respectively. According to data from several research, poor glycemic control is a risk factor for the onset and progression of DR and is linked to a higher prevalence of DR. FBG level at the time of data collection was utilised to assess the amount of glycemic control in our study because the HbA1c test, which is the best indicator of the level of glycemic control.

CONCLUSION

The prevalence of DR in our study was high. Systolic hypertension, being on insulin alone or in combination with OHA, and having diabetes for a longer period of time were all independently linked to the occurrence of DR.

RECOMMENDATION

The significant DR prevalence our study suggests that routine patient care, including treatment facilities, has to be improved. Healthcare practitioners must make a consistent effort to educate diabetic patients about the importance of blood sugar control and hypertension management in lowering the risk of the start and progression of DR. It is advised that diabetic patients get health education regarding the importance of routine eye exams for the early detection and treatment of diabetes-related eye problems.

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