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# Prevalence and Risk Factors of Diabetic Retinopathy among Type 2 Diabetic Patients in Tertiary Care Hospital of Gandaki Province of Nepal

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## ABSTRACT

### Background

Diabetic retinopathy (DR) is one of the commonest causes of blindness in Nepal. This study aimed to determine the prevalence and risk factors of diabetic retinopathy in type 2 diabetic patients in a tertiary care hospital of Gandaki Province of Nepal.

### Methods

This was a hospital based cross-sectional study conducted among 162 patients of type 2 diabetes aged 30 years and above. Standard proforma was used to collect socio-demographic and clinical variables of the patients. Detailed eye examination including fundus evaluation under mydriasis was done on all patients and diabetic retinopathy was classified according to Early Treatment of Diabetic Retinopathy Study Classification.

### Results

The mean ±SD of age of the study sample was 61.99 ±11.69 years. The prevalence of diabetic retinopathy was 41.98%. Among the patients with diabetic retinopathy, the prevalence of mild NPDR, moderate NPDR, severe NPDR, very severe NPDR and PDR were 51.47%, 25%, 11.76%, 1.47%, and 10.29% respectively. There was statistically significant association of diabetic retinopathy with duration of diabetes and chronic kidney disease. However, there was no statistically significant association of diabetic retinopathy with gender, family history, hypertension, history of smoking, history of alcohol, treatment history and physical activity.

### Conclusions

There is high prevalence of diabetic retinopathy among the diabetic patients. Longer duration of diabetes and chronic kidney disease were the significant risk factors for diabetic retinopathy. Early diagnosis and treatment of diabetic retinopathy is essential to reduce blindness in diabetic patients.

**Keywords:** chronic kidney disease; diabetic retinopathy; prevalence; risk factor.

## INTRODUCTION

Diabetes mellitus is a chronic disease of elevated blood glucose due to either suboptimal production of insulin or peripheral resistance of the body to insulin.[1] Around 366 million people are estimated to have diabetes mellitus by 2030 and the increase in adult diabetes is estimated to be far more (69%) in developing countries than in developed countries (20%).[2,3] Diabetic retinopathy is an emerging cause of blindness, especially in developing countries.[4] More than 80% of blinding sequelae of diabetic retinopathy have been reported from the developing world.[2,4-5] Several studies have reported a high prevalence of diabetic retinopathy ranging from 11.9% to 43.1%.[6,7] There are multiple risk factors for the development and progression of diabetes. Identification and timely management of modifiable risk factors could help to reduce the sight-threatening complications.[8-13] The objective of this study was to assess the prevalence of diabetic retinopathy and its risk factors among type 2 diabetic patients.

## METHODS

This was a hospital based cross-sectional study conducted in Ophthalmology Outpatient Department

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(OPD) of Manipal Teaching Hospital, Pokhara, Nepal from November 2023 to April 2024. Ethical approval was taken from the Institutional Review Committee of the Manipal College of Medical Sciences, Pokhara (Ref. No.: MCOMS/IRC/557). Informed consent was taken from all the patients. The sample size was calculated by using the formula 3.84 pq/ $d^2$ (where: p= prevalence, 11.9,[6] q=100-p, 88.1, d= margin of error=5%).The sample size according to this formula was 162. Non-probability convenient sampling method was used for the selection of cases. The inclusion criteria was the patients with type 2 diabetes of aged 30 years and above who presented to Ophthalmology OPD or referred from Endocrine Clinic of Department of Internal Medicine. Patients who had other ocular disease like corneal or lens opacities that cause media haze resulting difficulty in fundus assessment were excluded from the study. Those patients who do not give consent were also excluded from the study. Predesigned proforma was used to collect the sociodemographic and clinical variables of the patients. Detailed ocular examination was done including recording of visual acuity using Snellen's letter chart or E- chart. Anterior segment was assessed with slit lamp. Fundus examination was done under mydriasis with tropicamide 1% with direct ophthalmoscope and slit lamp biomicroscope using +90D lens. Diabetic retinopathy was classified according to Early Treatment of Diabetic Retinopathy Study (ETDRS) Classification as mild non-proliferative diabetic retinopathy (NPDR), moderate NPDR, severe NPDR, very severe NPDR and proliferative diabetic retinopathy (PDR).[7] The entry and analysis of the data was done in Epi-info version 7. The statistical methods used were mean, frequency and percentage. Chi Square test was applied for statistical analysis. The p-value less than 0.05 were considered statistically significant.

## RESULTS

A total of 162 type 2 diabetes mellitus (DM) patients were enrolled in the study. The mean age of the study sample was 61.99 (±11.69) years. There was no statistically significant association between mean age of patients with diabetic retinopathy (63.47±9.68 years) and without diabetic retinopathy (60.92±12.89 years) (p-value=0.22). Out of 162 patients, 68 patients had diabetic retinopathy. Hence, the prevalence of diabetic retinopathy was 41.98%. Among the patients with diabetic retinopathy, the prevalence of mild NPDR, moderate NPDR, severe NPDR, very severe NPDR and PDR were 51.47%, 25%, 11.76%, 1.47% and 10.29% respectively (Table 1).

**Table 1. Frequency of diabetic retinopathy.**

| Stage of retinopathy | Frequency (%) |
|---|---|
| Mild NPDR | 35 (51.47%) |
| Moderate NPDR | 17 (25%) |
| Severe NPDR | 8 (11.76%) |
| Very severe NPDR | 1 (1.47%) |
| Proliferative DR | 7 (10.29%) |

Abbreviations: DR: Diabetic retinopathy; NPDR: Non-proliferative retinopathy.

The relationship of diabetic retinopathy with different variables was showed in Table 2. The prevalence of diabetic retinopathy was found high among male, duration of diabetes of more than 10 years, positive family history of diabetes, hypertensive patient, patients with chronic kidney disease, history of smoking and alcohol intake as compared to other variables. The prevalence was also noted high in patients who were taking treatment of diabetes and physically inactive patients. However, the statistically significant association of diabetic retinopathy was found only with duration of diabetes and chronic kidney disease.

## DISCUSSION

In our study, the prevalence of diabetic retinopathy was 41.98%. Our results showed higher prevalence of diabetic retinopathy than reported in the Shanghai, China (10.1%),[15] Bangladesh (21.6%),[16] Canada (25.1%),[17] Bhaktapur, Nepal (30.96%),[10] Biratnagar, Nepal (32.39%),[18] Saudi Arabia (36.4%),[19] India (37.8%)[20] and Dharan, Nepal (38.8%).[21] However, our study noted lower prevalence of diabetic retinopathy than found in other studies conducted in Kathmandu, Nepal (45.9% and 44.7%) [22, 23] Indonesia (43.1%)[24] and Oman (42.4%).[25] In this study, the prevalence of mild NPDR is high followed by moderate NPDR, severe NPDR, and very severe NPDR. Similar to our

**Table 2. Relationship between different variables and diabetic retinopathy.**

| Variables | Diabetic retinopathy | | Odds Ratio | Chi-square | p-value |
|---|---|---|---|---|---|
| | Yes (%) | No (%) | | | |
| **Gender** | | | | | |
| Female | 36 (39.13) | 56 (60.87) | 0.76 | 0.463 | 0.49 |
| Male | 32 (45.71) | 38 (54.29) | | | |
| **Duration of diabetes (in years)** | | | | | |
| <5 | 11 (18.64) | 48 (81.36) | * | 31.813 | <0.001 |
| 5-10 | 21 (39.62) | 32 (60.38) | | | |
| >10 | 36 (72.00) | 14 (28.00) | | | |
| **Family history** | | | | | |
| Yes | 36 (48.0) | 39 (52.0) | 1.58 | 1.6461 | 0.19 |
| No | 32 (36.78) | 55 (63.22) | | | |
| **Hypertension** | | | | | |
| Yes | 47 (41.96) | 65 (58.04) | 0.99 | 0 | 1 |
| No | 21 (42.00) | 29 (58.00) | | | |
| **Chronic kidney disease** | | | | | |
| Yes | 18 (64.29) | 10 (35.75) | 3.02 | 5.8548 | 0.01 |
| No | 50 (37.31) | 84 (62.69) | | | |
| **Smoking history** | | | | | |
| Yes | 22 (50.0) | 22 (50.0) | 1.56 | 1.1768 | 0.27 |
| No | 46 (38.98) | 72 (61.02) | | | |
| **Alcohol history** | | | | | |
| Yes | 21 (44.68) | 26 (55.32) | 1.16 | 0.0733 | 0.78 |
| No | 47 (40.87) | 68 (59.13) | | | |
| **Treatment history** | | | | | |
| Yes | 56 (45.53) | 67 (54.47) | 1.88 | 2.077 | 0.14 |
| No | 12 (30.77) | 27 (69.23) | | | |
| **Physical activity** | | | | | |
| Yes | 16 (31.37) | 35 (68.63) | 0.51 | 2.8296 | 0.09 |
| No | 52 (46.84) | 59 (53.15) | | | |

*Odds ratio cannot be calculated.

study, different studies also noted high prevalence of mild NPDR followed by moderate NPDR, severe NPDR and very severe NPDR.[15,19,25-27] The difference in diabetic retinopathy prevalence may be due to the ethnic difference as well as different lifestyle, dietary habits, physical exercise and different health seeking behaviour among study samples. Our study showed that the prevalence of diabetic retinopathy was high in diabetic patients whose duration of diabetes was more than 10 years and the association of diabetic retinopathy with the duration of diabetic retinopathy was statistically significant. The similar findings was also noted by many other studies.[15,18,19,21,23,28-30] In this study, the mean age of the study sample was 61.99 years. Different other studies noted the mean age of patients as 56.51 years, 57.4 years, and 54.6 years respectively.[18,19,23] In our study, there was no statistically significant association between ages of patients with diabetic retinopathy. Similar to our study, two studies conducted in Kathmandu and Biratnagar, Nepal found that age was not the significant risk factors for development of diabetic retinopathy.[18,30] However, several other studies showed that age was significantly associated with diabetic retinopathy.[21,28,31] In our study, male patients had high prevalence of diabetic retinopathy than in female patients. This study also showed that gender was not significantly associated with diabetic retinopathy. Similarly, other studies also noted that male had more diabetic retinopathy than female[28,29] whereas, different studies found diabetic retinopathy was high in female as compared to male.[23,32] One study found no gender difference in the prevalence of diabetic retinopathy.[32] Similar to our study, different other studies also found that gender was not significantly associated with diabetic retinopathy.[18,19,21,23,26-28] The variation in the prevalence of diabetic retinopathy in gender can be explained by differential distribution in risk factors e.g. genetic predisposition, dietary factors, lifestyle habits such as alcohol intake, cigarette smoking and lack of physical activities. There was no statistically significant association of hypertension with diabetic retinopathy in this study. Many other studies have also supported this finding.[21,28] However, other two studies have shown the significant association of hypertension with diabetic retinopathy.[23,30] The possible mechanism by which hypertension affects diabetic retinopathy are hemodynamic (impaired autoregulation and hypoperfusion) and secondly through vascular endothelial growth factor, as it has been observed that hypertension independent of hyperglycemia up-regulates the vascular endothelial growth factor expression in retinal cells and ocular fluids.[34] This study showed the high prevalence of diabetic retinopathy in chronic kidney disease patients and the association was statistically significant. One study conducted in Nepal also found similar finding.[10] Both chronic kidney disease and diabetic retinopathy share the frequent microvascular complication of long standing diabetic mellitus. Our

study showed that there was not significant association of diabetic retinopathy with history of smoking and alcohol. Other studies also support this finding.[10,18,28,29] However, one study conducted in Bhaktapur, Nepal found the significant association of history of alcohol with diabetic retinopathy.[29] Family history was not found to be significantly associated with diabetic retinopathy in our study. Study conducted in Biratnagar, Nepal also supports this finding.[18] In our study, the prevalence of diabetic retinopathy was high in physically inactive patients and the association of physical activity with diabetic retinopathy was not statistically significant. Another study conducted in Nepal also supports this finding.[28]

## CONCLUSIONS

There is high prevalence of diabetic retinopathy among the diabetic patients. Longer duration of diabetes and chronic kidney disease were the significant risk factors for diabetic retinopathy. Early diagnosis and treatment of diabetic retinopathy is essential to reduce blindness in diabetic patients. The study recommends routine ophthalmological examination of every diabetic patient. The study also recommends holistic management of diabetic patients jointly by physician and ophthalmologist to prevent blindness.

### Limitations

The study has few limitations. The cross-sectional design of the study was the obvious limitation of this study which does not measure causal association. This study was hospital-based study conducted in one geographical area only. Hence, further large-scale analytical study in different regions of Nepal is required.

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