

Prevalence of and factors associated with diabetic retinopathy among diabetics in Nepal: a hospital based study

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ABSTRACT

Diabetic retinopathy is the one of the leading cause of visual impairment in world including Nepal. The objective of the study is to estimate the prevalence of and factors associated with Diabetic Retinopathy among diabetics in a Tertiary Eye Care Centre, Nepal. A hospital-based, cross sectional study, was conducted at Tilganga Eye Centre, Nepal. 371 consecutive subjects were recruited during a period of study. Ophthalmologist performed comprehensive eye examinations, which were reconfirmed by senior ophthalmologist. Diabetic Retinopathy was graded using the Early Treatment Diabetic Retinopathy Study. Total 371 consecutive diabetics were examined, mean of 57.4 years (SD 12.0) having the sex ratio of 0.72 male per female. The prevalence of Diabetic Retinopathy was 44.7% (166) with non-proliferative Diabetic Retinopathy presented 85.5% (142) and 14.5% (24) were proliferative Diabetic Retinopathy. Clinically significant macular edema was found in 19.2% (32). The age at onset of diabetes, duration of diabetes and hypertension were significantly associated with Diabetic Retinopathy ($p < 0.05$) whereas ethnicity, sex and cataract surgery were not associated with it ($p \geq 0.05$). The prevalence of Diabetic Retinopathy was within the range of previous studies with a high rate of proliferative diabetic retinopathy. Factors associated with diabetic retinopathy were similar to other developed countries. To prevent this condition of Diabetic Retinopathy, the coordination between physician and ophthalmologist needs to be strengthened.

Keywords: Diabetic retinopathy, prevalence, factors associated, Nepal.

INTRODUCTION

Diabetic Retinopathy (DR) is a common, potentially blinding and visually disabling complication of diabetics. Nearly all diabetics have some degree of retinopathy after 20 years.¹ It is the major cause for new cases of blindness in people aged 25-74 years.² DR poses an enormous public eye health challenge and financial burden in Asia. Diabetics have 29 times higher chance of becoming blind due to DR than non-diabetics of the similar gender and age.³ Scientific principles on the prevention and treatment of DR have been known for over 20 years, in spite of this, DR remains as major preventable blinding eye health problem in 21st century.⁴ Studies conducted on outpatients in hospitals had showed that the prevalence of DR arrayed from 14.0% in Oman to 47.4% in China.⁵⁻¹² So in order to meet the goal of "Vision 2020: The Right to Sight" for elimination of avoidable blindness, DR is considered as a one of the major challenge.

The aim of the study was to estimate the prevalence of and factors associated with diabetic retinopathy among diabetics in a Tertiary Eye Care Centre, Nepal.

MATERIALS AND METHODS

Subjects and Setting: A hospital-based, cross-sectional study was designed. The study population consisted of known diabetics, who had visited the Outpatient Department of Tilganga Eye Centre (TEC), Kathmandu from 19th December 2005 to 18th January 2006. Subjects were recruited after compiling the detailed history of Diabetes Mellitus (DM).

Examination Methods: Visual acuity (VA) of each eye was tested separately by using Snellen distance vision chart at 6 meters. Blood pressure was measured after ten minutes at rest in seated position.

The Anterior segment was evaluated with Haagt Streit 900 biomicroscope slit lamp and a retinal examination was carried out with +90 Dioptre Volk lens and panretinal indirect ophthalmoscope after pupil dilatation by tropicamide 0.8% and phenyl ephrine 5.0% in case of normal tension in order to examine its DR in detail which were performed by an ophthalmologist. The retina specialist or senior ophthalmologist reconfirmed all the clinical findings. Fundus photography was also taken to confirm the diagnosis as required. After complete eye examination, the necessary treatment was provided as indicated.

Data Management and Analysis: Collected data were edited, classified and coded on same day for completeness and accuracy of the data. The data was entered in two database software to minimize errors. Statistical analysis was performed using the Statistical Package for Social Science version 11.5 software. χ^2 test, p-value, univariate and

multiple regressions were used to test the factors associated with DR. A p-value of <0.05 and was considered to be statistically significant.

Ethical Considerations: This study was performed according to the guidelines of the declaration of Helsinki. Verbal consent was taken at the time of enrolling the patients. Self decision of patients to participate or not for research was highly appreciated by team of study.

RESULTS

A total of 371 consecutive known diabetics were examined at TEC. Patients of the age ranging from 20-88 years were included having a mean of 57.4 years (SD 12.0) and a median of 60.0 years. The sex ratio was 0.72 male per female. In total 38.5% (143) of patients were from Newar ethnicity. Likewise, Newar, Brahman and Chhetri constituted more than three quarters of the total patients. More than one-third (33.9%) of the patients were illiterate. About 39.0% (133) of the patients were housewives. The study had represented the population from 31 districts of Nepal (Table-1).

The prevalence of retinopathy was 44.7% (166). It was slightly higher in females (46.3%) than in males (42.6%). At the time of the study, more than two thirds of the cases had a mild and moderate grade of Diabetic Retinopathy, where as 14.5% cases had Proliferative Diabetic Retinopathy (PDR) (Table-2). About one-fifth (19.2%) cases had Clinically Significant Macular Edema (CSME).

The prevalence of diabetic retinopathy is higher in the 40-49 year age group (55.2%) and 30-39 years (54.9%) of age at onset of DM. The higher proportion with no evidence of DR was found in the 60-69 years age group at onset of DM.

The prevalence of Diabetic Retinopathy was 24.8% in the patients who had diabetes for less than a 5 year's duration, whereas 90.3% cases had Diabetic Retinopathy of 20 years and above duration of DM. The overall prevalence of retinopathy increased as the duration of DM increases (Fig. 1).

The prevalence of diabetic retinopathy in hypertensive patients was 56.0% and 37.1% in non-hypertensive patients.

There was no difference between phakic and pseudophakic/aphakic cases in relation to diabetic retinopathy.

Univariate analysis showed that the age at onset of DM ($p=0.00$, Odds ratio=2.16 in 95.0% Confidence Interval (CI): 1.39-3.36), duration of diabetes ($p=0.00$, Odds ratio=6.02 in 95.0% CI: 3.63-10.05) and hypertension ($p=0.00$, Odds ratio=2.16 in 95.0% CI: 1.38-3.37) were highly significant and associated with diabetic retinopathy, but sex ($p=0.50$, Odds ratio=1.16 in 95.0% CI: 0.75-1.80), ethnicity ($p=0.96$, Odds ratio=1.01 in 95.0% CI: 0.65-1.56) and Phakic conditions ($p=0.86$, Odds ratio=0.96 in 95.0% CI: 0.55-1.65) were not associated with diabetic retinopathy (Table-3).

Multiple regressions showed that age at the onset of diabetes ($p=0.03$, Odds ratio=1.70 in 95.0% CI: 1.04-2.75), duration of diabetes ($p=0.00$, Odds ratio=5.44 in 95.0% CI: 3.27-9.05) and hypertension ($p=0.00$, Odds ratio=2.41 in 95.0% CI: 1.50-3.88) were highly significant association with diabetic retinopathy. Sex ($p=0.71$, Odds ratio=1.09 in 95.0% CI: 0.67-1.74), ethnicity ($p=0.94$, Odds ratio=1.02 in 95.0% CI: 0.64-1.62) and phakic conditions ($p=0.80$, Odds ratio=0.93 in 95.0% CI: 0.51-1.68) were not associated with it (Table-4).

DISCUSSION

The prevalence of diabetic retinopathy was 44.7% (166) in the diabetic population, who had attended TEC during the study period. The prevalence of DR was consistent with the previous hospital based study in Nepal.⁶ In the Oman hospital-based study among diabetic outpatients showed that the prevalence of diabetic retinopathy was 14.4%.⁷ Fourteen WHO study centers throughout the world had shown a prevalence of 35.8%,⁸ and two large clinic-based studies in southern India had found its prevalence as 34.1% and 37% respectively^{9,13} and in China it was 47.4%.⁸

PDR and CSME are the vision threatening conditions. PDR was found in the same range of other developing countries.^{14,15} About one-fifth of DR had CSME. Nearly all CSME cases had received laser treatment. As in the previous study, most of the diabetic patients attended the retina clinic in the late stages of retinopathy.¹⁶

This study showed no significant association between sex and diabetic retinopathy ($p=0.50$, Odds ratio=1.16 in 95.0% CI: 0.75-1.80), but the prevalence of Diabetic Retinopathy was slightly higher in females than in males. This finding is similar to the Blue Mountains Eye Study, Japanese type II diabetic patients study.^{12,17} The results obtained from this study differed from a Zaires' study where the prevalence of DR was double (2:1) in male than in female patients.¹⁸ The Chennai Urban Rural Epidemiology Study on eyes in India and a hospital-based study in Oman found that DR was significantly higher in males than in female patients.^{7,9} In this study, PDR was more common in males (18.2%) than in females (12.0%), whereas PDR was more common in females (17.0%) than in male patients (9.4%) in a Swedish study.¹⁹

This study did not show significant association between diabetic retinopathy and ethnicity ($p=0.96$, Odds ratio=1.01 in 95.0% CI: 0.65-1.56). The Tibeto-Burman ethnic group had a slightly higher chance of developing diabetic retinopathy than the Indo-Aryan ethnic group. In the Victoria study, there was no association between ethnicity and DR.²⁰ Further research is recommended for a clarification of the exact situation.

The prevalence of DR was 45.5% among patients below 30 years old at onset, to 54.9% among 30-39 years old at onset, 55.2% among those 40-49 years old at onset, and then it decreased to 40.2% among 50-59 years and 22.4% among 60-69 years old at onset. A significant association was found between age at onset below 50 years and development of DR ($p=0.00$, Odds ratio=2.16 in 95.0% CI: 1.39-3.36). The prevalence of diabetic retinopathy was 6.0% among patients who were less than 29 years old at the onset of diabetes, 16.9% among the 30-39 years old at onset, and 38.8% among those 40-49 years old at onset and the prevalence again decreased to 28.3% for patients in whom the onset was at 50-59 years. The prevalence of retinopathy increased from 11.0% among patients less than 5 years old at onset of diabetes, to 48.0% among those 15-19 years old at diabetes onset. It then decreased to 30% for patients 30-35 years old at diabetes onset.¹⁹ The prevalence was 1.7% in persons younger than 60 years of age, 2.4% in persons 60 to 69 years of age, 2.7% in persons 70 to 79 years of age, and 2.3% in persons 80 years of age or older.²¹ In the Japanese Type II diabetes study, adolescents with type I diabetes in Children's Hospital, NSW, Australia and The Blue Mountains Eye Study showed that an onset of diabetes was not associated with the development of diabetic retinopathy.^{12,15,22}

This study estimated that the prevalence of diabetic retinopathy was less at a shorter duration of diabetes and was increased with the duration of diabetes. The prevalence of DR was 24.8% in the patients with DM for less than 5 years, 34.0% patients with DM for 5-9 years, and 90.3% in patients with 20 or more years of DM. The association was highly significant between 10 or more years of duration of diabetes and diabetic retinopathy ($p=0.00$, Odds ratio=6.02 in 95.0% CI: 3.63-10.05). The development of diabetic retinopathy was six times higher among patients who had DM for 10 or more years. The prevalence of PDR and the duration of diabetes showed a highly significant association. In DR, the prevalence of PDR was 17.8% in 10 or more years of duration of DM. The chance of PDR was twice in 10 or more years of DM. The retinopathy increases from 25.0% at 5 years to 100.0% at 20 years of suffering from type I diabetes. The prevalence is only 60-70% in type II diabetes who have had it for 20 years.²¹ A hospital-based study in Oman showed that the retinopathy development differences were not statistically significant.⁷ Proliferative diabetic retinopathy increased up to 4.9% after 10 years of duration of diabetes, which is manifested as sight-threatening retinopathy with macular edema. In NIDDM, 34.1% patients had evidence of retinopathy. This included 30.8% patients with non-proliferative diabetic retinopathy including 6.4% with maculopathy and 3.4% patients with proliferative diabetic retinopathy.²¹ In contrast the prevalence of retinopathy was 42.0% in adolescent IDDM patients. All of those affected had a mild background retinopathy.²²

This study shows that hypertension and DR had a strong association ($p=0.00$, Odds ratio=2.16 in 95.0% CI: 1.38-3.37). Development of diabetic retinopathy was twice more likely in hypertensive than non-hypertensive cases. Many researchers have proved that hypertension is a risk factor for diabetic retinopathy. Oman and Japanese population studies demonstrated that hypertension had a strong association. The increased risk of proliferative retinopathy was associated with the presence of baseline hypertension.^{17,23,24} Elevation in diastolic blood pressure, in combination with elevated systolic blood pressure, significantly correlated with retinopathy.²⁵ No association was found between the presence of any history of hypertension or elevated blood pressure with the prevalence of DR.^{16,17,22,26}

This study showed that there was no association between cataract surgery and development of diabetic retinopathy ($p=0.86$, Odds ratio=0.96 in 95.0% CI: 0.55-1.65). Most of the cases were operated with modern techniques of cataract surgery at Tilganga Eye Centre. However, we did not have enough information to comment on this issue. For this purpose, further research is recommended. The results are similar to the previous studies held in Denmark and Israel.^{27,28} Modern cataract surgery should not be contraindicated in non-proliferative diabetic retinopathy²⁶ as it has no influence on the progression of DR.²⁸ However, the literature showed that the diabetic retinopathy grows progressively worse after surgical intervention.²⁹⁻³¹ Macular edema before cataract surgery is the most common condition that limits post-operative visual recovery.^{28,32}

Multiple regressions showed that age at the onset of diabetes, duration of diabetes and hypertension were highly significant association with diabetic retinopathy ($p<0.05$). Sex, ethnicity and phakic condition were not associated with it ($p=>0.05$).

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Table-1: General characteristics of diabetics

Demographic data	
Mean age (years)	57.4
Median age (years)	60.0
Range (years)	20-88
Standard Deviation (years)	12.0
Sex ratio (M: F)	0.74
Literacy rate	222 (66.1%)
Residence of Kathmandu Valley	309(83.3%)

Table-2: Stages of diabetic retinopathy
(n=166)

Diabetic retinopathy	n. (%)
Mild NDPR	56 (33.7)
Moderate NDPR	59 (35.6)
Severe NDPR	18 (10.8)
Very severe NDPR	9 (5.4)
PDR	24 (14.5)

Table-3: Univariate regression analysis for factors associated with DR

Factors	χ^2	P-value	Odds ratio	95.0% CI
Sex	0.00	0.50	1.16	0.75-1.80
Ethnicity	0.00	0.96	1.01	0.65-1.56
Age at onset of DM	13.26	0.00	2.16	1.39-3.36
Duration of diabetes	58.50	0.00	6.02	3.63-10.05
Hypertension	12.90	0.00	2.16	1.38-3.37
Phakic condition	0.03	0.86	0.96	0.55-1.65

Table-4: Multivariate regression analysis for factors associated with DR

Factors	χ^2	P-value	Odds ratio	95.0% CI
Sex	0.14	0.71	1.09	0.67-1.74
Ethnicity	0.00	0.94	1.02	0.64-1.62
Age at onset of DM	4.54	0.03	1.70	1.04-2.75
Duration of diabetes	42.61	0.00	5.44	3.27-9.05
Hypertension	13.16	0.00	2.41	1.50-3.88
Phakic condition	0.06	0.80	0.93	0.51-1.68

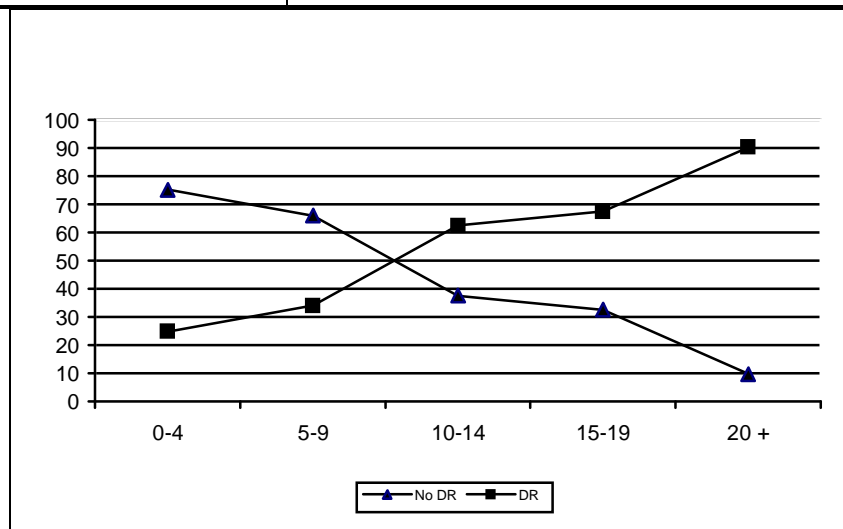


Fig. 1. Relation of duration of diabetes and diabetic retinopathy