

Prevalence of and risk factors for diabetic retinopathy among the patients with diabetes mellitus in Dharan municipality, Nepal

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ABSTRACT

Background & Objectives: The individuals with diabetes have 29 times higher chance of becoming blind due to diabetic retinopathy than non-diabetic of similar age and gender. The knowledge on the factors for it can help detect the disease in its early course. The study was conducted with objectives to study the prevalence of diabetic retinopathy and its risk factors in a diabetic population. **Materials and Methods:** A community based cross-sectional study that involved 418 subjects with type 2 diabetes, living in the Dharan municipality of Nepal was carried out using convenient sampling method. **Results:** The prevalence of diabetic retinopathy was 38.8%. Prevalence of mild, moderate, severe and very severe non-proliferative diabetic retinopathy was 9.1%, 16.3%, 6.2% and 17.2% respectively. Prevalence of proliferative diabetic retinopathy and clinically significant macular edema was 3.8% and 1.9% respectively. Among the risk factors studied age, hypoglycemic drug intake, family history and duration of diabetes mellitus had a significant association with the occurrence of diabetic retinopathy ($p < 0.05$). **Conclusions:** The prevalence of diabetic retinopathy in patients with diabetes mellitus was 38.8% and increase risk factors for it are age, hypoglycemic drug intake, family history of diabetes, duration of diabetes.

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INTRODUCTION

Diabetes is present in more than 246 million people around the world.^[1] The concern to it is growing because of its severe long term complications including cardiovascular disturbances, nephropathy, neuropathy and retinopathy. The prevalence of diabetes was recorded to be 6.3% in adult in a community based study in Eastern Nepal.^[2]

Individuals having diabetes for several years there is a presence of characteristic group of lesions found in the retina or fundus which is diabetic retinopathy or ocular vasculopathy. Diabetic retinopathy is a leading cause of blindness among working-aged adults around the world³. The individuals with diabetes have 29 times higher chance of becoming blind due to diabetic retinopathy than non-diabetic of similar age and gender.^[4] On the other hand the prevalence of DR and its risk factors may vary according to ethnicity and population studies.

MATERIALS AND METHODS

A community based cross sectional study was conducted in Dharan Municipality, Nepal from March, 2011 to February, 2012 applying convenient sampling method. The study included a total of 418 patients. All the patients were recruited in the study following their visit to KHDC (early detection and management of Kidney, Hypertension, Diabetes, Cardiovascular disease) outreach clinic managed in by the department of Internal Medicine of the B.P. Koirala Institute of Health Sciences in Dharan municipality. The diagnosis of diabetes was made according to the American Diabetes Association diagnostic criteria 2010.⁵

The protocol of the study was reviewed and approved by the ethics committee of the B.P. Koirala Institute of Health Sciences. The subjects who had given informed consent with established diagnosis of diabetes according to the American Diabetes Association diagnostic criteria of diabetes were enrolled in the study. A proforma was used to

record the patient's age, gender, and duration of diabetes, family history, drug intake, blood pressure, body mass index and blood glucose level. Baseline blood pressure was recorded at presentation with mercury sphygmomanometer applying auscultatory method technique. Blood pressure was classified according to JNC VII⁶ [Table 1]. Patient who did not provide consent for the study and those having dense opacities preventing detailed fundus examination were excluded.

EYE EXAMINATION

The visual acuity (VA) of each eye was tested separately using a Snellen distance vision chart at 6 meters.⁷ The anterior segment was grossly evaluated with torch light and the fundus examination was carried out with indirect ophthalmoscope after pupil dilation with tropicamide 0.5%.

Diabetic retinopathy was graded using the Early Treatment Diabetic Retinopathy Scale (ETDRS) modification of the Airlie House Classification scheme as no retinopathy, mild non-proliferative diabetic retinopathy (NPDR), moderate NPDR, severe NPDR, very severe NPDR, early proliferative diabetic retinopathy (PDR), high risk PDR, severe PDR and clinically significant macular edema.⁸

RESULT

Of 418 diabetic patients, mild non proliferative retinopathy (NPDR) was present in 38(9.1%), moderate NPDR in 68(16.3%), severe NPDR in 26 (6.2%), very severe NPDR in 7 (1.7%), PDR in 16 (3.8%) and clinically significant macular edema in 8 (1.9%).

The visual acuity of 371(88.7%) patients was normal, whereas 34 (8.1%) had visual impairment, 3(0.007%) had severe visual impairment and 10 (0.02%) were blind according to the WHO blindness classification.⁹

Table 1. JNC VII classification of Blood Pressure

SYSTOLIC BP (MMHG)	DIASTOLIC BP(MMHG)	STAGE
<120	<80	Normal
120-139	80-89	Pre-hypertensive
140-159	90-99	Stage I
>160	>100	Stage II

The mean age of the patients with diabetic retinopathy was 60.54±10.56 and that of without diabetic retinopathy was 53.64±10.92 years (p<0.001) [Table 2].

Table 2. Association between age and diabetic retinopathy

AGE(YRS)	GROUP		P-VALUE
	DR	No DR	
40-49	26	93	<0.001
50-59	45	81	
60-69	54	57	
70-79	31	20	
>80	6	5	
TOTAL	162	256	
MEAN AGE ± SD	60.54±10.5	53.64±10.9	<0.001

The duration of diagnosed diabetes was found to have a significant association with diabetic retinopathy (p<0.001) and prevalence was higher in patients with duration of diabetes of >5-10 years [Table 3]. The patients on treatment with hypoglycemic drugs were 5.37 times more likely to have diabetic retinopathy compared with those who required on medical nutrition therapy only for control of glycemia [Table 4]. Similarly, the patients with unknown family history of diabetes mellitus were 1.53 times at greater risk of developing diabetic retinopathy compared with those that had positive family history [Table 4].

Increase in blood pressure did not showed significant association with diabetic retinopathy (p=0.66) [Table 4]. Gender and body mass index of the patients were not found to be significantly associated with the occurrence of diabetic retinopathy [Table 4]. On evaluating the association of blood glucose level and retinopathy, the patients with high blood glucose level were 1.32 and 1.25 at a greater risk of retinopathy compared with normal post prandial and fasting blood glucose level [Table 4].

DISCUSSION

The prevalence of diabetic retinopathy was found to be 38.8% which was higher than that reported in Nepal (19.3%),¹⁰ Chennai (18%)¹¹ and Beijing 27.9%.¹² United Kingdom Prospective Diabetes Study (UKPDS) showed the prevalence of diabetic retinopathy to be 39% in male and 35% in female,¹³ whereas Gaddap Study highlighted the prevalence of 27.43%^[14] as the sample in this study were 30 years and above.

In this study, the risk factors studied included age, sex, body mass index (BMI), duration of diabetes, blood pressure and blood glucose level.

The age was found to be significantly associated with diabetic retinopathy similar to various other studies^{15,16} and longer duration of diabetes was significantly related to retinopathy too. This is consistent with WESDR which showed that non-proliferative retinal lesions, macular edema and proliferative diabetic retinopathy each had a prevalence that is strongly associated with the duration of diabetes diagnosis.^{13,17}

The patients taking insulin or oral hypoglycemic medicines were having diabetic retinopathy higher compared to those not on any medication which was similar to a study done in Tehran.¹⁵ This may reflect easy of control of blood sugar or shorter duration of diabetes, hence well controlled. Similarly, the patients with unknown family history were significantly associated with retinopathy. A

study done in Kuwait reported that the association between family history and diabetic retinopathy was insignificant.¹⁸

Table 3. Association between duration of diabetes and retinopathy

Duration (yrs)	Group		P-value
	DR	No DR	
≤1	12	102	<0.001
>1-5	15	84	
>5-10	80	50	
>10-15	29	15	
>15	26	5	
Total	162	256	

Table 4. Association between various risk factors and diabetic retinopathy

Variables	Disease status			Relative Risk	95% CI of RR		p-value
	DR	No DR	Total		Lower	Upper	
Drug Intake							
OHA/Insulin	157	200	357	5.37	2.30	12.53	<0.001
No	5	56	61				
Family History							
Unknown	144	207	351	1.53	1.01	2.13	0.029
Known	18	49	67				
Postprandial Blood Glucose(mg/dl)							
>200	94	120	214	1.32	1.03	1.69	0.026
≤200	68	136	204				
Fasting Blood Glucose (mg/dl)							
>126	106	146	152	1.25	0.96	1.61	0.87
≤126	56	110	166				
Gender							
Male	81	142	223	0.87	0.69	1.11	0.275
Female	81	114	195				
Body Mass Index							
Underweight/Normal	92	147	239	0.98	0.77	1.26	0.89
Overweight/Obese	70	109	179				
Blood Pressure (mm/Hg)							
High (≥120/80)	147	229	376	1.09	0.72	1.67	0.66
Normal (<120/80)	15	27	42				
Total	162	256	418				

This study did not find any association between fasting blood sugar at presentation and occurrence of diabetic retinopathy but there was a significant association between post prandial blood sugar and occurrence of diabetic retinopathy. UKPD study and DCCT study reported that glycemic control is associated with decreased incidence of retinopathy. It was further shown that development and progression of retinopathy is halted by a good control of blood sugar. Though people with poor control of blood sugar had higher incidence of retinopathy, it was not found to be independently associated with it.^{19, 20}

The present study showed that there was no association of retinopathy with gender. Most of the other studies have not reported the association of retinopathy and gender.^{[21][22]} Similarly there was no association between body mass index and occurrence of diabetic retinopathy in our study. However, some studies have found an increased prevalence of retinopathy in patients with lower BMI.^{21, 23}

There was no significant association between blood pressure and the occurrence of diabetic retinopathy. Study done by Ishihara M et al revealed systolic blood pressures to be significantly higher in the patients with retinopathy than in those without retinopathy, whereas there was no difference in the diastolic blood pressure between these two groups.²⁴ Study among Omani diabetics showed that hypertension was significantly associated with retinopathy and both systolic and diastolic blood pressures were deemed to have association, however, the diastolic blood pressure was found to be the variable consistent with the development of moderate to severe NPDR as well as proliferative DR in the logistical model with a higher risk than if any retinopathy was considered.²⁵

LIMITATION OF STUDY

This study has several limitations. Though it is a community based study, it was done in community outreach clinic. The sample taken was also by convenient sampling technique. These might have introduced bias of selection and patient with more severe and longer duration of diabetes might have been included leading to higher prevalence of DR. The sample size is also limited.

CONCLUSION

The prevalence of retinopathy in the subjects with type II diabetes was found to be 38.8%. The risk factors with significant association with retinopathy were age, oral hypoglycemic drug intake, family history, duration of diabetes mellitus and postprandial blood glucose level.

REFERENCES

1. Ceriello A, Colagiuri S. International Diabetes Federation guideline for management of postmeal glucose: a review of recommendations. *Diabet Med.* 2008 Oct;25(10):1151–6. DOI:10.1111/j.1464-5491.2008.02565.x; PMID:19046192; PMCID:PMC2701558.
2. Sharma SK, Ghimire A, Radhakrishnan J, Thapa L, Shrestha NR, Paudel N, et al. Prevalence of hypertension, obesity, diabetes, and metabolic syndrome in Nepal. *Int J Hypertens.* 2011;2011:821971. DOI:10.4061/2011/821971.
3. Klein BEK. Overview of epidemiologic studies of diabetic retinopathy. *Ophthalmic Epidemiol.* 2007 Jul-Aug;14(4):179–83. DOI:10.1080/09286580701396720; PMID:17896294.
4. Klein R, Klein BE, Moss SE. Visual impairment in diabetes. *Ophthalmology.* 1984 Jan;91(1):1–9. DOI:10.1016/S0161-6420(84)34337-8
5. Diagnosis and classification of diabetes mellitus. *Diabetes Care.* 2010 Jan;33(1):62–9.
6. National High Blood Pressure Education Program. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Bethesda (MD): National Heart, Lung, and Blood Institute (US); 2004 Aug. Classification of Blood Pressure. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK9633>.
7. J. Schwiegerling. Field Guide to Visual and Ophthalmic Optics, SPIE Press, Bellingham, WA (2004). DOI:10.1117/3.592975; PMID:15535364
8. Grading diabetic retinopathy from stereoscopic color fundus photographs--an extension of the modified Airlie House classification. ETDRS report number 10. Early Treatment Diabetic Retinopathy Study Research Group. *Ophthalmology.* 1991;98:786–806. DOI:10.1016/S0161-6420(13)38012-9.
9. WHO study group. The prevention of blindness. WHO Technical Report Series No. 518, 1973.
10. Paudyal G, Shrestha MK, Meyer JJ, Thapa R, Gurung R, Ruit S. Prevalence of diabetic retinopathy following a community screening for diabetes. *Nepal Med Coll J.* 2008 Sep;10(3):160–3. PMID:19253859.
11. Raman R, Rani PK, Gnanamoorthy P, Sudhir RR, Kumaramanikavel G, Sharma T. Association of obesity with diabetic retinopathy: Sankara Nethralaya Diabetic Retinopathy Epidemiology and Molecular Genetics Study (SN-DREAMS Report no. 8). *Acta Diabetol.* 2010 Sep;47(3):209–15. DOI:10.1007/s00592-009-0113-8; PMID:19326040.
12. Xie XW, Xu L, Wang YX, Jonas JB. Prevalence and associated factors of diabetic retinopathy. The Beijing Eye Study 2006. *Graefes Arch Clin Exp Ophthalmol.* 2008 Nov;246(11):1519–26. DOI:10.1007/s00417-008-0884-6 PMID:18604548.
13. Kohner EM, Aldington SJ, Stratton IM, Manley SE, Holman RR, Matthews DR, et al. United Kingdom Prospective Diabetes Study, 30: diabetic retinopathy at

- diagnosis of non-insulin-dependent diabetes mellitus and associated risk factors. *Arch Ophthalmol*. 1998 Mar;116(3):297–303. DOI:10.1001/archophth.116.3.297; PMID:9514482.
14. Mahar PS, Awan MZ, Manzar N, Memon MS. Prevalence of type 2 diabetes mellitus and diabetic retinopathy : the Gaddap Study. *J Coll Physicians Surg Pak*. 2010 Aug;20(8):528-32; PMID:20688018.
15. Javadi MA, Katibeh M, Rafati N, Dehghan MH, Zayeri F, Yaseri M, et al. Prevalence of diabetic retinopathy in Tehran province: a population-based study. *BMC Ophthalmol*. 2009 Jan;9:12. DOI:10.1186/1471-2415-9-12; PMID:19835608; PMCID:PMC2770536.
16. Dowse GK, Humphrey AR, Collins VR, Plehwe W, Gareeboo H, Fareed D, et al. Prevalence and risk factors for diabetic retinopathy in the multiethnic population of Mauritius. *Am J Epidemiol*. 1998 Mar 1;147(5):448–57. DOI:10.1093/oxfordjournals.aje.a009470; PMID:9525531.
17. Klein R, Klein BE, Jensen SC, Moss SE. The relation of socioeconomic factors to the incidence of proliferative diabetic retinopathy and loss of vision. *Ophthalmology*. 1994 Jan;101(1):68–76. DOI:10.1016/S0161-6420(94)31354-6.
18. The Prevalence of Diabetic Retinopathy and associated Risk Factors in Type 2 Diabetes Mellitus in Al-Naeem area (Kuwait). *Middle East Journal of Family Medicine*. 2005 May;3(2).
19. Stratton IM, Kohner EM, Aldington SJ, Turner RC, Holman RR, Manley SE, et al. UKPDS 50: risk factors for incidence and progression of retinopathy in Type II diabetes over 6 years from diagnosis. *Diabetologia*. 2001 Feb;44(2):156–63. DOI:10.1007/s001250051594; PMID:11270671.
20. Janghorbani M, Amini M, Ghanbari H, Safaiee H. Incidence of and risk factors for diabetic retinopathy in Isfahan, Iran. *Ophthalmic Epidemiol*. 2003 Apr;10(2):81–95. DOI:10.1076/opep.10.2.81.13893; PMID:12660857.
21. Lee ET, Lee VS, Lu M, Russell D. Development of proliferative retinopathy in NIDDM. A follow-up study of American Indians in Oklahoma. *Diabetes*. 1992 Mar;41(3):359–67. DOI:10.2337/diabetes.41.3.359; PMID:1551496.
22. Gillow JT, Gibson JM, Dodson PM. Hypertension and diabetic retinopathy--what's the story? *Br J Ophthalmol*. 1999 Sep;83(9):1083–7. DOI:10.1136/bjo.83.9.1083 PMID:10460781; PMCID:PMC1723193.
23. Classification and diagnosis of diabetes mellitus and other categories of glucose intolerance. National Diabetes Data Group. *Diabetes*. 1979 Dec;28(12):1039–57. DOI: 10.2337/diab.28.12.1039; PMID:510803
24. Ishihara M, Yukimura Y, Aizawa T, Yamada T, Ohto K, Yoshizawa K. High blood pressure as risk factor in diabetic retinopathy development in NIDDM patients. *Diabetes Care*. 1987;10(1):20–5. DOI:10.2337/diacare.10.1.20; PMID:3568963.