

Prevalence of diabetic retinopathy among adult diabetics in the rural and urban population

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Abstract

Introduction: Diabetic retinopathy (DR) is the leading cause of blindness among working age adults around the world. Each year more and more people live with this condition, which can result in life-changing complications. **Aim:** To determine the prevalence and risk factors of diabetic retinopathy (DR) in screening programme, in order to estimate the future burden of the disease. **Materials and methods:** A cross sectional community based study was with purposive sample of adults with self-reported diabetes mellitus (DM). A structured questionnaire was used to collect patient data. Ophthalmological evaluation was done and fundus was examined for grading DR using direct and indirect ophthalmoscope. **Results:** Among the 698 diabetic patients, mean age was 55.02±11.8 years (ranging from 24 to 91 years). 12.3% of diabetic were not under any treatment. Only 69.3% of patients had visited eye specialist for diabetic retinopathy screening. Prevalence of DR was found to be 15.3%; 13.9% had non-proliferative DR and 1.4% had proliferative DR. Prevalence of diabetic macular edema was 2.1%. In the binary-logistic regression analysis, duration of diabetes was associated with significantly increased risk of DR (OR: 1.13; 95% confidence interval (CI), 1.09 to 1.17; p<0.001). History of absence of arterial hypertension decreased the risk of DR (OR: 0.56; 95% CI, 0.36 to 0.87; p=0.01). **Conclusion:** One sixth of the patients with diabetes have retinopathy. Diabetic retinopathy risk increased with duration of diabetes and decreased with history of no co-existing arterial hypertension.

Keywords: Diabetic Retinopathy, Diabetes mellitus, Prevalence, Risk factors.

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Introduction

Diabetes is one of the greatest global health burdens of the 21st century (International Diabetes Federation, 2015). Each year more and more people live with this condition, which can result in life-changing complications (International Diabetes Federation, 2015). Diabetic retinopathy (DR) is the leading cause of blindness among working aged adults around the world. Uncorrected refractive errors (43%), cataracts (33%), glaucoma (2%), age related macular degeneration (1%) and diabetic retinopathy (1%) are the major causes of visual impairment globally (WHO, 2012). Although the major risk factors for DR (e.g., hyperglycemia, hypertension, dyslipidemia) have been examined in many epidemiologic studies and clinical trials, there is considerable variation in the consistency, pattern, and strength of these risk factors.

The present study aims to evaluate the prevalence of diabetic retinopathy of adults with self-reported diabetes mellitus (DM)[1-3].

Materials and Methods

This prospective, unicentric, study was conducted in the department of Ophthalmology, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar. The study was approved by the institutional research and ethical committee.

This study was conducted over a period of 02 Months from June 2019 to August 2019. An informed and written consent was obtained from all the participating subjects prior to the commencement of the study. Adults (20 years and above) with self-reported diabetes mellitus were included in the study by purposive sampling. Patients with media opacity (like corneal opacity and significant cataract) precluding fundus examination were not included in the study.

A structured questionnaire was used for data collection. All participants were interviewed; socio-demographic details including age, gender, occupation, past history of ocular examination for diabetic retinopathy, duration of DM, treatment of DM and history of coexisting hypertension were collected. Age distribution was taken at 10 years interval as per International Diabetes Federation, 2015. Distribution of duration of diabetes was done as per Centers for Disease Control and Prevention (CDC), 2011.

Detailed ophthalmological evaluation included dilated fundus examination to grade DR using direct and indirect ophthalmoscope.

Best corrected Snellen's visual acuity was recorded and graded as per WHO categories for visual impairment 1977. Diabetic retinopathy was graded according to the Global Diabetic Retinopathy Project Group, 2003. The presence of retinopathy in one eye was considered as a positive diagnosis of DR and when asymmetrical disease was present, the stage of retinopathy was based on grade of DR in more severely affected eye[4-6].

Statistical analysis

Data was entered in an Excel spreadsheet (Microsoft Corp.) and analyzed using SPSS software (version 16.1, SPSS, Inc.). Continuous variables were expressed as the mean ± standard deviation and categorical variables were expressed as individual counts. Differences were considered statistically significant when the p value was less than 0.05.

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Results

Six hundred and ninety eight diabetics were screened for diabetic retinopathy and were included in the study. Out of these, 303 (43.4%) patients were resident of rural areas and 395 (56.6%) of urban areas. Male: female ratio was 1.26:1. Mean age of the patients was

55.02±11.8 years (ranging from 24 to 91 years). More than half of patients (56.3%) belonged to the age group 50 to 69 years (Table 1). The major group of patients was housewives (37.7%), followed by business man (28.2%), service man(14.8%), farmer(14.2%) and others (5.2%).

Characteristic and Parameters	Total No. of patients in the subgroup (%)	Adjusted Prevalence of Retinopathy (%)
Age (in years) ^a	20-29	9 (1.3)
	30-39	47 (6.7)
	40-49	169 (24.2)
	50-59	190 (27.2)
	60-69	203 (29.1)
	70-79	67 (9.6)
	≥80	13 (1.9)
Gender	Male	389 (55.7)
	Female	309 (44.3)

Majority of patients (85.1%) had diabetes for duration of 1 to 10 years (Table 2). More than half of diabetics (55%) were taking oral hypoglycemic agents, 29.5% of them were taking insulin, 12.3% were not under any treatment and 3.2% were under dietary control.

Characteristic and Parameters	Total No. of patients in the subgroup (%)	Prevalence of Retinopathy (%)
Duration of diabetes (in years)	0-2	243 (34.8)
	2-5	208 (29.8)
	6-10	143 (20.5)
	11-15	61 (8.7)
	16-20	28 (4)
	21-25	11 (1.6)
	26-30	4 (0.6)
H/O Hypertension	Yes	296 (42.4)
	No	402 (57.6)
H/O Visited Ophthalmologist for screening	Yes	484 (69.3)
	No	214 (30.7)

More than two third (69.3%) of patients had previously visited eye specialist for diabetic retinopathy screening. Of the study population, only 0.4% gave history of treatment in the form of retinal lasers and none of them had received any intraocular injections or had undergone retinal surgery. Around two fifth (42.4%) of patients gave history of coexisting hypertension.

Majority of the patient's best corrected Snellen's visual acuity (BCVA) was between 6/6 - 6/18 (Table 3).

Visual acuity	Right eye (%)	Left eye (%)
	6/6-6/18	501 (71.8)
6/24-6/60	147 (21.1)	139 (19.9)
5/60-3/60	25 (3.6)	28 (4)
2/60-1/60	25 (3.6)	35 (5)
<1/60-PL	0	0
NPL	0	0
Grading of Diabetic Retinopathy	No	596 (85.4)
	Mild NPDR	54 (7.7)
	Moderate NPDR	23 (3.3)
	Severe NPDR	15 (2.1)
	PDR	10 (1.4)
	DME	13 (1.9)

Age adjusted prevalence of DR in the screened diabetic population was found to be 15.3%; 13.9% had non-proliferative DR and 1.4% had proliferative DR. Prevalence of diabetic macular edema was 2.1%. In rural population prevalence of DR was 14.2% and in urban population it was 16.2%. There was an insignificant difference (p=0.087) in the prevalence between male (15.2%) and female (15.5%) gender. There was no significant difference (p=0.832) in prevalence of DR between those who had visited ophthalmologist for DR screening (14.9%) and those who had not (16.4%). Highest prevalence of DR (60.7%) was seen among those having diabetes for duration of 16 to 20 years (Table 2). Prevalence of DR was highest (21.2%) in the

age group 60 to 69 years and lowest (0.0%) in the age group 20 to 29 years (Table 1).

In the binary-logistic regression analysis in all adults, duration of diabetes was associated with significantly increased risk of DR (OR: 1.13; 95% confidence interval (CI), 1.09 to 1.17; p<0.001). History of absence of arterial hypertension decreased the risk of DR (OR: 0.56; 95% CI, 0.36 to 0.87; p=0.01). Age (OR: 1.005; 95% CI, 0.98 to 1.02; p=0.61), male gender (OR: 0.91; 95% CI, 0.58 to 1.42; p=0.68) and whether visited eye specialist for DR screening (OR: 0.77; 95% CI, 0.48 to 1.12; p=0.27) were not found to be associated with DR.

Discussion

Prevalence of DR in our study was found to be 15.3% which was higher than 10.16%, reported by Thapa SS et al (2013) in the Bhaktapur Glaucoma Study. In other hospital based studies conducted, DR prevalence ranged from 44% as reported by Shrestha MK et al (2008) to 78% as reported by Thapa R et al (2012).

In the present study, around 1/6th of the patients with diabetes were found to have DR, a prevalence that is similar to that reported in

recent population- based prevalence studies from individual South Asian countries (Table 4). Prevalence of DR urban Indians with diabetes was reported as 17.6% by Rema M et al (2005) in the Chennai Urban Rural Epidemiology Study (CURES). Raman R et al (2009) reported it as 18.0% in the Sankara Nethralaya Diabetic Retinopathy Epidemiology and Molecular Genetics Study (SNDREAMS).

Table 4: Prevalence of Diabetic Retinopathy in South Asian countries

Country (Study by)	Year of publication	Study setting	Prevalence of DR(%)
Nepal (Thapa R et al)	2012	Hospital	78
Nepal (Shrestha S et al)	2007	Hospital	21
Nepal (Thapa SS et al)	2013	Population (regional)	10.2
India (Rema M et al)	2005	Population (regional)	17.6
India (Raman R et al)	2009	Population (regional)	18
Srilanka (Katulanda P et al)	2014	Population (national)	27.4
Pakistan (Mahar PS et al)	2010	Population (regional)	27.4
Pakistan (Hussain F et al)	2011	Population (regional)	12
Bangladesh (Akhter A et al)	2013	Population (regional)	21.6

In our study, prevalence of DR in rural area was 14.2% and in urban area it was 16.2%. Although higher prevalence values are reported in some hospital based studies, they are likely to be subjected to a significant selection bias. Differences in socioeconomic factors, including access to and the level of diabetes care are some of the possible explanations for the observed disparity in the prevalence rates[7-10].

United Kingdom Prospective Diabetes Study (1998) showed the prevalence of diabetic retinopathy to be 39% in male and 35% in female which was very high as compared to that in our study. More male than female were seen during our study period but there was no significant difference in prevalence of DR among them ($p=0.087$). This was similar to that reported by Shrestha et al (2008). On contrary, SNDREAMS (2009) reported that men were associated with increased risk of diabetic retinopathy (21.1%; versus 14.6% for women). Highest prevalence of DR (60.7%) was seen among those having diabetes for duration of 16 to 20 years and duration of diabetes was found to be associated with significantly increased risk of DR (OR: 1.13; 95% CI, 1.09 to 1.17; $p<0.001$) in the present study population. Duration of diabetes has been suggested as a major risk factor for DR by various authors in various studies [11-14]. This finding was recently confirmed in a meta analysis by Yau et al (2012) and applies broadly across mild to vision-threatening stages of DR.

Hypertension is also considered as a risk factor for DR (UKPDS, 1998); Similarly in our study, no history of hypertension was associated with decreased risk of DR (OR: 0.56; 95% CI, 0.36 to 0.87; $p=0.01$).

Although prevalence of DR was highest (21.2%) in the age group 60 to 69 years and lowest (0.0%) in the age group 20 to 29 years in this study population, age was not associated with an increased risk of DR (OR: 1.005; 95% CI, 0.98 to 1.02; $p=0.61$).

There is considerable variation in the consistency, pattern, and strength of risk factors for DR. Yau JW et al (2012) reported poor glycemic control and higher total cholesterol levels to be associated with diabetic retinopathy. However, these parameters were not evaluated in this study [15-20].

The detection and treatment of sight threatening DR at an early stage is essential to ensure improved long term outcome. In our study only 1.4% patients had PDR, few patients gave history of laser treatment and none of them had a history of retinal surgery for DR. Patients with severe retinopathy may be attending tertiary eye care services and might not have attended screening camps.

Conclusion

One sixth of the patients with diabetes have retinopathy. Diabetic retinopathy risk increased with duration of diabetes and decreased with history of no co-existing arterial hypertension.

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