Prevalence and Risk Factors for Diabetic Retinopathy among the Rural Diabetic Population of West Bengal

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ABSTRACT

Introduction: Diabetic retinopathy, also known as diabetic eye disease (DED), is a medical condition in which damage occurs to the retina due to diabetes mellitus. It is a leading cause of blindness in developed countries. This study was organized to determine the prevalence of diabetic retinopathy (DR) and its risk factors among diabetic patients in rural West Bengal.

Material and methods: Patients were screened in some of the villages of West Bengal, India by a dedicated team of ophthalmologist, optometrist and counsellor in association with a treating physician. Demographic details, diabetic control, compliance to eye check-up, awareness regarding diabetic blindness, and visual acuity were recorded using a questionnaire. DR was graded by ophthalmoscopy.

Results: Prevalence of DR in our study was seen to be 13.92% with mild NPDR constituting 8.86%, moderate NPDR 3.8%, and PDR 1.27%. There was significant difference with DM age (p<0.01, odds ratio 1.14). No significant difference was found with the level of awareness (p=0.72), and gender (p=0.75).

Conclusion: This study provides the first prevalence data from rural WB, and gives valuable insight regarding modifiable risk factors for DR.

Keywords: Diabetes Mellitus, Diabetic Retinopathy, Prevalence, Rural, West Bengal

INTRODUCTION

Diabetes mellitus (DM) is increasing in epidemic proportions in the last few decades, with over 700 million expected to be affected worldwide by next 30 years.[1] Diabetic retinopathy (DR) is the leading cause of visual impairment in the Western world, particularly among persons of working age.[2] It is estimated that DR develops in more than 75% of diabetic patients within 15 to 20 years of diagnosis of diabetes.[3,4] It is a devastating microvascular ophthalmological complication which develops in long standing uncontrolled diabetic population.[5] It is estimated that one-third of diabetics live with DR, while at least 10% develop vision threatening eye disease in their lifetime.[6] The prevalence of DR among diabetics in India has been documented to be lower than western countries.[7,8] However, as India is expected to become home to the largest number of diabetic population in the world, the number of people affected by DR is projected to be huge.[9,10] Most of the DR prevalence studies in India have been done in the southern Indian population, while very limited literature is available from eastern India.[11] This study was designed to estimate the prevalence of DR from two districts of rural West Bengal, India and also to ascertain the associated risk factors.

MATERIAL AND METHODS

Outcome measure
These included age- and gender-adjusted prevalence of diabetic retinopathy, among the diabetic population of rural Bengal and correlation of prevalence/stage of DR with different risk factors.

Patient selection
Screening camps were conducted in the villages by an ophthalmologist and optometrist in association with a treating physician. Diabetic population from two villages from two different districts of WB were screened (Porabazar from Hooghly district and Kalanabagram from Bardhaman district.) Patients with known history of DM were included in the study.

Exclusion criteria
Any patient with any other ocular co-morbidity such as visually significant cataract, glaucoma, corneal or neurological pathology was excluded from the study.

Data collection
The counsellor filled in the demographic details, and recorded pertinent history of DM and its treatment, as well as ophthalmological problems. All interviews were conducted in the local language, Bengali. Informed consent form was provided to each patient and explained in the local language they understand. Diabetic age (or DM age) was recorded as the duration since patient was first diagnosed with DM. Their food habit was recorded as vegetarian or non-vegetarian. Tobacco use in any form was also enquired. The patient's awareness regarding DM as a possible cause of blindness was enquired. The optometrist recorded the best corrected

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distance visual acuity (BCDVA) using Snellen's distance vision chart. For the study purpose, BCDVA was classified as good visual acuity (6/6 - 6/9), mild vision loss (6/9 - 6/18), moderate vision loss (6/18 – 1/60), and diabetic blindness (counting fingers, hand movement, perception of light present or absent). Anterior segment screening examination was done using torch light. Both eyes were dilated using tropicamide 0.8% with phenylephrine 5% combination eye drop. The ophthalmologist examined the fundus with an indirect ophthalmoscope, and recorded DR grading. DR was graded according to International Classification of Diabetic Retinopathy and Diabetic Macular Edema given by International Council of Ophthalmology (ICO) as no DR, mild non-proliferative diabetic retinopathy (NPDR), moderate NPDR, severe NPDR or proliferative diabetic retinopathy (PDR).[12]

STATISTICAL ANALYSIS

Statistical analysis was done using statistical software R version 3.5.1. The results are expressed as mean ± standard deviation for quantitative data and number (percentage) for qualitative data. Test statistics used are Pearson's Chi-squared test, Fisher's exact test for count data, t-test and Spearman's rank correlation test. p value < 0.05 is considered to be significant.

Ethical Guidelines

All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000. Approval was obtained from the regional and local ethical committees. Informed consent was obtained from each participant before participating in the survey. Confidentiality was mentioned as per protocol.

RESULTS

The camps were conducted in two districts in West Bengal, Hooghly and Bardhaman, in April 2019. Data from 79 patients was collected, which included 58.23% males (n=46) and 41.77% females (n=33). The average age was 54.68 ± 11.68 years. 39.24% (n=31) were below 50 years of age, 30.38% (n=24) were between 50-60 years, and 30.38% (n=24) were above 60 years. (TABLE 1) The average DM age was 6.87 ± 6.71 years. Only 45.57% (n=36) were on regular medication for their disease. The detailed analysis has been provided in table 2.

Among the total population under investigation, 79.75% (n=63) were Hindu by religion, while 20.25% (n=16) were Muslims. 93.67% (n=74) had a non-vegetarian diet, while 6.33% (n=5) were vegetarians. Most of the males (84.78%) were farmers by occupation, while most of the females (90.91%) were housewives. 65.22% (n=30) of males and 12.12% (n=4) of females were tobacco users. 29.11% (n=23) of subjects screened were aware of DM as a cause of blindness, while 70.89% (n=56) had never been informed about it. There was no statistically significant difference in the level of awareness between males and females (p=0.65),

or with DM age (p=0.69). 55.7% of subjects did not have a comprehensive eye checkup in the last six months, of which a substantial 27.85% had never had an eye checkup since DM was diagnosed. There was no significant difference between males and females (p=0.78). The detailed analysis has been provided in table 3.

50.63% (n=40) of subjects had good visual acuity, while 30.38% (n=24) experienced mild loss of vision, 15.19% (n=12) experienced moderate loss of vision, and 2.53% (n=2) had diabetic blindness. Loss of BCDVA was significantly correlated to age of the patient (r=0.43, p< 0.01). Again, there was no significant variation between males and females (p= 0.91). The detailed analysis has been provided in table 4 and table 5.

Prevalence of DR in our study was seen to be 13.92% with mild NPDR constituting 8.86%, moderate NPDR 3.8%, and PDR 1.27%. There was significant difference with DM age (p<0.01, odds ratio 1.14). No significant difference was found with the level of awareness (p=0.72), and gender (p=0.75). The detailed analysis has been provided in table 6.

	No. (%)
Sex	
Male	46 (58.23%)
Female	33 (41.77%)
Religion	
Hindu	63 (79.75%)
Muslim	16 (20.25%)
Food habit	
Vegetarian	5 (6.33%)
Non Vegetarian	74 (93.67%)
Age (Years)	
≤ 50 Yrs	31 (39.24%)
50 - 60 Yrs	24 (30.38%)
> 60 Yrs	24 (30.38%)

Table-1: Socio-demographic profile of the studied population

	No. (%)
DM Age (Years)	
0 -- 5 Yrs	47 (59.49%)
5 – 10 Yrs	18 (22.78%)
> 10 Yrs	14 (17.72%)
On DM Medication	
Yes	36 (45.57%)
No	43 (54.43%)
DM Awareness	
Yes	23 (29.11%)
No	56 (70.89%)

Table-2: Diabetic profile of the studied population

	No. (%)
≤ 6 Months	35 (44.30%)
> 6 Months	22 (27.85%)
Not Done	22 (27.85%)

Table-3: Table showing time since last eye check-up

	Visual Acuity			P Value
	Good VA	**Mild Loss**	**Moderate Loss /Blindness**	
Sex				
Male (n=46)	23 (50.00%)	15 (32.61%)	8 (17.39%)	0.9145
Female (n=32)	17 (53.13%)	9 (28.13%)	6 (18.75%)	
Age (Years)				
≤ 50 Yrs (n=31)	25 (80.65%)	4 (12.90%)	2 (6.45%)	0.00039*
50 - 60 Yrs (n=24)	9 (37.50%)	8 (33.33%)	7 (29.17%)	
> 60 Yrs (n=23)	6 (26.09%)	12 (52.17%)	5 (21.74%)	

Table-4: Table showing relation of visual acuity loss with age, sex and time since last eye checkup

Time since Last Eye Checkup	Visual Acuity			P Value
	Good VA	**Mild Loss**	**Moderate Loss /Blindness**	
≤ 6 Months (n=35)	18 (51.43%)	11 (31.43%)	6 (17.14%)	0.06601
> 6 Months (n=21)	10 (47.62%)	5 (23.81%)	6 (28.57%)	
Not Done (n=22)	12 (54.55%)	8 (36.36%)	2 (9.09%)	

Table-5: Table showing distribution of visual acuity with last eye checkup

Stage of DR	No. (%)	95% C. I.
Mild NPDR	7 (8.86%)	(5.66%, 12.06%)
Moderate NPDR	3 (3.80%)	(1.65%, 5.95%)
PDR	1 (1.27%)	(0.01%, 2.52%)

Table-6: Table showing prevalence of various stages of DR in rural WB

DISCUSSION

The prevalence of DM in WB is estimated to be 1.66% in rural areas and 4.8% in urban areas in a 2005 study.[13] India is currently home to the largest number of diabetics in the world, and the numbers are increasing alarmingly, from 50.8 million in 2010 to a predicted 87.0 million in 2030.[14] DR currently is the leading cause of visual impairment and blindness among the working age population globally.[15] Visual disability is the commonest cause of disability in the state of WB.[16] The age standardised disability-adjusted life year (DALY) rates due to DM in WB is estimated to be 756 per 100000.[17]

Numerous studies have been done in the past to estimate the prevalence of DR in states of southern and western India, while two major pan-India DR prevalence studies have been done, which have estimated prevalence rates of DR among diabetic population to be from 10.3% to 26.8% in population based studies, while in ophthalmological clinic based studies, it ranges from 21.7% to 34.1%.[18,19] Till now, prevalence data for DR has been insufficient from eastern India. The only data available is from the AIOS 2014 study which reported prevalence of DR in the eastern zone to be 22.59%.[20] Prevalence of DR in our study was found to be 13.92%.[20]

Previous studies have shown higher prevalence of DR in urban areas.[21] DR prevalence in rural areas have been reported between 10.3 – 18.2%.[22] The prevalence of DM is also reported to be higher in urban areas compared to rural areas in India.[23] The DM awareness has also been shown to be lower in rural areas, which combined with socio-economic factors and limited infrastructure, may lead to a catastrophic increase in diabetic blindness in rural areas in the coming years.[24]

Several interesting risk factors for DR have come to the fore while interviewing these diabetic patients. Since the screening camps were conducted in association with a physician, all recruited subjects were diagnosed cases of DM, and under regular treatment for their disease. Even so, 70.89% remained unaware that uncontrolled DM can be a cause of blindness. ICO recommends eye checkup with retinal screening for all diabetic patients atleast once in 1-2 years.[25] In our study, 55.7% of subjects did not have a comprehensive eye checkup in the last six months, and 27.85% had never had an eye checkup since DM was diagnosed.

Prevalence of DR, awareness regarding diabetic eye disease and duration since last eye checkup were all found to be similar among both the sexes in our study in rural as well as urban areas. This is similar to the global META-EYE analysis.[26] However, a majority of other studies have demonstrated a higher prevalence among males, without citing any anatomic reason for the same.[27] It is possible that socio-economic factors and education level may have a bigger role to play than male gender itself as a risk factor for DR.[28]

Significant loss of visual acuity was seen with increasing age, which is expected in patients with increasing DM age with progressively advanced stages of DR.[29] However, it is also known that this chain can be broken by earlier diagnosis and treatment for DR. Hence, the awareness of the disease and regular checkups are of utmost importance.

CONCLUSION

In conclusion, our study shows that prevalence of DR among diabetic population in rural WB is 13.92%. The awareness of DM as a cause of blindness remains very low among the rural population, as a result of which, regular screening eye checkups are not done. We recommend that the policy makers should tackle this problem at the grass root level by increasing the awareness and need for yearly checkup

among this population, as well as provide infrastructure for the same.

Limitations of our study include small sample size, and not differentiating between type 1 and type 2 DM patients. Further long term studies should be done in this population to analyze the risk factors for DR in rural WB.

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