Original Article

Diabetic Retinopathy in Type II Diabetics Detected by Targeted Screening Versus Newly Diagnosed in General Practice

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Abstract

Introduction: The aim of this study was to compare the occurrence of diabetic retinopathy in targeted screening diabetic patients (Group I) with newly diagnosed diabetic patients in general practice (Group II). Materials and Methods: This was an observational cross-sectional study. Data were obtained from 25,313 subjects who participated in the diabetic screening camps, and 128 newly diagnosed diabetes who presented to the diabetic retinopathy screening camps in general practice in rural and urban south India. The study variables were collected from all patients who underwent eye examination from the target screening detected diabetics [(n = 173) Group I] and those newly diagnosed in general practice [(n = 128) Group II]. The variations in prevalence of diabetic retinopathy and sight-threatening diabetic retinopathy in Group I and Group II and the factors affecting it were identified. Results: The occurrence of diabetic retinopathy was 6.35% (95% CI, 2.5-9.5) in Group I and 11.71% (95% CI, 5.6-16.4) in Group II. No significant difference was observed on occurrence of diabetic retinopathy, including sight-threatening retinopathy, in rural versus urban population and in Group I versus Group II. Patients diagnosed in general practice (Group II) with systolic blood pressure (BP) >140 were more likely to have retinopathy (P = 0.02). Conclusions: Diabetic retinopathy including sight-threatening complications was found at the time of diagnosis of diabetes in the targeted screening group as well as in newly diagnosed diabetics in the general practice group.

Ann Acad Med Singapore 2006;35:531-5

Key words: Diabetes mellitus, Diabetic retinopathy, General practice, Screening

Introduction

The epidemic of type II diabetes mellitus is now recognised worldwide.[1] In India, it has been estimated that the population with type II diabetes would increase by 150% in 2025.[2,3] As the population with type II diabetes increases, so does the prevalence of diabetic retinopathy and other microvascular complications.[3,4]

It has been observed that the actual onset of diabetes mellitus occurs much earlier (could be 9 to 12 years) before it is clinically presented and diagnosed.[5] Since microvascular complications are directly related to the duration of diabetes mellitus, it is important to screen the general population in order to detect potential or pre-clinical diabetics.[6,7] This will enable early detection of diabetic retinopathy before sight-threatening complications develop.

The purpose of this study was to compare the occurrence of diabetic retinopathy in targeted screening diabetic patients (Group I) with newly diagnosed diabetic patients in general practice (Group II).

Patients and Methods

Study Population

All patients were enrolled between June 2003 and September 2004. For Group I (targeted screening), diabetic screening camps were organised in the two rural districts – Kanchipuram and Vellore (73 camps) Tamil Nadu, India – and urban Chennai (4 camps), Tamil Nadu, India. Patients above the age of 30 years were screened for diabetes.

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Random blood glucose was measured with a glucometer (Accutrend Alfa, Boehringer Mannheim, Germany) using the finger-prick capillary method. Target screening-detected diabetes was defined as one who had random blood glucose value of 200 mg/dL or more. Among 25,313 subjects who participated in the diabetic screening camps, 4345 were known diabetics and 1130 were screening-detected diabetics individuals. Of these 1130, 173 (15.3%) reported for eye examination in the diabetic retinopathy camp. Of these 173, 125 (72.3%) were from the rural camps and 48 (27.7%) from the urban camps. All screening detected diabetics in the camps were referred to the general physicians or diabetologists for further evaluation of their diabetes status and follow-up.

For Group II (newly diagnosed in general practice), recently diagnosed diabetes individuals (during the last one month) were enrolled. There were 128 patients. Of these, 80 (62.5%) were referred from the diabetic clinics (urban) and 48 (37.5%) from the general physicians (rural). Forty-one (32%) were on oral hypoglycaemic agents, 9 (7%) were on insulin and the rest [78 (60.9%)] were on diet control and exercise.

Study Data

The study variables were collected from all patients who underwent eye examination. These variables included demographic data, height and weight for calculating body mass index (BMI) (normal range, up to 22.9; overweight, more than 23), blood pressure, physical activity (sedentary – rarely participate in any physical activity), smoking and alcohol status. Eye examination included assessment of Snellen's' visual acuity, slit-lamp evaluation (using hand-held Heines HSL 100 CE), measurement of intraocular pressure and dilated fundus examination using binocular indirect ophthalmoscopy (Keeler Instruments Inc. PA, USA) and +20 D lens (Nikon). Fundus examination of all the patients was done by an experienced retinal specialist. Diabetic retinopathy was clinically graded as per the guidelines of Early Treatment Diabetic Retinopathy Study classification.[8]

Statistical Analysis

The SPSS (version 9.0) programme was used for statistical analysis. The prevalence was expressed as percentages with 95% confidence interval. Significance tests such as chi-square, *t*-test and Z test were applied at appropriate situation. *P* value <0.05 was considered statistically significant. The 2 groups were compared using Student's *t*-test for continuous variable and χ^2 test for dichotomous variables.

Results

Table 1 shows the baseline characteristics of Group I (n = 173) and Group II diabetics (n = 128). The 2 groups were similar in terms of mean age, BMI, use of alcohol, smoking habits, physical activity and blood pressure. There were more males in Group I (*P* = 0.0005).

Table 2 shows the occurrence of diabetic retinopathy at the time of diagnosis of diabetes in Groups I and II. The diagnosis of diabetic retinopathy was made in 6.4% (95% CI, 2.5-9.5) and 11.7% (95% CI, 5.6-16.4) of individuals in Camps I and II, respectively. Sight-threatening diabetic retinopathy was observed in 4.6% in Group I and 7.8% in Group II. No significant difference was observed on occurrence of diabetic retinopathy in rural versus urban population in both groups.

Table 3 shows the influence of various factors on occurrence of diabetic retinopathy. None of the variables

Table 1. Characteristics of Diabetic Patients in Group I (Targeted Screening) and Group II (Newly Diagnosed in General Practice)

Variable	Group I (n = 173) n (%)	Group II (n = 128) n (%)	*P*
Age (y)			
Mean ± SD	54 ± 11	52 ± 12	0.13
Gender			
Male	103 (60)	50 (39)	0.0005
Physical activity			
Sedentary	67 (39)	57 (44)	0.34
BMI (Mean ± SD)	24 ± 4	24 ± 4	0.99
Smoking status			
Non-smoker	151 (87)	118 (92)	0.19
Alcohol status			
Non-drinker	146 (84)	116 (91)	0.12
Systolic BP (Mean ± SD)	132 ± 19	133 ± 20	0.65
Diastolic BP (Mean ± SD)	82 ± 10	83 ± 11	0.41

BMI: body mass index; BP: blood pressure; SD: standard deviation

Table 2. Occurrence of Diabetic Retinopathy at the Time of Diagnosis in Group I (Targeted Screening) and Group II (Newly Diagnosed in General Practice)

Variable	Group I n = 173 (%)	Group II n = 128 (%)	*P*
DR	11/173 (6.35%) (95% CI, 2.5-9.5)	15/128 (11.71%) (95% CI, 5.6-16.4)	0.22
NSTDR	3/173 (1.73%) (95% CI, 0.21-3.67)	5/128 (3.90%) (95% CI, 0.54-7.25)	0.43
STDR	8/173 (4.62%) (95% CI, 1.49-7.74)	10/128 (7.81%) (95% CI, 3.16-12.45)	0.36

DR: diabetic retinopathy; NSTDR: non-sight threatening diabetic retinopathy includes mild and moderate non-proliferative diabetic retinopathy; STDR: sight threatening diabetic retinopathy includes severe non-proliferative diabetic retinopathy, proliferative diabetic retinopathy and clinically significant macular oedema

Table 3. Influence of Variables on Diabetic Retinopathy in Groups I and II

Variable	Group I			Group II		
	n	Prevalence of DR (%)	*P*	n	Prevalence of DR (%)	*P*
Age (y)						
<49	53	3/53 (5.7)	0.55	43	6/43 (14)	0.386
>50	120	8/120 (6.7)		85	9/85 (10.6)	
Gender						
Male	103	7/103 (6.8)	0.52	50	9/50 (18)	0.07
Female	70	4/70 (5.7)		78	6/78 (7.7)	
Physical activity						
Sedentary	67	2/67 (3)	0.129	57	10/57 (17.5)	0.06
Non-sedentary	106	9/106 (8.5)		71	5/71 (7)	
BMI						
Normal	76	6/76 (7.9)	0.335	57	8/57 (14)	0.323
Overweight	97	5/97 (5.2)		71	7/71 (9.9)	
Smoking						
Non- smoker	151	9/151 (6)	0.42	118	15/118 (12.7)	0.274
Alcohol status						
Non-drinker	146	8/146 (5.5)	0.236	116	15/116 (12.9)	2.208
Systolic BP						
≤139	112	8/112 (7.1)	0.414	79	5/79 (6.3)	0.018
≥140	61	3/61 (4.9)		49	10/49 (20.4)	
Diastolic BP						
≤89	104	7/104 (6.7)	0.536	80	10/80 (12.5)	0.479
≥90	69	4/69 (5.8)		48	5/48 (10.4)	

DR: diabetic retinopathy; BMI: body mass index; BP: blood pressure

showed any influence in Group I, but systolic blood pressure >140 mm Hg was associated with high occurrence of diabetic retinopathy in Group II ($P = 0.02$).

Discussion

This paper highlights that one of the microvascular complications – diabetic retinopathy – in individuals with type II diabetes appeared to be somewhat higher in newly diagnosed patients from general practice (11.7%) compared to those diagnosed in the targeted screening group (6.4%). However, this difference did not reach statistical significance. Table 4 shows the prevalence of diabetic retinopathy in published reports, both in the diabetic clinics and in the general population. As expected, the prevalence of diabetic retinopathy was higher in those who were examined in the diabetic clinics than in the population-based screening. The prevalence of diabetic retinopathy ranged from 7.3% to 25.5% in those diabetics who were detected in the diabetic clinics and 1.9% to11.2% in diabetics in the population-based screening.[9,11-23] The reason for this difference could be that those who attended the diabetic clinics could have been symptomatic and had diabetes for longer period than those who attended the targeted screening camps. However, surprisingly the difference in prevalence of diabetic retinopathy between the two groups was not observed (7.6% in targeted screening vs 1.9% in general practice) in the Hoorn Screening study, possibly due to the small sample size in the general practice group.[9]

Among those detected to have diabetic retinopathy (in the present study), sight-threatening diabetic retinopathy was evident in 4.6% in the targeted screening group and 7.8% in the general practice group. This is important as these patients could be referred to our base hospital for further investigations such as fluorescein angiography and prompt laser photocoagulation. In doing so, we hoped to avoid potential complications of proliferative diabetic retinopathy and stabilise vision in eyes with diabetic maculopathy. However, it is worth mentioning that of the 1130 diabetic individuals detected in Group I, only 15.3% attended the diabetic retinopathy camp. Non-response of such a magnitude calls for creating greater awareness among the masses on diabetes and its microvascular complications.[26] Being a progressive disorder, a one-time screening effort would not suffice to alleviate the socio-economic burden of diabetic retinopathy. These screening programmes need to be regularly repeated in order to reduce the visual morbidity of type II diabetics.

Our study did not elucidate any risk factors related to diabetic retinopathy in Group 1; only in Group II, one factor – systolic blood pressure – was found to be related to diabetic retinopathy. Likewise, in a study done by Rema

Table 4. Comparison with Published Reports

Year, Author	Country (n)	Age/Mean age (y)	Prevalence of DR (%)
Clinic-based Studies			
2005, Al Zuabi et al[11]	Kuwait (92)	-/-	7.6
2003, Spijkerman et al[9]	Netherlands (60)	>50/61.4 ± 7.0	1.9
2002, Talu et al[12]	Romania (487)	>40/58.5	14.3
2002, Chowdhury et al[13]	England (292)	<40/ South Asians 35.3 years Europeans 33.5 years	 South Asians 17.5 Europeans 7.9
2002, Liu et al[14]	China (773)	-/58	21
2001, Unuigbe et al[15]	Nigeria (66)	-/-	23
2001, Tzeng et al[16]	Taiwan (148)	-/-	25.5
2000, Rema et al[17]	India (438)	-/48 ± 14	7.3
1998, Weerasuriya et al[18]	Sri Lanka (597)	-/42.3 ± 6.2	15
1998, Wang et al[19]	Hong Kong (474)	-/53.6 ± 0.6	21.9
Present study	India (128)	40/52 ± 12	11.7
Population-based Studies			
2005, Rema et al[10]	India (354)	≥20/48 ± 12	5.1
2003, Spijkerman et al[9]	Netherlands (195)	>50/63.4 ± 7.0	7.6
2002, Van Leiden et al[20]	Netherlands (626)	>50/65.7 ± 6.6	9
2001, Perusicova[21]	Czech Republic (314)	20-65	3.5
2001, de Fine Olivarius et al[22]	Denmark (1251)	≥40/-	5
2001, West et al[23]	United States (4774)	≥40/-	9
1997, Klein et al[24]	United States (354)	≤30 type I/-	1.3
1997, Nagi et al[25]	United Kingdom (169)	≥15/-	11.2
Present study	India (173)	40/54 ± 11	6.35

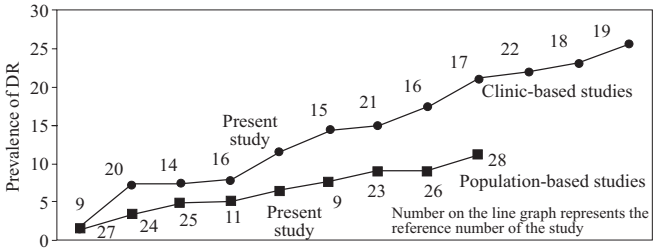

Fig. 1. Comparison with published reports.

et al,[10] none of the clinical or biochemical variables were associated with diabetic retinopathy. In contrast, the Hoorn Screening study noted that blood pressure, lipid concentration and BMI are associated with microvascular complications.[9]

Figure 1 shows that the prevalence of diabetic retinopathy is always high in clinic-based studies. Estimation of diabetic retinopathy occurrence in the present study was somewhat in the mid-range in Group I, but at the junction of one-third and upper two-thirds in Group II

Though the gold standard technique for the detection of diabetic retinopathy is fundus photography, we used indirect ophthalmoscopy as described by Dandona et al[27] in a population-based study. Moss et al[28] reported that sensitivity and specificity of indirect ophthalmoscopy for detecting any retinopathy was 82 % (95% CI, 80-84) and 95% (95% CI, 94-96), and for sight threatening retinopathy, 72% (95% CI, 73-86) and 100% (95% CI, 99-100), respectively. The British Diabetic Association recommended that for any screening tool to be able to detect diabetic retinopathy, the sensitivity should be around 80%, and specificity, 95%. Availability of HiMag attachment with Keeler indirect ophthalmoscope allowed us to view the macular area with high magnification (5 times); hence, this tool could be used as an initial screening procedure for mass community screening for diabetic retinopathy.

In conclusion, diabetic retinopathy including sight-threatening complications was found at the time of diagnosis of diabetes in targeted screening group as well as in newly diagnosed diabetics in general practice group.

Acknowledgements

We would like to acknowledge the Lions Club International Foundation and the RD Tata Trust for their financial support.

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