PREVALENCE OF DIABETIC RETINOPATHY IN TYPE 2 DIABETES IN RELATION TO RISK FACTORS: HOSPITAL BASED STUDY

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ABSTRACT

The aim of the study was to examine the prevalence of retinopathy and its relation with various risk factors in type 2 diabetic patients. This study was done on 4067 subjects (M: F 2354:1713, Mean age: 54±7.8 years) out of the 4400 diabetic patients attending the diabetic clinic at our hospital. All patients underwent clinical examination and relevent biochemical examinations i.e. fasting blood glucose, HbA_{1C} and lipid profile, alongwith detailed ophthalmoscopic examinations for retinopathy by indirect ophthalmoscopy and fundal photography in positive patients.

A total of 1176 patients (28.9%) had evidence of retinopathy. This comprised of 938 patients (79.8%) of non proliferative diabetic retinopathy, 68 (5.8%) of maculopathy patients and 172 patients (14.6%) of proliferative diabetic retinopathy. Multiple logistic regression analysis showed that duration of diabetes, age of the patients, systolic blood pressure and glycosylated haemoglobin had positive contributions with regression coefficent 0.287, 0.134, 0.119 and 0.184 respectively.

This study highlights the high prevalence of retinopathy in type 2 diabetes in India and indicates the importance of various risk factors. Diabetic retinopathy could become a formidable challange in the future.

KEYWORDS: Type 2 diabetes; Diabetic retinopathy; Risk factors.

INTRODUCTION

The prevalence of type 2 diabetes is known to be very high in the Indian subcontinent (1). Indian patients demonstrate certain distinct features i.e. onset at a younger age (2), less common obesity (3) and a strong genetic predisposition (4, 5). Studies of various complications in Indian diabetics are therefore of great interest and very few studies are available on the prevalence of diabetic retinopathy from India (6). This study was undertaken to explore the prevalence of retinopathy and the influence of various factors that are thought to contribute to diabetic retinopathy.

MATERIALS AND METHODS

The prospective study was done on 4400 consecutive patients attending diabetic clinic from Jan 1999 to Dec 2000. The patients represent the general population of the urban and rural area. Out of 4400 patients attending the centre, 4067 patients were included in the study.

Diagnosis of diabetes was made in each case by a standard oral GTT with 75gm glucose load using recommendation of ADA (American Diabetic Association) for type 2 diabetes (7). The selected subjects underwent detailed clinical examination and investigation. The project was approved by the institutional ethical committee and informed written consent was obtained from every patient.

Hypertension was defined as the presence of systolic blood pressure (SBP) >150 mm Hg and diastolic blood pressure >90 mm Hg or more and if any person was being treated with antihypertensive drugs.

Biochemical Parameters – Oral GTT was done for all new cases. Fasting and 2h post prandial plasma glucose, glycosylated haemoglobin (HbA_{1C}) was done for all the review cases. Lipid profile was done by semi auto analyser. Urine protein estimation was done either in a 24-hr sample of urine or the expected protein estimation by estimation of protein to creatinine ratio in a random sample (8). Presence of urinary infection was excluded before testing for proteinuria.

Ophthalmoscopic examination included a detailed fundus examination done by indirect ophthalmoscopy. Background diabetic retinopathy (BDR) was diagnosed by the presence of microaneurysms, blot hemorrhages or cotton wool spots. Proliferative diabetic retinopathy (PDR) was defined as the presence of abnormal new vessels on the disc or elsewhere. Retinopathy was classified according to diabetic retinopathy study (DRS) and early treatment diabetic retinopathy study (ETDRS) (9, 10). Due to limited resources and large number of patients, retinal photography was done only in patients with evidence of retinopathy.

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Statistical Analysis: Prevalence of retinopathy in sub groups was compared by chi square test. Multiple logistic regression analysis with stepwise addition of variable was done to assess their association with the complications studied. The independent variables were age, duration of diabetes, smoking, body mass index, waist hip ratio, systolic and diastolic blood pressure, glycemic control i.e. HbA_{1C}, lipid profile and type of treatment. Continuos variables were categorised appropriately. Prevalence of retinopathy in each year of duration of diabetes was calculated. A weighted linear regression analysis was used to estimate the period when the prevalence of retinopathy was nil. The calculation and the plotting of graph has been done using SAS programme.

RESULTS

A total of 716 patients (17.6%) had impaired vision (visual activity <6/9) and 8 patients (0.2%) were registered blind (visual activity <6/60 in both eyes). In 369 patients (51.5%), the decreased visual activity was due to diabetic retinopathy related causes and in the remaining cases, the major cause was cataract.

A total of 1176 patients (28.9%) had evidence of retinopathy. This comprised of 938 (79.8%) patients of non proliferative diabetic retinopathy (NPDR), 68 (5.8%) patients of maculopathy and 172 (14.6%) patients of proliferative diabetic retinopathy. The details of prevalence in different age groups is shown in table 1 and more than 50% patients after the age of 60 years had evidence of retinopathy.

Table 1: Age of Patients and Diabetic Retinopathy in Type 2 Diabetes

Age group (yrs)	Total	Retinopathy	
		No of Patients	%
< 40	472	81	17.2
41-50	1328	262	19.7
51-60	1581	434	27.5
61-70	504	291	57.8
>70	182	108	59.3
Total	4067	1176	28.9

Table 2, shows the details of retinopathy according to the duration of diabetes, and it shows a steady increase in the prevalence of retinopathy with increasing duration of diabetes. The prevalence of retinopathy was 52.2%, in patients with diabetes of >15yrs duration. The prevalence increased linearly with duration of diabetes and by extrapolation of the linear regression, we can predict the prevalence of retinopathy and we can also calculate the point with no prevalence of retinopathy. (Fig 1) (The regression formula is: Prevalence of retinopathy (y) = 0.023769 x Duration – 0.002748)

Table 2: Duration of Diabetes and Prevalence of Retinopathy

Duration of Diabetes (years)	Total	Retinopathy	
		No of Patients	%
< 40	472	81	17.2
< 5	1107	53	4.8
6-10	1441	446	30.9
11-15	804	304	37.8
> 15	715	373	52.2
Total	4067	1176	28.9

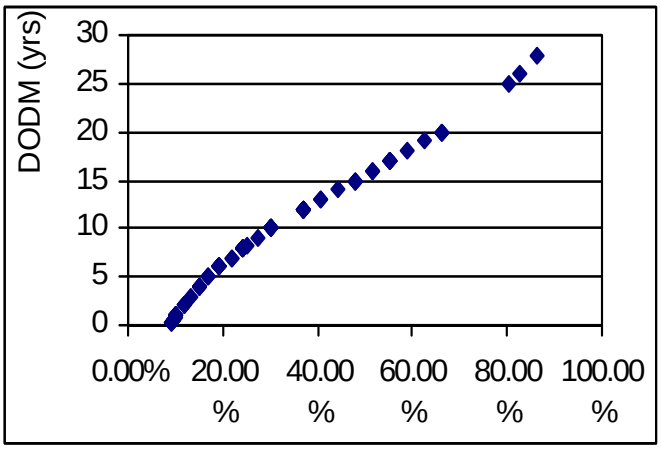

Figure 1: Predicted % of Retinopathy versus Duration of Disease in Years

Table 3, shows the relation of systolic BP with retinopathy. It clearly shows that systolic blood pressure is an important determination of retinopathy. Similar kind of observation was noted with diastolic BP (table 4).

Table 3: Systolic BP and Prevalence of Retinopathy

Systolic BP mm of Hg	Total	Retinopathy	
		No of patients	%
< 120	889	34	3.3
121-140	1757	456	25.9
141-160	938	405	43.1
> 160	483	281	58.1
Total	4037	1176	

Table 4: Diastolic Blood Pressure and Prevalence of Retinopathy

Systolic BP mm of Hg	Total	Retinopathy No of patients	%
< 80	1866	245	13.1
81-90	1084	323	29.8
91-100	809	394	48.7
> 100	308	214	56.3
Total	4067	1176	

Table 5 shows the relationship of glycosylated Hb and prevalence of retinopathy. In patients with having HbA_{1c} levels <8%, the retinopathy was seen only in 0.04% patients and in patients with HbA_{1c} levels more than 10%, the prevalence of retinopathy was 36.4%.

Table 5: GHb levels and Prevalence of Retinopathy

GHb%	Total	Retinopathy No of patients	%
< 8	50	2	0.04
8.1-9	522	47	9.0
9.1-10	1033	230	22.2
> 10	2462	897	36.4
Total	4067	1176	

Table 6 shows that the patients who were managed with insulin either alone or with OHA, had more prevalence of retinopathy than those managed without insulin.
Table 6: Treatment Modality and Diabetic Retinopathy in Type 2 Diabetes

Treatment	Total	Retinopathy No of patients	%
Diet + E	911	78	8.6
Diet + E + OHA	1678	384	22.9
Diet + E + Insulin	715	273	38.2
Diet + E + I + OHA	763	441	57.8

E - Excercise; I - Insulin; OHA - Oral Hypoglycemic Agents

Table 7 gives the results of multiple logistic analysis. The variables which had a significant association with retinopathy are listed in the table. Duration of diabetes, age of the patient, systolic blood pressure and glycosylated haemoglobin showed a positive association with retinopathy with regression coefficient (7) 0.262, 0.298, 0.0922 and 0.016 respectively.

Table 7: Results of Multiple Logistic Regression Analysis Showing Association of Various Risk Factors with Diabetic Retinopathy

Variable	Odds Ratio	(95% CI)	Regression Coefficient β
Age	2.29	1.71-3.05	0.134
Duration of diabetes	6.50	5.46-7.27	0.287
BP Systolic	2.47	2.04-2.99	0.119
BP Diastolic	2.35	1.84-2.98	0.035
BMI	2.24	1.49-3.34	0.172
HbA_{1c}	2.64	2.21-3.12	0.184

DISCUSSION

This paper presents the prevalence of retinopathy in a cohort of north Indian type 2 diabetic patients attending a diabetes center who were screened for retinopathy irrespective of presence of visual symptoms or the duration of diabetes. This was a prospective study on all the patients attending a tertiary level health care centre and thus may have some referral bias, which may influence the prevalence rate observed in this study. Finally, due to financial and logistic reasons, fundus photographs of all patients were not possible and it was done only in patients having evidence of retinopathy.

4400 patients were enrolled in the study out of which 333 dropped out due to various reasons and the study was conducted on 4067 patients of type 2 diabetes. We observed different types of retinopathy in 1176 patients i.e. 28.9% and our results are consistent with those of Ramchandran et al 1999 (11) who observed retinopathy in 714 i.e. 23.7% cases out of 3010 patients of type 2 diabetes. M.W. Knuiman (12) reported prevalence of retinopathy at 28% in Perth, Western Australia. Caird et al (13) found a prevalence rate of 36.8% NPDR in a survey which involved 4076 diabetic patients with over ten years duration of diabetes. In other studies the prevalence of retinopathy at diagnosis varies from 20-30%. The reasons for these differences are not clear. The observed geographic/population variations in the prevalence of diabetic retinopathy could be due to real ethnic differences in the susceptibility to diabetic retinopathy (genetic) or due to poor control of diabetes, prevalence of hypertension and influence of socio-

economical and cultural factors (environmental). Proliferative retinopathy is reported to be less common in type 2 diabetes than in type 1 diabetes. The best epidemiological data on retinopathy to date is the Wisconsin data by Klein et al (14).

The results of logistic regression analysis showed that duration of diabetes, glycosylated hemoglobin, type of treatment and systolic blood pressure had a possible association with retinopathy. Correlation with duration of diabetes is well known (15, 16). The role of hyperglycemia in the development of diabetic retinopathy is also well known and has been elegantly demonstrated in the diabetes control and complication trial (17). In this study a strong association was also observed between HbA_{1C} level and retinopathy. There was strong correlation between the type of treatment i.e. insulin treatment and retinopathy. Although the link with blood pressure has been suggested (18), a causal relationship has not been identified. Hypertension can occur either before or after the development of retinopathy.

Diabetic retinopathy is a major health problem in patients with type 2 diabetes. It can lead to morbidity, disability and high cost for the health care system. It should be the endeavor to control hyperglycemia and hypertension tightly by appropriate therapeutic measures, so that the occurrences and worsening of the retinopathy could be mitigated.

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