

RETINOPATHY IN INSULIN DEPENDENT DIABETES MELLITUS (IDDM) IN SOUTH INDIA

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SUMMARY

The prevalence of diabetic retinopathy was assessed by direct and indirect ophthalmoscopy in a group of patients with insulin dependent diabetes mellitus (IDDM). Fourteen percent of patients had retinopathy. Proliferative retinopathy and severe background retinopathy including maculopathy were both seen in four percent of patients. It is possible that the lower prevalence rates for these complications is due to the shorter duration of diabetes in our patients.

Key Words: Insulin dependent diabetes mellitus; Diabetic retinopathy.

INTRODUCTION

Insulin dependent diabetes mellitus (IDDM) is believed to be less common in tropical countries like India¹. Because of the small number of patients at most centres, few studies on IDDM in India have been reported till recently. There is very little data on microvascular complications in IDDM patients. We report here a detailed study of retinopathy in IDDM patients studied at Madras.

MATERIAL AND METHODS

The study group comprised of 139 diabetic patients fulfilling the following criteria for diagnosis of IDDM:

1. Acute onset of symptoms
2. Requirement of insulin from the time of diagnosis or shortly thereafter and
3. Proneness to ketosis in the basal state on withdrawal of insulin or a history of established diabetic ketoacidosis.

Additionally all patients had fasting plasma C-peptide levels less than 0.1 pmol/ml and stimulated levels <0.02 pmol/ml. These values are consistent with the diagnosis of IDDM². The biochemical tests included fasting and post prandial plasma glucose, glycosylated haemoglobin and serum cholesterol and triglyceride estimations.

All patients underwent plain X-rays of the abdomen to exclude pancreatic calculi. The body mass index (BMI) was calculated using the formula: Wt in Kg/Ht in square metres. The blood pressure was recorded and a complete physical examination was done. Detailed eye studies were then performed. The corrected visual acuity was recorded; the intra-ocular pressure was checked and a complete biomicroscopic examination of the anterior segment was done. The pupils were fully dilated and a detailed retinal examination was performed by direct and indirect ophthalmoscopy by one of us (R.M.). Retinopathy, was graded according to the Hammersmith hospital grading system³.

The Hammersmith hospital grading system uses a set of standard colour photographs of the retina where the

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various lesions of retinopathy are graded through levels of severity from grade 1 to grade 5. Diabetic retinopathy is broadly classified into background diabetic retinopathy (BDR) and proliferative diabetic retinopathy (PDR). BDR was further subdivided into minimal to mild BDR when only venous changes, microaneurysms or dot haemorrhages corresponding to grade 1 lesions of the Hammersmith grading system were present. When additionally exudates, and/or cotton wool spots were present and these were of grade 2 and 3 of the Hammersmith hospital grading system, they were classified as moderate BDR. When grade 4 and 5 lesions were present, they were called as severe BDR. Maculopathy was defined as decrease in visual acuity due to macular oedema in the presence of microaneurysms, haemorrhages or exudates. Proliferative diabetic retinopathy was defined as presence of abnormal new vessels on the disc (NVD) or elsewhere (NVE). Advanced diabetic eye disease comprised of patients with fibrous retinitis proliferans, vitreous haemorrhage, traction detachment of the retina or optic atrophy.

The biochemical tests included fasting and post prandial plasma glucose, glycosylated haemoglobin and serum cholesterol and triglyceride estimations. Plasma glucose was estimated by the glucose oxidase method, glycosylated haemoglobin by a colorimetric method⁵ and serum lipid estimations by standard methods^{6,7}.

Results are expressed as mean \pm SEM. Statistical analysis was done using t tests and Chi squared tests. P values of <0.05 were considered to be statistically significant. Since numbers were small, for purposes of analysis, maculopathy was considered along with moderate to severe BDR and advanced eye disease was included along with PDR.

RESULTS

There were 88 males and 51 females. The mean age of the patients was 25 ± 1.1 years. Ninety nine patients (72%) were below 30 years and 90%, below 40 years of age. The mean age at diagnosis of diabetes was 18 ± 1.0 years. In 68 patients (49%), the age at diagnosis was below 15 years and in 122 patients (88%), below 30 years. The remaining 12% had onset of diabetes above 30 years of age.

The duration of diabetes was over 15 years in 18 patients (13%). In others, the duration was shorter. In 47%, it was below 5 years and in rest (40%) between 5-15 years. The mean duration of diabetes was 7.0 ± 0.5 years.

Nineteen patients (14%) had some form of retinopathy. Nine (6%) had minimal to mild retinopathy, and 5 patients (4%) had moderate to severe retinopathy including maculopathy. Five patients (4%) had proliferative retinopathy including advanced diabetic eye disease. There was no correlation between the age at diagnosis of diabetes and the prevalence of retinopathy.

Table 1 shows the distribution of retinopathy in relation to known duration of diabetes. There was an increase in prevalence of retinopathy with increase in duration of diabetes.

An attempt was made to identify possible risk factors for retinopathy in our patients. In order to compare the clinical and biochemical characteristics of the patients with and without retinopathy, we carefully matched the 19 patients with retinopathy with a group of 19 patients without any retinopathy. The matching was done with respect to age, sex and duration of diabetes, so that other possible risk factors for retinopathy could be identified.

Table 2 shows the biochemical characteristics of the patients with and without retinopathy. The fasting and post prandial plasma glucose values and the HbA1 were significantly higher in the group with retinopathy ($p < 0.05$). There was no difference in the other parameters between the two groups.

DISCUSSION

This paper reports for the first time on retinopathy in a large series of IDDM patients from South India. The diagnosis of IDDM in these patients was made by clinical and C-peptide studies.

Fundus photography and fundus fluorescein angiography (FFA) could not be routinely performed in this study. In some of the patients with proliferative retinopathy and maculopathy who underwent laser photocoagulation, fluorescein angiography was done. Since the numbers are small, the results of these studies are not given separately in this paper. A detailed clinical grading was done in all cases by a trained retinal specialist using the Hammersmith hospital grading system and both direct and indirect ophthalmoscopy were done. In an earlier study, we have found an excellent correlation between such a clinical grading system and fundus photography using a non-

Table 1. Duration of known diabetes in relation to different types of diabetic retinopathy

Duration of diabetes (years)	No. of patients examined	No retinopathy	Minimal to mild BDR	Moderate to severe BDR including maculopathy	PDR including advanced diabetic eye disease
<5	54	54 (100)	---	---	---
5-10	42	39 (92.8)	1 (2.4)	1 (2.4)	1 (2.4)
11-15	22	18 (82)	2 (9)	1 (4.5)	1 (4.5)
16-20	16	7 (44)	5 (31)	2 (12.5)	2 (12.5)
>20	5	2 (40)	1 (20)	1 (20)	1 (20)

Figures in parentheses indicate percentage

BDR = Background diabetic retinopathy

PDR = Proliferative diabetic retinopathy.

Table 2. Clinical and biochemical parameters in patients with and without retinopathy

Clinical parameters	Group I no retinopathy n = 19	Group II retinopathy present n = 19	Significance
Present age (Years)	34 ± 2.1	37 ± 2.8	
Age at onset of diabetes (Years)	20 ± 1.9	23 ± 3.4	
Duration of diabetes (Years)	14 ± 1.8	13 ± 1.3	
Body mass index	20.1 ± 0.8	19.7 ± 0.6	N.S.
B.P. Systolic (mm/Hg)	116 ± 3	126 ± 5	N.S.
Diastolic (mm/Hg)	77 ± 2	83 ± 2	N.S.
Insulin dose (units/day)	46 ± 12	46 ± 10	N.S.
Biochemical parameters	194 ± 22	265 ± 25	P < 0.05
Fasting plasma glucose (mg/dl)	227 ± 21	296 ± 20	P < 0.05
Post prandial plasma glucose (mg/dl)	9.8 ± 0.4	11.3 ± 0.5	P < 0.05
HbA1 (%)	201 ± 10	210 ± 12	N.S.
Serum cholesterol (mg/dl)	101 ± 9	109 ± 10	N.S.
Serum triglyceride (mg/dl)			

mydriatic retinal camera. The results obtained are reproducible and accurate to the limits of clinical judgement by a trained retinal specialist.

The results indicate that significant retinopathy occurs in South Indian IDDM patients. Both proliferative retinopathy and maculopathy were seen in our patients. Eight of these patients subsequently underwent laser photocoagulation (all the five patients with proliferative retinopathy and three with maculopathy). The mean duration of diabetes was only 7 ± 0.5 years. With longer duration of diabetes, the prevalence of retinopathy is likely to go up quite sharply.

We cannot draw definite conclusions regarding the exact prevalence rates of the different forms of retinopathy because of the small numbers in the various groups due to the fact that IDDM is uncommon in India. At our centre, IDDM constitutes about 2% of the total diabetic clinic population. Other authors have found even lower figures, Krishnaswami and Chandra report a figure of 0.8%⁴. The figure of 14% for any retinopathy in this series is lower than that reported by workers abroad. Kornerup⁵ and Cullen⁶ noted a 47% and 50% prevalence of retinopathy respectively. These higher prevalence rates are clearly related to the longer duration of diabetes in their series compared to the 7.0 ± 0.5 years in this study. The second explanation is that all the studies mentioned above had a mixture of IDDM and NIDDM patients. In NIDDM it is well known that due to its insidious onset, the actual duration of diabetes could be much longer than the 'known' duration.

There is wide variation in the reported prevalence rates for proliferative retinopathy. On an average, 8-10% of patients are reported as having proliferative retinopathy⁷. The figure of 4% in this study is possibly due to shorter duration of diabetes in our study group.

The best epidemiological studies on retinopathy are those of Klein *et al*⁸, where a population based study on retinopathy was done in Wisconsin. These authors found that duration of diabetes is the most important risk factor for development of retinopathy. This has been supported by the findings of Dornan *et al*⁹ and Krolewski *et al*¹⁰. Frank *et al*¹¹ found that both age and duration of diabetes are important in development of retinopathy in juvenile onset young diabetics. Aiello *et al*¹² reported from the Joslin clinic that proliferative retinopathy was uncommon before ten years of diabetes duration in those diagnosed before the age of 40 years. These findings are similar to that of the British multicentric study reported by Kohner and Barry¹³. In the present study, we did find a correlation of retinopathy with duration of diabetes but not with age at diagnosis of diabetes.

We did not observe any significant relationship between retinopathy and blood pressure or serum lipid

levels. As the numbers with maculopathy were small, no attempt was made to look for correlations with lipid levels in patients with maculopathy in this study.

Our finding of significantly higher plasma glucose and glycosylated haemoglobin levels in the patients with retinopathy is of interest. However, the relationship between the control of diabetes and the occurrence of retinopathy can only be evaluated by longitudinal follow-up studies. Several recent studies have attempted to address this question and they have been recently reviewed by Kohner *et al*¹⁴.

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