

COMPLICATIONS OF DIABETES MELLITUS AT DIAGNOSIS IN SOUTH INDIAN TYPE 2 DIABETIC PATIENTS*

Premlata G, Rema M, Mohan V

Non-insulin Dependent Diabetes Mellitus (NIDDM) or Type 2 diabetes constitutes, nearly 95-97% of all diabetic patients in most population groups. The prevalence of NIDDM varies considerably from <1% in some countries to 50% in certain populations and developing countries like Pima Indians and Micronesians[1]. The prevalence of diabetes in India is very rapidly rising and it is estimated that by the year 2010 A.D, 20% of all Type 2 patients in the world would be contributed from India. This form of diabetes till recently was considered as a mild diabetes or "a touch of diabetes" and obviously the management strategies were less vigorous. Recently published studies[2,3] have proved beyond doubt, that tight control of diabetes definitely prevents or slows down the progression of late complications of diabetes. Diabetes mellitus basically produces changes in the blood vessels and hence can affect almost every part of the body. It is known that diabetes mellitus is a leading cause of acquired blindness in the developed countries. It carries 2-3 times higher risk of heart attacks and an even higher risk for stroke. Diabetics are at 5 times higher risk to develop nephropathy and an estimated 25% of all new cases of end stage renal diseases are the result of diabetes. Diabetic patients are five times more prone to gangrene and diabetes accounts for 50% of all non traumatic complications[4]. The onset Type 2 diabetes is usually insidious and the patient may remain asymptomatic until late stages of the diseases. Hence one should aim to make an early diagnosis in order to reduce the morbidity and prevent the progression to end-stage complications. Thus, it is necessary to screen for all complications at the time of diagnosis of diabetes.

The late complications of diabetes can be broadly classified as

1. Microangiopathy - Retinopathy
- Nephropathy
2. Macroangiopathy - Coronary Heart Disease
Peripheral Vascular Disease
Cerebrovascular Disease

3. Neuropathy - Peripheral Neuropathy
Autonomic Neuropathy

In this review, we will be dealing with the prevalence of complications at diagnosis of Type 2 diabetes based on our clinical and epidemiological studies done at the Madras Diabetes Research Foundation and M.V. Diabetes Specialities Centre, Chennai.

DIABETIC RETINOPATHY

Diabetic Retinopathy is perhaps the most specific of all diabetic complications. The prevalence of Retinopathy is related to the duration of diabetes. Rema et al[4] studied the prevalence of retinopathy in 6792 NIDDM patients seen at M.V Diabetes Specialities Centre at Chennai. The overall prevalence of retinopathy was 34.2% of which 30.8% was NPDR (Non -proliferative Diabetic Retinopathy) and 3.4% PDR (Proliferative Diabetes Retinopathy). In the same study, the prevalence of NPDR and PDR were 7.2% and 0.2% at the onset of diabetes which increased to 73% and 11.9% after 20 years duration of diabetes. These figures are lower than those reported by other workers[5]. In most western studies the prevalence of retinopathy at diagnosis varies from 20-30%. The reason for these differences are not clear. Klein et al[6] using retinal photography reported that 23% of their patients had retinopathy in those with less than 2 years duration of diabetes. It was felt that the lower prevalence rates of retinopathy in our first study may be due to lower sensitivity of clinical examination. Hence a study was taken up by Rema et al[8] to assess the prevalence of retinopathy at diagnosis in south Indian NIDDM patients using retinal photography. A total of 300 newly diagnosed NIDDM patients attending MVDSC were assessed by both clinical (direct and indirect ophthalmoscopy) and by retinal photography after full mydriasis using a 50 -VT Topcon retinal camera. Four standard fields including stereo photographs of the macula were taken using 35mm colour transparencies. Photographs were graded using modification of the Early Treatment Diabetic Retinopathy study (ETDRS) classification system[7]. 7.9% of newly diagnosed NIDDM patients had retinopathy which included 6.9% of early background diabetic

* From M.V. Diabetes Specialities Centre, Chennai.

retinopathy and 1% with maculopathy. In this series none had proliferative diabetic retinopathy. The results were presented at the IDF congress congress at Helsinki[8] and are shown in Table 1.

Table 1

Prevalence of Retinopathy at Diagnosis in NIDDM by Photographic Assessment [Rema et al 8]

Grade	Number	Prevalence rate (in percent)
Early BDR	22	6.9%
BDR with maculopathy	3	1.0%
Total BDR	25	7.9%
PDR	0	0%

Comparison of retinopathy rates across different countries is difficult because of differences in type of diabetes, number of patients studied and the different methods used for screening. In spite of high prevalence rate of diabetes in South India, the slightly lower prevalence of retinopathy at onset of Type 2 diabetes compared to European is of interest and obviously more studies are needed from different parts of India.

PREVALENCE OF ISCHAEMIC HEART DISEASE

In an earlier study we have shown that the prevalence of ischaemic heart disease is high in South Indian NIDDM patients[9]. To assess the prevalence of IHD at diagnosis in NIDDM patients, we took up a study of 4471 newly diagnosed NIDDM patients seen at the M.V. Diabetes Specialities Centre. Criteria for Diagnosis was based on the clinical history and physical examination. All patients had a resting 12 lead computerised electrocardiogram. The definitions for IHD used were:

1. **Myocardial Ischaemia:** History of classical chest pain and/or unequivocal ECG changes suggestive of ischaemia but no evidence of infarction.
2. **Infarction:** A definite history of myocardial infarction and/or unequivocal changes of E.C.G.

suggestive of a recent or past myocardial infarction.

The overall prevalence of IHD at diagnosis of Type 2 diabetes in this series was 7.9% of which 6% had ischaemia and 1.9% patients had infarction (Table 2).

Table 2

Prevalence of IHD and PVD at diagnosis in NIDDM

Prevalence of IHD	Numbers	Prevalence
Ischaemia	272/4471	6.1%
Infarction	86/4471	1.9%
Total IHD	358/4471	7.9%
Prevalence of PVD	24/3371	0.71%

This study thus confirms earlier reports that while the prevalence of IHD is high, that of PVD is low [10,11]

PREVALENCE OF PERIPHERAL VASCULAR DISEASE

The prevalence of peripheral vascular disease was studied in 3371 new diagnosed patients seen at the M.V.Diabetes Specialities Centre. Peripheral vascular disease was diagnosed clinically, if there was a history of intermittent claudication or rest pain and both dorsalis pedis and posterior tibial pulsations were absent in the same foot or one of these pulses were absent in both feet. Doppler studies were done using the KODY Vaslab machine and ankle/brachial (A/B) index was calculated. An (A/B) index of 0.8 or less was used for diagnosis of PVD by doppler criteria. In contrast to IHD, the prevalence of PVD was only 0.7 at the time of diagnosis of NIDDM. The results are tabulated in Table 2

EPIDEMIOLOGICAL STUDIES ON IHD AND PVD

The above studies were done at our centre, a specialised hospital and it could be argued that the data may be subject to a lot of referral bias. To avoid this bias, we recently took up population based studies to find out the prevalence of IHD and PVD in the population. The study was carried out in three residential colonies in different part of the Chennai city representing low, middle and upper income groups.

A resting 12-lead ECG (Minnesota coded) and peripheral doppler studies were done in a total of 955 individuals. According to this study, 17.8% of the over all population had CHD and 20.4% of diabetics had CHD. The prevalence of PVD was low in all three groups, overall prevalence in the population was 1.05% and 2.3% among diabetic subjects [12]. Thus our population based data once again confirms that prevalence of IHD is high while that of PVD is low among the South Indian population studied by us.

AUTONOMIC DYSFUNCTION IN NIDDM

It is interesting to note that significant autonomic neuropathy is present even at onset of diabetes. In support of this Ratzmann et al[13] have recently shown that in a cohort of "newly diagnosed NIDDM", autonomic dysfunction was seen in 2.1% - 7.3% of patients. It is possible that the actual duration of diabetes is longer because of the insidious nature of the disease. Estimates of the prevalence of autonomic dysfunction based on presence of abnormalities of cardiovascular autonomic reflexes have ranged from 14% to 66%. Veglio et al [14] in a study of 221 NIDDM patients found that 66% had at least one abnormal cardiovascular autonomic test. They found a correlation with age but not with duration of diabetes or metabolic control.

The prevalence of autonomic dysfunction in NIDDM patients seen at our centre was reported in 1996[15]. The study group comprised of 336 NIDDM attending MVDSC, which included every fifth NIDDM patient registered at our centre. A battery of five standard tests of autonomic dysfunction i.e. three tests of heart rate responses and two tests of blood pressure responses and two tests of blood pressure responses to different manoeuvres were done using protocols recommended by Ewing and Clarke[16] which are outlined in Table 3. The tests were done using a computerised electrocardiograph machine with an in-built programme for performing computerised R-R interval analysis. The machine automatically calculates the mean of approximately 100 R-R measurements and provides the minimum R-R, maximum R-R, and the co-efficient of variation of R-R (CV of R-R) for each of the parameters used.

The prevalence of autonomic dysfunction was studied in relation to the age of patients and duration of diabetes. There was no evidence of autonomic neuropathy dysfunction below the age of 20 years and there was a steady increase reaching upto 50%

prevalence after 60 years of age. Similarly the prevalence after 60 years of age. Similarly the prevalence increased with increased duration of diabetes. 28.2% of NIDDM patients with duration of <5 years had autonomic dysfunction which increased to 56.2% with duration of >20 years.

CONCLUSIONS

In summary, prevalence of complications is quite high even at the time of diagnosis of Type 2 diabetes (NIDDM). This is probably because of the insidious onset of diabetes and long duration of asymptomatic disease before symptoms develop. Hence screening tests for complications are strongly recommended at the time of diagnosis not only for early detection, but also to prevent the progression to end-stage disease.

Table 3

Normal Values for Autonomic Nervous System Tests.

	<i>Coefficient of Variation</i>	
	<i>Control (Mean ± S.D.)</i>	<i>Abnormal Value</i>
<i>Heart Rate Tests</i>		
Heart rate response To Valsalva	13.2 ± 5.0	< 3.2
Heart rate variation During deep breathing	11.3 ± 4.4	< 2.5
Heart rate response to standing	6.5 ± 2.4	< 1.7
<i>Blood Pressure Tests</i>		
Blood pressure response to standing (fall in systolic BP)	Less than 10 mm	More than 20 mm
Blood pressure response to sustained hand grip (increase in diastolic BP)	More than 20 mm	Less than 10 mm

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