Ischaemic Heart Disease in South Indian NIDDM Patients - A Clinic Based Study on 6597 NIDDM Patients

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SUMMARY

The prevalence of ischaemic heart disease (IHD) was assessed in a large cohort of 6597 NIDDM patients seen at a diabetes centre. Overall 17.8% of patients had IHD. The prevalence of IHD was not significantly different in males and females. The prevalence of IHD increased with age and duration of diabetes in both males and females and 40.1% of those with over 20 years duration of diabetes had IHD. The prevalence of all other diabetic complications like peripheral vascular disease, nephropathy and retinopathy was higher in the patients with IHD. Multiple logistic regression analysis showed that serum cholesterol, diastolic blood pressure, duration of diabetes, age at onset of diabetes, post-prandial plasma glucose, nephropathy and retinopathy had a positive association with IHD.

Non-insulin-dependent diabetes mellitus (NIDDM) constitutes about 95% of all the diabetic patients seen in Southern India [1]. The prevalence of ischaemic heart disease is higher among patients with both diabetes and impaired glucose tolerance (IGT) compared to the general population [2-4]. Recent studies have shown that the overall prevalence of IHD is higher among migrant Asian Indians compared to Europeans [5, 6]. It is also of interest that IHD occurs at a younger age among migrant Indians in the UK [7]. There are few data on IHD in NIDDM patients from our country and most are based on small study numbers. In this paper we report on the prevalence of IHD in a large cohort of NIDDM patients attending the M.V. Diabetes Specialities Centre, a large referral centre for diabetes at Madras in South India.

PATIENTS AND METHODS

The study group comprised of 6597 consecutive NIDDM patients registered at the M.V. Diabetes Specialities Centre, Madras. The diagnosis of diabetes and the classification as NIDDM were based on the WHO study group criteria [8]. A detailed clinical history was taken in all patients including the duration of diabetes mellitus, age at onset, previous history of angina/infarction and a history of smoking. All patients underwent a thorough clinical examination which included recording of height and weight, body mass index (BMI), blood pressure, palpation of peripheral pulses, auscultation for carotid or femoral bruit and elicitation of the knee and ankle jerks are vibration sense.

Biochemical investigations were done on Cornn Express plus Autoanalyser (USA) using Boehring Mannheim kits (West Germany) and included fasting and post-prandial plasma glucose (glucose oxidase method), serum cholesterol (CHOD-PAD method), serum triglycerides (GPO-PAD method blood urea (modified GLDH/kinetic method), serum creatinine (modified kinetic method) and urinary albumin excretion by the protein/creatinine rats method. All patients had a resting 12 lead computerised electrocardiogram. A detailed retinal examination was done by a retinal specialist both by direct and indirect opthalmoscopy after pupillary dilatation. Peripheral arterial doppler studies were done using a recording device (Vaslab, KODY, Madras) and blood pressure and velocity graph recording were done in both the upper and lower limbs.

The following definitions were used for diagnosis diabetic complications

Myocardial Ischaemia: History of classical chest pain and/or unequivocal E.C.G. changes suggests of ischaemia, but no evidence of infarction.

Infarction: A definite history of myocardial infarction and/or unequivocal changes on E.C.G. suggests of a recent or past myocardial infarction.

Nephropathy: Proteinuria >500 mg/day in the prevalence of retinopathy and in the absence of urinary tract infection, hypertension or cardiac failure,

Renal Insufficiency: Serum creatinine > 1.2 mg: Background Diabetic Retinopathy (BDR) Microneurysms, dot haemorrhages or exudates inv retina, in the absence of new vessels.

Profiferative Diabetic Retinopathy (PDR): N vessels on the disc or elsewhere or advanced diabetic eye disease with vitreous haemorrhages and or retinal detatchment.

Peripheral Vascular Disease (PVD): It was diagnosed clinically, if there was a history of

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Intermittent claudication or rest pain and both dorsalis pedis and posterior tibial pulsations were absent in the same foot or one of these pulses was absent in both feet. Doppler studies were done using the KODY Vaslab Machine and the ankle/brachial (A/B) index was calculated in all cases. An A/B index of 0.8 or less was used for diagnosis of PVD by doppler criteria.

STATISTICAL ANALYSIS

The chi-square test was done to compare differences m frequencies and t-tests for differences in means. Statistical analysis were done using SPSS program on a IBM PC compatible computer. Multiple logistic regression analysis were done using IHD as the dependent variable. The variables included in regression analysis were

a) **Continuous Variables:** Fasting and post-prandial plasma glucose, serum cholesterol, serum triglycerides, serum creatinine, systolic BP, diastolic BP, BMI, blood urea, duration of diabetes mellitus and age at onset of diabetes mellitus.

b) **Categorical Variables:** smoking, alcohol, macroalbuminuria, PVD and retinopathy.

RESULTS

Table 1 shows the prevalence of IHD in our NIDDM patients. The overall prevalence of IHD (ischaemia infarction) was 17.9% in this study. There was no significant difference in the prevalence of ischaemia or infarction between males and females.

Table 1
Prevalence of IHD in NIDDM patients

	A	B	A+B
Total (n = 6597)	Ischemia (n = 785) (11.9%)	Infarction (n = 396) (6.0%)	Ischaemia+Infarction (n = 1181) (17.9%)
Males (n = 4149)	497 (12%)	254 (6.1%)	751 (18.1%)
Females (n = 2448)	288 (11.8%)	142 (5.8%)	430 (17.6%)

Figure 1 shows the prevalence of IHD in relation to the age of the patient. Below the age of 30 years there were no cases of IHD but the prevalence of IHD started rising from the age of 30 years and showed an increase with every decade of life and by the age of 80 years 22.9% of patients had evidence of IHD. Female diabetics had an almost equal prevalence of IHD compared to male diabetics at every decade of life.

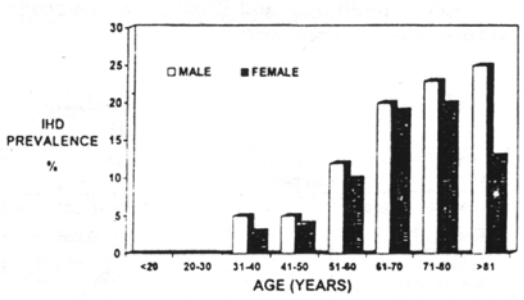

Fig. 1: Prevalence of IHD and age

Table 2 shows the prevalence of IHD in relation to the duration of diabetes. There was a linear increase in the prevalence of IHD with increasing duration of diabetes and this increase was statistically significant (Trend Chi Square, P < 0.001). 11 .5% of the patients with less than 5 years of diabetes mellitus had IHD, while this figure increased to 40.1 % in those with over 20 years duration of diabetes.

Table 2
Duration of Diabetes Mellitus

Duration (in years)	Total No.	IHD	
		No.	%
0 - 5	2764	310	11 .2
6 - 10	1649	210	12.7
11 - 15	1071	265	24.7
16 - 20	570	178	31 .2
> 20	543	218	40.1

Trend Chi Square - 374.9
D.F - 1
P value < 0.0001

We analysed the smoking habits in our patients. 10.9% of the non-IHD patients were smokers, compared to 8.5% of IHD patients. Hence smoking did not appear to be a risk factor for IHD in this study.

Table 3 shows the prevalence rate of amputations. Amputations were classified as minor amputations (below ankle) and major amputations (above ankle). The prevalence of major amputations was higher in the IHD patients compared to those without IHD (P = 0.03).

Table 3
Prevalence of amputation rates in IHD patients

Level of Amputation	Normal n = 5096	IHD (Ischaemia+infarction)	Significance
Minor (belowankle)	22 (0.43%)	10 (0.85%)	P = .11 N.S.
Major (above ankle)	5 (0.1%)	5 (0.42%)	P = .03

Table 4 shows the results of the logistic regression analysis using IHD as the dependent variable and

several other variables (listed above) as independent variables. Only those variables with a positive association are shown in the table. It can be seen that serum cholesterol, diastolic blood pressure, duration of diabetes, age at onset of diabetes, post-prandial plasma glucose, nephropathy and retinopathy (both BDR and PDR) showed a positive association with IHD.

Table 4
Multiple Logistic Regression Analysis Dependent Variable = IHD

Variable	Regression Coefficient	Standard Error	Significance	Odds Ratio
Serum Cholesterol	.23	.06	P < 0.001	1.3
Diastolic BP	.54	.14	P = 0.002	1.7
Duration of Diabetes Mellitus	.30	.03	P < 0.001	1.3
Age at onset of Diabetes	.37	.04	P < 0.001	1.4
Post-prandial plasma glucose	0.8	.03	P = .008	2.2
Nephropathy	.63	.20	P = .002	1.9
Background Diabetic Retinopathy	.30	.09	P = .001	1.3
Proliferative Diabetic Retinopathy	.60	.19	P = .002	1.8

Table 5 shows the presence of other diabetic complications in those with IHD. The prevalence of all complications - nephropathy, renal insufficiency, PVD and retinopathy (both background and proliferative) was higher in the patients with ischaemia and infarction. The differences between the ischaemia and infarction groups were however not statistically significant.

Table 5
Presence of other complications in those with IHD

Variable	GROUPS			P VALUES		
	Normal %	Ischae-mia %	Infarc-tion %	Normal vs Ischae-mia	Normal vs Infarc-tion	Ischaemia vs Infarc-tion
Nephropathy	2.0	4.7	3.5	P < 0.001	P = .07	P=.43 NS
Renal insufficiency	2.1	8.3	5.3	P<0.001	P<0.001	P=.08 NS
PVD	1.5	7.1	5.3	P<0.001	P<0.001	P=.28 NS
BDR	22.2	36.8	36.6	P<0.001	P<0.001	P=1.0 NS
PDR	2.2	7.8	5.1	P<0.001	P=.07	P=.10 NS

PVD = Peripheral Vascular Disease
BDR = Background Diabetic Retinopathy
PDR = Proliterative Diabetic Retinopathy

DISCUSSION

The major cause of death in diabetics is due to pre mature atherosclerosis leading to IHD. The Framingham data [9] showed that diabetic men had a 50% higher risk and diabetic women a 200% higher risk for IHD [10]. This paper reports on the prevalence of IHD in a large cohort of South Indian NIDDN patients. Although clinic based, the large numbers of patients selected in an unbiased manner should provide fairly reliable estimates. The overall prevalence of IHD was 1 7.8% in our patients which included 12% of patients with ischaemia and 6.1 % of patients with infarction. This study thus shows that the prevalence of IHD is high even among Indians in India confirming the findings in migrant Indians [5, 6]. Our study also confirms the well known fact that diabetic women are as prone to IHD as male diabetics. In the Framingham study, the relative rates of intermittent claudication, congestive heart failure and coronary, heart disease was substantially greater in women than in men [11].

The results of multiple logistic regression analyses revealed that serum cholesterol, systolic BP, serum creatinine, duration of diabetes and age at onset diabetes mellitus are risk factors for IHD. It is of interest that smoking did not come out as the major risk factor, but this could be because the smoking history is unreliable. Smokers rarely give an accurate account of their smoking habits. Again, ex-smokers were classified as non-smokers in this study. A more detailed study in relation to smoking is certainly warranted.

It is also of interest that all diabetic complications like nephropathy, retinopathy and peripheral vascular disease was more common among IHD group This could however be attributed to the longer duration of diabetes in the IHD group.

This study is based on resting ECG findings and hence the actual prevalence of IHD must be much higher. It is well known that IHD is often asymptomatic and the sensitivity of a resting ECG is quit, low [12]. If Cardiac Stress (treadmill) testing had been done, the, actual prevalence rates would undoubtedly, have been much higher [13]. For logistic reasons treadmill testing could not be done on the large number of patients included in this study.

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