

Original article:

Study of cardiovascular involvement in patients of diabetes mellitus in Indian Population

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Abstract:

Introduction: Cardiovascular disease is the leading cause of death among patients with diabetes mellitus. With this background present study was planned to study the cardiovascular involvement in patients of diabetes mellitus.

Material and methods: 100 patients of Diabetes Mellitus (Both type 1 and type 2) presenting to Padmashree Dr. D. Y. Patil Hospital and Research centre, Pimpri, Pune-18 were selected. 50 age and sex matched healthy non-diabetic controls were taken from friends and relatives of the patient.

Results: Out of 100 diabetic patients 79% had evidence of left ventricular diastolic dysfunction on Doppler echocardiography, while 18% of the controls showed abnormal diastolic parameters. Twenty one diabetics out of 100 and 41 controls out of 50 did not have LVDD. This study found diabetics more prone for LVDD which is statistically significant.

Conclusion: In this study it was found that a very high number of diabetics (79%) had left ventricular diastolic dysfunction compared to age and sex matched controls (18%). This was highly significant ($p < 0.0001$).

Keywords: Cardiovascular disorders , diabetes mellitus

Introduction:

Cardiovascular disease is the leading cause of death among patients with diabetes mellitus.¹The main forms of structural heart disease associated with diabetes are coronary heart disease and diabetic cardiomyopathy, which is characterized by left ventricular hypertrophy, left ventricular diastolic and systolic dysfunction.² Asymptomatic structural heart disease is common and associated with a poor prognosis in patients with diabetes.

Diabetes is associated with increased cardiovascular complications, the most common of which are ischemic cardiomyopathy and left ventricular (LV) dysfunction⁵. The Framingham Heart study has shown that the incidence of congestive cardiac failure in diabetic patients occurs irrespective of coronary artery disease or hypertension". In overt heart failure, diastolic dysfunction often co-exists with systolic dysfunction as a consequence of ischemic heart disease, but diastolic dysfunction is frequently reported in diabetes mellitus without signs and symptoms of heart disease and is possibly due to diabetic

cardiomyopathy. With this background present study was planned to study the cardiovascular involvement in patients of diabetes mellitus.^{3,4}

Material and methods:

100 patients of Diabetes Mellitus (Both type 1 and type 2) presenting to Padmashree Dr. D. Y. Patil Hospital and Research centre, Pimpri, Pune-18 were selected. 50 age and sex matched healthy non-diabetic controls were taken from friends and relatives of the patient.

Inclusion criteria:

Diabetic Group:

- 1) Newly diagnosed patients of Diabetes mellitus when their-
 - Random Capillary Blood Glucose> 200 mg/dl
 - Fasting Capillary Blood Glucose> 110mg/dl
 - Blood Glucose After Oral Glucose Tolerance Test> 200 mg/dl
 - Hb1c > 6.5%
- 2) Known cases of diabetes mellitus on treatment.
- 3) Isolated diabetic patients and diabetics with other co-morbid conditions like HTN, IHD, CAD.

Controls:

Age and sex matched healthy non diabetic controls from family and friends of patients were included after written and informed consent.

Exclusion criteria:

Patients and controls with age less than 18 years.

Results:

Table 1 : Incidence of left ventricular diastolic dysfunction in both diabetic and control groups

Incidence	Diabetics	Controls	Total
LVDD	79%	9 (18%)	88
Without LVDD	21%	41 (82%)	62
Total Patients	100	50	150

Odds ratio= 17.14, (95% CI= 6.78 to 45.10); Chi Square= 50, df= 1, p < 0.001.

Out of 100 diabetic patients 79% had evidence of left ventricular diastolic dysfunction on Doppler echocardiography, while 18% of the controls showed abnormal diastolic parameters. Twenty one diabetics out of 100 and 41 controls out of 50 did not have LVDD. This study found diabetics more prone for LVDD which is statistically significant.

Table 2: Grading of LVDD in patients with dm and controls

Grading	Cases	Control
Gradel	50 (63%)	9 (18%)
Grade II	12 (15%)	0
Grade ID	9 (12%)	0
Grade IV	8 (10%)	0
Total	79	9

Among 79 diabetic patients having left ventricular diastolic dysfunction, 63% had abnormal relaxation (Grade I diastolic dysfunction), 15% had pseudonormalization (Grade II diastolic dysfunction), 12% had reversible restrictive pattern (Grade III diastolic dysfunction) and 10% had irreversible restrictive pattern (Grade IV diastolic dysfunction). 9 out of 50 controls had LVDD, amongst them 100% had Grade I dysfunction. However almost all the controls were above the age of 60 years, which again suggest the role of age in the incidence of LVDD in normal individuals. Our Findings in diabetics and controls suggest Grade I (abnormal relaxation) to be the predominant pattern of LVDD.

Table 3 : Incidence of LVDD in both diabetic and control groups considering age

Age	Total number of Diabetics	Diabetics with LVDD	Total number of Controls	Controls with LVDD
20-30years	9	6 (67%)	3	0
31-40 years	10	5 (50%)	4	0
41-50 years	16	6 (38%)	12	0
51-60years	26	23 (88%)	12	0
61-70years	28	28 (100%)	14	5 (36%)
71-80 years	11	11 (100%)	5	4 (80%)
Total	100	79	50	9

Discussion:

In this study it was found that, elderly patients in both the study groups had higher incidence of LVDD. 6 out of 9 diabetics (67%) from 20-30 years age group showed incidence of LVDD which was significant. 51 out of 54 (94%) patients from the age of 51 - 70 years showed LVDD. In the controls all the 9 individuals who had LVDD were from the age group of 61 - 80 years. The distribution of LVDD in both the study groups according to age is depicted in the chart below.

In this study it was found that, amongst 100 diabetic patients, left ventricular diastolic dysfunction was present in 79 (79%) patients, twenty one (21%) showed normal left ventricular filling pattern. In the control group 9 (18%) showed LVDD and 41 (82%) had normal findings. Odds ratio= 17.14, (95% CI= 6.78 to 45.10); Chi Square= 50, df=1, p < 0.001. The difference is therefore significant.

Exiara et al (2010) from Greece studied 114 outpatients with type 2 DM. All patients were normotensive with well-controlled diabetes, without evidence of heart failure.⁵ All patients underwent Doppler echocardiography with use the Valsalva maneuver on analysis of mitral flow. A total of 62(63.2%) patients, 23 male (49.7% of men) and 39 female (59.1% of women) had LVDD.

Silvio Romano et al (2010) studied 127 consecutive outpatients with type-2 diabetes mellitus. Subjects with overt heart failure or NYHA class > 1, history of coronary artery disease, severe valvulopathy or chronic atrial fibrillation were excluded from the study. They found the incidence of LVDD in 42% patients with DM which was significant (p < 0.01)⁶

Antonio Nicolino, Giancarlo Longobardi et al (1995) investigated 84 diabetic patients and 84 nondiabetic age- and sex-matched control subjects for evidence of left ventricular diastolic dysfunction. Diabetic patients were subdivided into two groups on the basis of the presence of arterial

hypertension, Group 1 comprised 41 normotensive diabetic patients, Group 2 comprised 43 hypertensive diabetics.⁷

Rajesh Rajput, Jagdish W et al studied 30 diabetic patients for evidence of LV diastolic dysfunction and compared them with 30 age and sex matched healthy controls. They reported incidence of diastolic dysfunction to the tune of 63% in diabetic patients. The mean of ratio of *E/A* as compared with normal age and sex matched controls was found to be highly significant ($p < 0.0001$).⁸

Conclusion:

In this study it was found that a very high number of diabetics (79%) had left ventricular diastolic dysfunction compared to age and sex matched controls (18%). This was highly significant ($p < 0.0001$).

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