Research Article

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A study of prevalence of cardiomyopathy in diabetes mellitus as evidenced by electrocardiography and 2-D echo

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ABSTRACT

Background: Diabetic cardiomyopathy is characterized by diastolic dysfunction, which is rarely clinically apparent unless associated with hypertension and/or with myocardial ischemia. The aim of the study was to determine the prevalence of cardiomyopathy in diabetes mellitus.

Methods: This study was carried out on patients coming as out patients (100) to Dr. D.Y.Patil Hospital & Research Centre, Nerul Navi Mumbai from June 2006 to December 2008.

Results: In this study maximum number of diabetics are between the age group of 41-50. Males (65) are more common than female (35). Main complaints of the patients coming to OPD was chest pain (59%), followed by giddiness (48%), breathlessness (47%), sweating (33%). ECG changes does not have any correlation with duration of DM. ECG changes related to cardiomyopathy were present in 38 out of 65 males and 25 out of 35 females i.e. total number of 63 subjects had ECG changes related to diabetic cardiomyopathy. 28 males and 16 females had diastolic dysfunction in 2 D Echo. Maximum numbers of patients with diastolic dysfunction were between the age group of 51-60 years in male and females i.e. 11 and 08 respectively. 46 patients had mild systolic dysfunction. 40 patients had normal systolic function but 13 patients had moderate systolic dysfunction while only 01 patient had severe systolic dysfunction.

Conclusions: Prevalence of cardiomyopathy in diabetes in present study as evidenced by ECG is 63% and by 2 D Echo it is 62%. Patient with DM of 5 years of duration, should be properly screened & put on proper inotropic drugs to prevent the worsening of diabetic cardiomyopathy.

Keywords: Cardiomyopathy, Diabetes

INTRODUCTION

Cardiomyopathy literally means heart muscle disease. A predisposition of heart failure in asymptomatic patients with diabetes alone may reflect the effects of underlying abnormalities in Diastolic Dysfunction. This suggests specific impairment of heart muscle termed Diabetic Cardiomyopathy.

Diabetic cardiomyopathy is characterized by diastolic dysfunction, which is rarely clinically apparent unless associated with hypertension and/or with myocardial ischemia.

With the invention of insulin as diabetics started living longer, cardiovascular complications went on increasing & the most common cause of death in diabetics.

Diabetic cardiomyopathy is not a rare condition, its etiology is largely due to hyperglycemia with contributions from the insulin resistance syndrome that cause left ventricular hypertrophy.

Diagnosis & assessment of severity of disease depends on 2-D Echo with Doppler studies, cardiac catheterization, angiography & other non invasive investigations like Chest X-Ray, ECG & MRI of chest.

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In present study we tried to find out prevalence of cardiomyopathy in diabetes mellitus with reference to ECG & 2-D Echo.

METHODS

This study was carried out on patients coming as out patients to Dr. D.Y. Patil Hospital & Research Centre, Nerul Navi Mumbai from June 2006 to December 2008. Total 100 patients were taken.

Inclusion criteria

100 Patients of either sex & any age with confirmed diagnosis of diabetes mellitus were taken into the study.

Exclusion criteria

Patients with comorbid conditions or any conditions which are likely to cause cardiomyopathy like IHD, alcoholism, thyroid disease, HIV/AIDS, pregnancy, amyloidosis, hypertension, myocarditis, chemotherapy or other conditions known to cause cardiomyopathy.

RESULTS

Table 1 shows that maximum number of diabetics are between the age group of 41-50 i.e. 31 followed by 51-60 years of age (30), males (65) are more common than female (35).

Table 1: Age and sex distribution.

Age (years)	Male	Female	Total	Percentage (%)
21-30	03	-	03	03
31-40	15	04	19	19
41-50	21	10	31	31
51-60	18	12	30	30
61-70	05	06	11	11
71-80	03	02	05	05
81-90	-	01	01	01
Total	65	35	100	100
Percentage	65	35	100	100

Table 2: Duration of diabetes mellitus.

Duration of Dm (Years)	Male	Female	Total	Percentage (%)
0-5	24	10	34	34
6-10	18	18	36	36
11-15	11	02	13	13
16-20	07	01	08	08
21-25	02	02	04	04
26-30	02	01	03	03
31-35	-	01	01	01
36-40	01	-	01	01

Table 2 shows in present study 36% of patients has diabetes mellitus for 6-10 years, 34 had diabetes since 0-5 years, 13 had diabetes since 11-15 years, 08 had since 16-20 years, 04 since 21-25 years, 03since 26-30 years while one patients had diabetes since 31-35 and one since 36-40 years.

Table 3 shows that main complaints of the patients coming to OPD was chest pain (59%), followed by giddiness (48%), breathlessness(47%),sweating(33%), & most of the patients were between the age group of 41-50 years.

Non specific ST-T changes were present in 33 male and 21 females, 27 males and 10 females had normal ECG while changes in ECG like AF/VPC, LVH, BBB, AV Block were present in small no. of patients. Although ECG changes are present in diabetic cardiomyopathy but these are non specific.

Table 5 shows ECG changes does not have any correlation with duration of DM.ECG changes related to cardiomyopathy were present in 38 out of 65 males and 25 out of 35 females i.e. total number of 63 subjects had ECG changes related to diabetic cardiomyopathy.

Table 6 shows 28 males and 16 females had diastolic dysfunction in 2 D Echo. Maximum number of patients with diastolic dysfunction was between the age group of 51-60 years in male and females i.e. 11 and 08 respectively.

Table 3: Chief complaints.

Age (Years)	Chest Pain	Breathlessness	Giddiness	Sweating	Palpitation	Anorexia	Fever
21-30	01	01	02	01	-	-	-
31-40	08	09	09	07	05	02	-
41-50	16	13	21	15	05	02	-
51-60	26	17	09	05	03	02	-
61-70	06	02	05	05	01	01	01
71-80	02	04	02	-	-	-	-
81-90	-	01	-	-	-	-	-

Table 4: ECG changes.

Age (Years)	ST-T Changes		AF/VF	PC	LVH		ВВВ		AV Block	<u>K</u>	Norm	al
	M	F	M	F	M	F	M	F	M	F	M	F
21-30	-	01	-	-	-	-	-	-	-	-	03	-
31-40	05	01	-	-	-	-	01	-	01	-	10	03
41-50	09	04	-	-	03	01	02	-	01	-	09	06
51-60	09	12	01	-	02	02	04	02	03	01	04	01
61-70	04	05	01	01	-	01	01	02	-	01	01	-
71-80	03	01	-	01	-	-	-	-	-	-	-	-
81-90	-	-	-	01	-	-	-	-	-	-	-	-
Total	30	24	02	03	05	08	08	04	05	02	27	10
Percentage (%)	30	24	02	03	05	08	08	04	05	02	27	10

Table 5: ECG changes with duration of diabetes mellitus.

Duration of DM (Years)	ST-T	Changes	AF/	VPC	LVH	[BBB		AVI	Block	Nori	nal
	M	F	M	F	M	F	M	F	M	F	M	F
0-5	06	06	01	-	02	01	01	-	-	-	16	05
6-10	08	10	-	03	03	-	01	01	02	01	09	05
11-15	07	02	-	-	01	-	03	01	03	-	01	-
16-20	06	01	01	-	-	01	02	01	-	01	-	-
21-25	01	02	-	-	-	02	-	01	-	-	01	-
26-30	01	01	-	-	-	-	01	-	-	-		-
31-35	-	01	-	-	-	-	-	-	-	-	-	-
36-40	-	-	-	-	-	-	-	-	-	-	-	-
Total	31	22	02	03	06	04	08	04	05	02	26	10
Percen-Tage	31	22	02	03	06	04	08	04	05	02	26	10

Table 6: 2 D echo (diastolic dysfunction) changes.

Age (years)	Diastolic dysfunction			
	Male		Female	
	Present	Absent	Present	Absent
21-30	-	03	-	-
31-40	02	13	-	04
41-50	08	13	03	07
51-60	11	07	08	05
61-70	04	01	02	03
71-80	03	-	02	-
81-90	-	-	01	-
Total	28(28)	37(37)	16(16)	19(19)

In present study Table 7 shows that 46 patients had mild systolic dysfunction. 40 patients had normal systolic function but 13 patients had moderate systolic dysfunction while only 01 patient had severe systolic dysfunction.

Table 7: 2D echo (systolic dysfunction).

Age (Years)	Systolic Dysfunction			
	Severe Lvef (<35%)	Moderate Lvef (35%- 45%)	Mild Lvef (45%- 55%)	Normal Lvef (>55%)
21-30	-	-	01	02
31-40	-	-	06	13
41-50	-	02	16	14
51-60	01	05	16	08
61-70	-	03	04	03
71-80	-	02	03	-
81-90	-	01	-	-
Total	01	13	46	40

Table 8: Comparison of ECG changes with diastolic dysfunction in 2 D echo.

ECG Changes	Diastolic Dysfunction				
	Present	Absent			
Present	36	26			
Absent	07	31			

Table 8 shows 36 patients had both ECG changes as well as diastolic dysfunction on 2 D echo while 31 patients does not have any change either in 2 D echo or ECG. 26 patients had only ECG changes of cardiomyopathy while 07 patients had only 2 D echo changed of cardiomyopathy.

DISCUSSION

Diabetic cardiomyopathy is characterized by diastolic dysfunction which is rarely clinically apparent unless associated with hypertension (when it is likely to become clinically apparent) and/or with myocardial ischaemia (when it is likely to present with severe clinical manifestation).

In present study we had taken 100 cases of Diabetes Mellitus taking into consideration of inclusion and exclusion criterion. The exact prevalence, nature and cause of cardiac dysfunction directly attributable to diabetes have given rise to considerable debate because other factors common in diabetes such as hypertension, coronary atherosclerosis & microvascular dysfunction can independently impairs myocardial performances. The term diabetic cardiomyopathy is used to describe heart failure in diabetic patients in the absence of coronary atherosclerosis; early impairment of diastolic function is seen even in asymptomatic persons with diabetes should be labeled as diabetic cardiomyopathy. This abnormal myocardium is then subject to further injury leading to systolic dysfunction.

In electrocardiography nonspecific ST-T wave changes, AF /Premature VPC are noted. LVH, BBB, AV Blocks can also be observed on electrocardiography but all these changes are nonspecific.

Clinically apparent diabetic cardiomyopathy may take several years to develop but echocardiography can detect significant abnormalities well before the onset of symptomatic HF.

On conventional 2 D Echo, early abnormalities are defined by a preserved LV ejection fraction with reduced early diastolic filling, prolongation of isovolumetric relaxation and increased atrial filling, the presence of which confirms diastolic dysfunction.⁴

In diabetic cardiomyopathy diastolic dysfunction precede the development of systolic dysfunction.

Out of 100 cases in present study 65% were males & 35% were females with the ratio of 1.8:1 which is comparable to study conducted by Blohme et al⁵ in which male to female ratio is 1.8:1 in type I DM & 1.3:1 in type 11 DM.

In present study maximum number of patients were in age group of 41-50 years which is in concordance with Scott R Votey et al 6 study in which diabetic cardiomyopathy occurs most commonly in 40 years of age or older.

In present study maximum no. of patients has 6-10 years of duration of DM. Few (01 in 31-35 years & 01in 36-40 years of age) has long duration. This can be due to less no. of patients in sample or patients do not survive till longer.

The maximum no. of cases fell in age group of 41-50 years (31%). Most of patients (59%) presented with chest pain followed by giddiness (48%) breathlessness (47%) & sweating (33%) & most of the patients were between the age group of 41-50 years with all the symptoms.

The present study shows54% of patients had non specific ST-T changes in ECG while 37% has normal ECG findings. 5% has AF/VPC, 9% has cardiomegaly & 12% has BBB in ECG. So far no study has been done showing the ECG changes in Diabetic Cardiomyopathy. ECG changes can be nonspecific in Diabetic Cardiomyopathy.

In present study 28 males & 16 females has diastolic dysfunction. Cardiomyopathy in Diabetes Mellitus I evidenced early by diastolic dysfunction in 2 D Echo in middle stage of diabetic cardiomyopathy followed by systolic dysfunction evidenced in late stage of cardiomyopathy. Study done by Sohn D W⁷ & Nokundo et al⁸ 32% & 30% subjects had diastolic dysfunction while it is 44% in present study.

Present study shows 60% of patients with systolic dysfunction in which 46% has mild dysfunction, 13% has moderate while only 1% has severe systolic dysfunction & 40% has normal ejection fraction. Study done by Regan et al 55% of diabetic subjects had systolic dysfunction. This finding correlates with the present study.

In present study 26% patients have only ECG changes 36% has both ECG as well as Echo changes. 31% neither had ECG changes nor had any change in Echo, but no study has been done presenting ECG changes in Diabetic Cardiomyopathy.

Prevalence of cardiomyopathy in diabetes in present study as evidenced by ECG is 63% and by 2 D Echo it is 62%. Study done by Redfield MM et al⁹ prevalence of cardiomyopathy is 51% while in study done by Poirier P et al¹⁰ prevalence of cardiomyopathy is 60% in diabetics. Present study agrees with study done by Poirier et al.

Diabetic cardiomyopathy is not a rare entity, it is present commonly amongst diabetics, occurs years after development of diabetes. Proper screening of diabetics should be done so that it can be detected well before the heart failure occurs. By 2 D Echo diastolic and systolic dysfunction can be detected in middle stage. Diabetic Cardiomyopathy can be prevented. Patient with DM of 5 years of duration, should be properly screened & put

on proper inotropic drugs to prevent the worsening of diabetic cardiomyopathy.

As with the invent of insulin, treatment of diabetes is advancing and patients are living longer & complications of diabetes are increasing & diabetic cardiomyopathy is one of the complication.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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