

ORIGINAL PAPER

Cardiac dysfunction in diabetes mellitus: a hospital based study

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ABSTRACT

Introduction: Diabetic Cardiomyopathy is characterized by the presence of myocardial dysfunction in the absence of hypertension, coronary artery disease, or other known cardiac disease. **Materials and methods:** It was a hospital based observational, descriptive study carried out in 105 diabetic patients who were screened for cardiac dysfunction using 2D echocardiography. **Results:** Left ventricular diastolic dysfunction (grade 1) was found in 69 patients of the study population. Out of 69, 10 patients (9.5%) had left ventricular diastolic dysfunction in the absence of hypertension, coronary artery disease or other known cardiac disease. **Conclusion:** 9.5% of 105 diabetic patients studied had presence of left ventricular diastolic dysfunction in the absence of hypertension, coronary artery disease or other known cardiac disease. These patients may be considered to be having Diabetic Cardiomyopathy.

Keywords: Diastolic dysfunction; cardiomyopathy; hypertension; coronary artery disease.

INTRODUCTION

The American Diabetes Association has rightly designated diabetes mellitus as “coronary heart disease equivalent” as it is associated with a number of cardiovascular complications namely atherosclerotic coronary artery disease, myocardial infarction, congestive heart failure, coronary microangiopathy and systemic arterial hypertension.¹ In addition to these, structural myocardial involvement termed as “Diabetic cardiomyopathy” may occur, which has been suggested by various studies done on diabetics till date.² These conditions are rarely found as isolated forms; they often overlap and potentiate each other. Diabetes mellitus can lead to heart failure, not only by augmenting the impact of cardiovascular risk factors, but also via the direct deleterious effect on the

myocardium per se which is known as Diabetic Cardiomyopathy.²

Diabetic Cardiomyopathy is characterized by the presence of myocardial dysfunction in the absence of hypertension, coronary artery disease, or other known cardiac disease.³ The prevalence of diabetic cardiomyopathy in diabetic patients is 12% and reaches 22% in individuals over 64 years.⁴ Although it commonly affects the diastolic and systolic function of the left ventricle, there are scanty data indicating that diabetes is equally detrimental for the right ventricle as well.²

The Diabetic Cardiomyopathy is a diagnosis of suspicion. Unfortunately, there is no widely accepted method for its diagnosis.⁵ The best approach is detection of myocardial dysfunction, and exclusion of other heart diseases, which may cause myocardial structural and functional changes. Clinically, it may take several years for heart failure to develop in diabetic patients. So, it is essential to demonstrate the abnormality before symptoms of heart failure begin. Echocardiography is a reliable and non-invasive imaging tool which can be used to demonstrate early functional changes of left ventricle. However, normal echocardiographic findings at rest do not exclude the diagnosis of diabetic Cardiomyopathy.⁵ Left ventricular dysfunction detected by

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Tissue Doppler Imaging (TDI), during exercise or stress, may be the earliest sign of diabetic Cardiomyopathy. Other diagnostic methods such as Computed Tomography (CT), single photon emission CT, and Magnetic Resonance Imaging (MRI) may be used for detection of myocardial dysfunction. Assessment of interstitial fibrosis and steatosis by using delayed Gadolinium enhancement cardiac MRI is possible, but its diagnostic value has not been established.⁵

Very few studies have been done to find out the prevalence of cardiomyopathy in Diabetes Mellitus in Indian population. The present study is an attempt to identify echocardiographic evidence of cardiac dysfunction in Diabetes Mellitus in the absence of hypertension, coronary artery disease and other known cardiac diseases.

MATERIALS AND METHODS

This was a hospital based observational, descriptive study carried out in patients attending the outpatient department of Medicine and Emergency department in Gauhati Medical College and Hospital, Guwahati during a period of one year. Patients above 18 years of age and belonging to either sex who were already on drugs for diabetes mellitus and/or fulfilling the diagnostic criteria of Diabetes mellitus as per the American Diabetes Association were included in the study. Patients aged less than 18 years and above 60 years, patients with chronic renal disease, microalbuminuria, chronic pulmonary disease, chronic liver disease, congestive cardiac failure, anabolic steroid users, patients with a history of alcohol consumption, chemotherapeutic agents or radiotherapy, collagen vascular disease and endocrinopathy (excluding diabetes mellitus), congenital and valvular heart diseases, neuromuscular disorders, family history of cardiomyopathy and pregnant patients were excluded from the study.

A scheme of case taking or proforma was filled up meticulously for every patient included in the study by interviewing patients/attendants, thorough clinical examination and relevant investigations. The evidence for the presence of coronary artery disease was obtained through history regarding coronary ischemic events, ECG (q wave, right bundle branch block, left axis deviation) and ECHO findings including past medical records and coronary angiography (in some). Echocardiography was done using the SIEMENS ACUSON CV70. Operators blinded to the diagnosis of diabetes in the study population performed all echocardiographic measurements. The presence of diastolic and systolic dysfunction, left ventricular hypertrophy and regional wall motion abnormality was looked for.

RESULTS

105 diabetic patients were included in this study, out of which 73 were males and 32 were females. 11 patients belonged to the age-group of 31-40 years, 38 to 41-50 years and 56 belonged to 51-60 years age-group. Systemic hypertension was present in 42 patients and coronary artery disease was present in 40 patients. **Table 1** shows the distribution of diastolic dysfunction in the study population.

Table 1 Distribution of cases with diastolic dysfunction in the total study population

Diastolic dysfunction	Number of patients (n=105)	Percentage (%)
Present	69	65.7
Absent	36	34.3

Diastolic dysfunction was detected in 69 out of 105 patients. In 59 patients out of these 69, hypertension and / or coronary artery disease was present, and in 10 patients diastolic dysfunction was present in absence of either of these. **Table 2** shows distribution of diastolic dysfunction in the study population in absence of hypertension and coronary artery disease.

Table 2 Distribution of cases with diastolic dysfunction in the absence of hypertension and coronary artery disease

Diastolic dysfunction	Number of patients (n=105)	Percentage (%)
With HTN/ CAD/both	59	56
Without any of the above	10	9.5
No Diastolic dysfunction	36	34.5

Out of these 10 patients who had diastolic dysfunction in absence of hypertension and coronary artery disease, majority (6 out of 10) belonged to the age group of 51 to 60 years (**Table 3**).

Table 3 Age-wise distribution of patients with diastolic dysfunction without hypertension and coronary artery disease

Age group	Number (n=10)	Percentage (%)
31-40	0	0
41-50	4	40
51-60	6	60

DISCUSSION

In the present study, out of 105 diabetic patients, 73(69.5%) were males and 32(30.5%) were females. Maximum number of patients was in the age-group 51-60 years (53.4%). 42 patients (40%) were hypertensive, while coronary artery disease was present in 40 patients (38%).

2D- echocardiography was performed on all patients and diastolic dysfunction of grade-1 was present in 69(65.7%). Dikshit NM et al, performed a cross-sectional study in 2013 on 50 asymptomatic diabetics and found diastolic dysfunction in 66% of diabetics.⁶ Patil MB et al performed a cross-sectional hospital based study in 2012 in 50 patients with asymptomatic type 2 diabetes mellitus and found diastolic dysfunction in 64% of study population.⁷ Moreover, studies conducted by Poulsen MK et al which demonstrated that

there exists an association between type 2 diabetes mellitus and heart failure with preserved ejection fraction, the prevalence of abnormal diastolic dysfunction had been reported to be 43-75%.⁸ Poirier et al found left ventricular diastolic dysfunction in 60% of subjects with diabetes mellitus.⁹

In our study, 10 patients out of the study population of 105 cases had evidence of diastolic dysfunction on echocardiography in the absence of hypertension, coronary artery disease and other known cardiac diseases. The incidence of diastolic dysfunction in patients of diabetes mellitus in the absence of hypertension, coronary artery disease and other known cardiac diseases are reported by several other workers. Dandamudi S et al in a cross-sectional study involving diabetic patients, found that 16.9% patients had diastolic dysfunction on echocardiography in the absence of evidence of other cardiac disease.¹⁰ Trachanas K et al reported the prevalence of Diabetic Cardiomyopathy to be 12%.² Dhar R et al in their prospective study on 100 newly diagnosed type 2 diabetes mellitus aged between 30-60 years found that 39% of the patients had developed diabetic cardiomyopathy.¹¹ Chaudhary AK et al conducted a cross-sectional study on 100 newly diagnosed normotensive patients of type 2 diabetes mellitus aged 30-60 years of age and found that diabetic cardiomyopathy was found in 41% of the study population.¹² Thus the prevalence of Diabetic Cardiomyopathy was found to vary in different studies. In our study, the incidence of Diabetic Cardiomyopathy was found to be 9.5%.

In our study, among 10 patients with diastolic dysfunction without CAD and hypertension, majority (60%) patients belonged to the age-group 51-60 years. Londhe A. et al in their study on 200 normotensive type 2 diabetics without cardiovascular involvement, observed that 57.14% patients belonged to the 50-59 years age-group.¹³

CONCLUSION

It is well known that diabetes is capable of producing myocardial dysfunction independent of coronary artery disease, hypertension and other known cardiac disease. This entity has been named as Diabetic Cardiomyopathy, the existence of which has been a subject of controversy.

Several studies have been carried out to find the exact prevalence of this condition among diabetics with variable results. In our study, the incidence of left ventricular diastolic dysfunction in the study population comprising of 105 diabetic patients in absence of hypertension, coronary artery disease or other known cardiac disease was found to be 9.5%. Although small in number, this group of patients falls into the category of Diabetic Cardiomyopathy. However, prospective studies with larger sample sizes are necessary to arrive at a definite conclusion.

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