



Evaluation of Cardiac Status in Asymptomatic Patients With Type 2 Diabetes Mellitus.

KEYWORDS

Type 2 Diabetes mellitus, Ischaemic Heart Disease, Diastolic dysfunction.

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ABSTRACT

Diabetic patients are more prone to develop different types of heart disease. The most important of these are Cardiomyopathy, Ischaemic Heart Disease and, Autonomic neuropathy. This study is done to evaluate the cardiac status in asymptomatic Type 2 Diabetes mellitus patients. This Cross sectional study was conducted in MGM Govt.Hospital Trichy, comprising 100 asymptomatic type 2 Diabetic patients. LV diastolic dysfunction is commonly seen among asymptomatic type 2 diabetes mellitus patients and it can be present even before the onset of symptoms and ECG changes. Its incidence is higher than previously suspected. Usually diastolic dysfunction precedes systolic dysfunction.

INTRODUCTION

Diabetic patients are more prone to develop different types of heart disease. The most important of these are Cardiomyopathy, Ischaemic Heart Disease and Autonomic neuropathy^{1,2}.

Cardiovascular mortality is very high in Diabetic men and women as compared to non Diabetic individuals. The factors favouring coronary artery disease in diabetics are increased platelet aggregation, enhanced coagulation, fibrinolysis and endothelial cell proliferation³. Coronary artery disease is more diffuse and more vessels will show atherosclerotic change in diabetics. After the age of 40 years, diabetes mellitus is intimately associated with Coronary artery disease. Involvement of coronary artery disease in diabetes mellitus is as follows⁴.

Cardiac involvement - 61.3%, Myocardial infarction - 40%

Ischemic heart disease without myocardial infarction -21.3%, RBBB -19.5%, LBBB -2.1%

Cardiomyopathy -17.3%, Arrhythmia-10.7%

Pre – clinical cardiomyopathy⁵ :

Asymptomatic Diabetic men had lower cardiac output during supine exercise than did non – Diabetic control. In 1996, Muralidhar S rao et al did a study of left ventricular function by Doppler echocardiography in 30 adult type 2 diabetes mellitus patients without clinical manifestations of heart disease and found that 17 had demonstrable LV dysfunction without ECG evidence of myocardial infarction or ischemia⁶.

Electro cardiographic abnormalities are commonly observed in patients with diabetes mellitus⁷. Most of these changes are due to associated conditions like hypertension

and coronary artery disease.

1. QRS axis abnormalities
2. Arrhythmias
3. Conduction abnormalities
4. Diffuse ST – T wave abnormalities
5. Silent myocardial infarction

The commonest ECG abnormalities reported were, left axis deviation in 16%, left anterior hemiblock in 5.5%, right bundle branch block (RBBB) with or without left anterior hemiblock in 4.2%.

Echocardiography

Echocardiography is recognized as one of the most important diagnostic modality in Cardiovascular medicine. It is painless, non invasive and less expensive than other sophisticated imaging techniques.

Early stages of diastolic dysfunction is indicated by E/A ratio <1⁸.

AIM

To evaluate the Cardiac status in asymptomatic type 2 Diabetes mellitus patients.

To study the influence of duration of diabetes and glycaemic control on cardiac status of asymptomatic type 2 Diabetes mellitus patients.

METHODOLOGY

This is a cross sectional study, conducted at Mahatma Gandhi Memorial Govt.Hospital attached to K.A.P.Viswanatham Government Medical College, Trichy over one year period from June 2014 to May 2014.

The study comprised a total 100 cases of asymptomatic

type 2 Diabetic patients. Patients with blood pressure < 130/90mm of Hg and normal ECG findings were included in the study.

All the patients with history of type 2 Diabetes mellitus , who are attending MGM GH Trichy are randomly selected for the study group. The study group includes both In-patients and Out patients. Informed written consent was taken from the study subjects and approval from hospital ethical committee was obtained.

Inclusion criteria

1. Selection of patients based on history of Diabetes mellitus , clinical examination and laboratory parameters
2. Asymptomatic patients with minimum 5years of diabetes mellitus

Exclusion criteria

1. Myocardial infarction by history
2. Patients with angina pectoris
3. Patients with Valvular heart disease
4. Overt renal disease
5. Heart failure secondary to any cause
6. Patient with hypertension

Following investigations were done

FBS, PPBS, Blood urea, Serum creatinine, HbA1c, Serum cholesterol

ECG in all 12 leads and Echocardiography.

ALOKA 830 equipment which had the capabilities of performing two dimensional, M mode , pulsed wave and continuous wave Doppler and colour flow imaging was used to obtain Echocardiographic images. All measurement were performed in the freezed images .Good quality images suitable for the measurements and interpretations were obtained and recorded.

The following measurements were made to detect systolic function^{9,10}

1. Fractional shortening
2. Ejection fraction

The following parameters were used to assess diastolic function.

1. Mitral E velocity
2. Mitral A velocity
3. E/A ratio (normal 1-2)
4. Isovolumetric relaxation time (IVRT) (normal 60-100ms)

Pulsed wave Doppler was used to measure the flow velocities , with sample volume placed at leaflet tips.

Table : 1
Normal values of Doppler parameters

Parameters	Normal values
E wave	75 ±12cm/sec
A wave	23±10cm/sec
E/A ratio	1.44±0.4
IVRT	69±12msec

Statistical analysis

Statistical analysis was done by using percentages, mean values, standard deviation , standard error, chi square test.

SPSS version 20 was used to analyse data. The level of significance used was 0.05 . A p value < 0.05 was considered to be statistically significant.

RESULTS

Out of the 100 patients , most of the subjects were between 56-60 years , comprising 21% of the sample size. Mean age of the study group was 46.3years. Males constituted 63% and females constituted 37% of the study group. Male : Female ratio = 1.7:1.

Mean duration of diabetes was 8.7years. The mean HbA1c was 7.85. 40% of the study group had HbA1c more than 8.

Out of the 100 patients studies 53 had diastolic dysfunction (53%). The mean E/A ratio in patients with diastolic dysfunction was 0.77+/- 0.12 as against 1.31+/- 0.25 in patients who had no diastolic dysfunction. There is statistically significant association between E/A ratio and presence of diastolic dysfunction. The mean IVRT of the patients with diastolic dysfunction and those without diastolic dysfunction are 96.06+/- 12.97 and 64.19 +/- 8.30 respectively. There is statistically significant association between IVRT and presence of diastolic dysfunction.

The mean LVEF in the groups were 68.42 and 67.42, both had no statistically significant difference.

Table 2: Correlation of Diastolic dysfunction with AGE

Age in years	Diastolic dysfunction				Total	
	Present		Absent		N	%
	N	%	N	%		
31-35	3	21.4	11	78.6%	14	100.0
36-40	5	33.3	10	66.7	15	100.0
41-45	9	52.9	8	47.1	17	100.0
46-50	10	58.8	7	41.2	17	100.0
51-55	10	62.5	6	37.5	16	100.0
56-60	16	76.2	5	23.8	21	100.0
Total	53	53.0	47	47.0	100	100.0

x² = 13.276 df =5 p=0.021

There is statistically significant association between the age of the patient and incidence of diastolic dysfunction (p value = 0.021)

Table3: Correlation of Diastolic dysfunction with duration of Diabetes

Duration of diabetes in years	Diastolic dysfunction				Total	
	Present		Absent		N	%
	N	%	N	%		
5-6	7	23.3	23	76.7	30	100.0
7-8	13	46.4	15	53.6	28	100.0
>8	33	78.6	9	21.4	42	100.0
Total	53	53.0	47	47.0	100	100.0

x² =22.110 df =2 p<0.001

Out of the 53 patients with diastolic dysfunction,33 patients were having diabetes for more than 8years duration. There is statistically significant relation between the duration of diabetes and diastolic dysfunction.

Table3: Correlation of Diastolic dysfunction with HbA1c level

HbA1c	Diastolic dysfunction				Total	
	Present		Absent			
	N	%	N	%	N	%
<7	8	30.8	18	69.2	26	100.0
7.1-8	19	55.9	15	44.1	34	100.0
>8	26	65.0	14	35.0	40	100.0
Total	53	53.0	47	47.0	100	100.0

$\chi^2 = 7.584$ $df = 2$ $p = 0.023$

Out of the 53 patients with diastolic dysfunction, 26 patients had HbA1c >8, which constitutes 49%. There is statistically significant relation between the HbA1c levels and diastolic dysfunction (p value = 0.023).

DISCUSSION

Left ventricular diastolic dysfunction is the first stage of Diabetic cardiomyopathy. Usually diastolic dysfunction will precede systolic dysfunction. This shows the importance of early echocardiographic examination in individual with diabetes.

Age of the patients

In the present study, the age of the patients ranges from 32 to 60 years and the mean age is 46.13 years and standard deviation is 8.4. Majority of the patients belongs to the fifth decade.

Study	Mean	Sd
Paul Poirie et al ¹¹	48	6
Abdul Khaliq M H et al ¹²	51	6.8
Present study	46.13	8.4

Duration of Diabetes:

The present study had mean duration of 8.7 years and SD 3.3, which is slightly more than the above mentioned studies.

Ejection Fraction :

The present study shows a mean ejection fraction of 68 ± 4.8. This is comparable to that of Paulpoirie et al, Abdul Khaliq MH et al and John K Boyer et al who showed mean Ejection fraction of 65%, 58% and 64% respectively.

Fractional Shortening:

The present study shows a mean of 39.6 ± 5.1.

E/A ratio and IVRT

In the present study, the mean E/A ratio is 1.03 ± 0.33. This is comparable to that of Paulpoirie et al, Abdul Khaliq et al and John Boyer et al who showed a mean ratio of 0.72 ± 0.13, 0.90 ± 0.20 and 0.95 ± 0.29 respectively. In the present study IVRT showed a mean value of 81.1 ± 19.4.

The presence of diastolic dysfunction was correlated with the age of patient. It showed that increasing age had a significant association with the presence of diastolic dysfunction. Out of the 21 patients who had age more than 55 years, 16 had diastolic dysfunction.

Diastolic dysfunction was correlated with the duration of diabetes mellitus. It showed a statistically significant association (p value < 0.001). Out of the 42 patients with duration of diabetes more than 8 years, 33 were found to have diastolic dysfunction.

Diastolic dysfunction was correlated with the HbA1c levels. It showed statistically significant association (p value

= 0.023). Out of the 40 patients with HbA1c >8, 26 had diastolic dysfunction.

E/A ratio was correlated with diastolic dysfunction and found to have statistically significant association between E/A ratio and diastolic dysfunction. In the present study all the patients were found to have normal LVEF and LVFS.

CONCLUSION

1. LV diastolic dysfunction is commonly seen among asymptomatic type 2 diabetes mellitus patients
2. E/A ratio < 1 is a sensitive and specific indicator of early diastolic dysfunction
3. LV diastolic dysfunction is a marker of evolving heart disease among diabetics.
4. LV diastolic dysfunction can occur without any evidence of coronary heart disease in type 2 Diabetic mellitus patients.
5. HbA1c and duration of diabetes was significantly associated with the incidence of diastolic dysfunction.
6. In the present study, diastolic dysfunction was more common in patients with duration of diabetes more than 8 yrs; It doesn't mean that glycemic control is not needed in the initial years. A good metabolic control in the initial years is needed to prevent further development of diastolic dysfunction in the further years.

Limitation of the study

Conventional Doppler had limitation in the diagnosis of diastolic dysfunction in the setting of elevated end diastolic pressure and apparently normal Trans mitral flow velocity.

The study group was not compared with age and sex matched control group.

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