

Prevalence of diastolic dysfunction in Normotensive diabetics below 45 years of age

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Introduction: Dengue rarely affects the heart but clinical symptoms of cardiac involvement may range greatly from silent illness to severe myocarditis resulting in death. Clinical features are asymptomatic and most are transient among patients with DF/DHF. **Material and methods:** It was an observational study conducted at the Department of General Medicine, Peoples College of Medical Sciences and Research Centre, Bhopal. The total duration of the study was One and a half years from November 2016 to APR 2018. All normotensive diabetic patients less than 45 years of age presenting to the Department of General Medicine, Peoples College of Medical Sciences and Research Centre, Bhopal during one and half years from which data was collected using as per given proforma. **Results:** In the present study, It was found that significant Pearson's correlation between age of diabetics and diastolic changes in ECHO, and serum creatinine and diastolic changes in ECHO. The rest of the parameters like blood urea, blood pressure, RBS, FBS, PPBS, and duration of diabetes were not significantly correlated. **Conclusion:** It was concluded that in the present study, diabetes mellitus is itself a risk factor for developing diastolic dysfunction though its prevalence increases with increasing age, serum creatinine and there is no association found between duration of diabetes and diastolic dysfunction. So screening of every young normotensive diabetic for diastolic dysfunction should be done to prevent early cardiovascular disease.

Keywords: Diabetes, Normotensive, Diastolic dysfunction, ECHO

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Introduction

Epidemiological data indicate a greater risk of cardiovascular morbidity and mortality, particularly congestive heart failure, in diabetic subjects compared with nondiabetic subjects [1]. Clinical, epidemiological, and pathological studies attribute the increased occurrence of clinical congestive heart failure in diabetic subjects to diabetic cardiomyopathy, which could take the form of diastolic and/or systolic left ventricular dysfunction [2,3]. Left ventricular diastolic dysfunction (LVDD) may represent the first stage of diabetic cardiomyopathy [3], reinforcing the importance of early examination of diastolic ventricular function in individuals with diabetes.

Several hypotheses proposed for the advancement of diabetic cardiomyopathy including micro and macrovascular disease, autonomic dysfunction, metabolic abnormalities, interstitial fibrosis leading to myocardial hypertrophy, and diastolic dysfunction. The association between diastolic dysfunction and hyperglycemia is still a matter of debate. Diastolic dysfunction has been explained as a premature sign of diabetic heart disease evident before systolic damage. It is also responsible for early heart failure with maintained ejection fraction. The pathogenesis behind diastolic dysfunction remains unknown and numerous studies have been proposed but with uncertainty and still have been controversial.

There are a few studies that are conducted in India that show the coexistence of diastolic dysfunction and diabetes. But previous studies show an increased incidence of diastolic dysfunction in diabetics. It is approximately two times as common in men and five times common in women suffering from diabetes. So the purpose of the present study is to detect the exact frequency of diastolic dysfunction in asymptomatic young diabetics and to use an echocardiogram as an early detector of diastolic dysfunction. So preventive and interventional measures can be targeted to prevent both diastolic dysfunction and early stages of heart failure.

Material and Methods

Study Design: Observational study

Duration of Study: One and a half years. (November 2016 to April 2018)

Place of Study: The study was conducted at the Department of General Medicine, Peoples College of Medical Sciences and Research Centre, Bhopal.

Source of Data: All the cases with Diabetes below 45 years of age attending OPD/IPD in the Department of General Medicine, PCMS, and RC Bhopal during the above said period of one and half years.

Sample Size: All cases with Diabetes below 45 years of age presenting to People's Hospital during one and half years from which data was collected using as per given proforma.

Inclusion Criteria

Diabetes patients which include

- Newly diagnosed DM with normal sinus rhythm.
- K/C/O diabetes mellitus with normal sinus rhythm.
- AGE- <45Years

Exclusion Criteria

- Patients with known Coronary artery disease
- Patients with Chronic obstructive pulmonary disorder, severe anemia.
- Patients taking medications that can cause cardiac dysfunction like lithium, oral contraceptive pills.
- Patient with arrhythmia like AF.

Data Collection Procedure

Patients who had given written informed consent been are enrolled after reading the consent in the local language. All patients of diabetes coming to OPD/IPD were investigated for routine blood investigations like complete hemogram, renal function tests, liver function test, chest radiography, and ultrasonogram of the abdomen. Electrocardiography and Echocardiography for cardiac involvement were done by an ECG machine and 2d and Color Doppler echo machine (siemens acuson x300).

Diagnosis of diabetes mellitus

"Fasting blood sugar (FBS) \geq 126 mg/dL (7.0 mmol/L) or 2-h blood sugar \geq 200 mg/dL (11.1 mmol/L) during an oral glucose tolerance test (OGTT) or HbA1c \geq 6.5% or Classic diabetes symptoms + random plasma glucose \geq 200 mg/dL (11.1 mmol/L)" [4].

Data Management and Statistical analysis: Microsoft Excel® 2010 was used for the compilation of data while MedCal® (version 19.0.5) software was used for statistical treatment. Full patient information was included and maintained during the entire study period. The supervisor monitored the completeness and quality of the gathered data periodically.

Results

Table-1: Distribution of the patients according to age.

Age group in years	Frequency	Percentage (%)
0-15	18	36.0
15-30	14	28.0
30-45	18	36.0
Total	50	100.0

In the present study, out of a total of 50 subjects 17 (34%) were females and 33 (66%) were males. 18 (34%) subjects were in the 0-15 years age group, 14 (28%) subjects were in the 15-30 years age group and 18 (34%) subjects were in the 15-45 years age group.

Table 4: Correlation of ECHO with different parameters

	Association	Age	Urea	Serum Creatinine	Diastolic BP	Systolic BP	RBS	FBS	PPBS	Duration
ECHO	Pearson Correlation	.296	.249	.336	.134	.228	.083	.249	.084	5.507
	P value/ Sig. (2-tailed)	.037*	.081	.017*	.353	.111	.567	.081	.563	.239

In the present study, it was found significant Pearson’s correlation between the age of diabetics and diastolic changes in ECHO, and serum creatinine and diastolic changes in ECHO. The rest of the parameters like blood urea, blood pressure, RBS, FBS, PPBS, and duration of diabetes were not significantly correlated.

Discussion

This observational study was based on echocardiographic findings to detect the prevalence of diastolic dysfunction in 50 diabetic patients under 45 yrs of age with normal blood pressure and with no preceding history of cardiac disease. In the present study, various parameters of age, sex, FBS, PPBS, RBS, Systolic, and diastolic blood pressure, and Serum creatinine were taken. Out of 50 patients, 26 patients had grade 1 diastolic dysfunction and 4 patients had grade two diastolic function.

Table-2: Distribution of the patients according to ECHO findings.

ECHO	Frequency	Percentage (%)
Grade 1 Diastolic Dysfunction	26	52.0
Grade 2 Diastolic Dysfunction	4	8.0
Normal function	20	40.0
Total	50	100.0

In the present study, out of a total of 50 patients, 26(52%) had grade 1 diastolic dysfunction and 4 (8%) had grade 2 diastolic dysfunction.

Table-3: Mean and standard deviation of all parameters.

Parameter	Mean	Std. Deviation
FBS	197.4160	60.05881
PPBS	286.0912	88.66274
RBS	278.3400	75.72092
Urea	24.6752	8.68515
Serum Creatinine	.6596	.26262
Systolic BP	116.0000	9.03508
Diastolic BP	75.0000	6.14452

Mean and standard deviation of different parameters like FBS, PPBS, RBS, Urea, Serum creatinine, Systolic BP, and Diastolic BP.

In the present study, it was found a positive correlation between age of the subjects and diastolic dysfunction with a p-value of 0.037 which is significant and suggests an association of diastolic dysfunction with increasing age as corroborated by Ashour Kamil [5] in his study “early detection of diastolic dysfunction in diabetics patients single-center cross-sectional study” which shows diastolic dysfunction is significantly higher in patients with age>45years as compared to age<45years. (p value<0.05). Diastolic dysfunction is compared with FBS levels; it shows that with a p-value of 0.081 which shows the insignificant association of raised FBS and diastolic dysfunction. In a study conducted by Assi Milwidsky et al [6]. LVDD was diagnosed in 19% of subjects and it was more prevalent among patients with IFG and DM than in euglycemic individuals, concluding that IFG is independently associated with a significant increase in the likelihood for the presence of LVDD in middle-aged adults.

Diastolic dysfunction was compared with PPBS level, in the present study, subjects had no diastolic dysfunction. With a p-value of 0.554 which is insignificant suggest that there is no important variation when compare with PPBS level, but the study "Prevalence of asymptomatic LV diastolic dysfunction in type 2 diabetic patients and healthy controls" by G Suresh et al [7] suggested that diastolic dysfunction is more prevalent in patients PPBS level >199mg/dl. In the present study, there was no significant correlation between RBS and diastolic dysfunction with a p-value of 0.554 there, but Virendra C Patil et al concluded that diastolic dysfunction is associated with high HbA1c and sugars level [8].

In the present study, there was a significant correlation between serum creatinine and diastolic dysfunction with a p-value of 0.014 which is significant suggesting an association between raised serum creatinine and diastolic dysfunction as denoted by Jennifer E Liu MD et al [9] in their study "association of albuminuria with systolic and diastolic dysfunction in type two diabetes" suggest that microalbuminuria and nephropathy are independent risk factors for the development of diastolic dysfunction in diabetics (p-value 0.001).

In the present study, there was no significant correlation between systolic and diastolic blood pressure and diastolic dysfunction but a study conducted by Felicio JS et al [10] on hyperglycemia and nocturnal systolic blood pressure are associated with left ventricular hypertrophy and diastolic dysfunction in diabetic patients. Study shows that higher NSBP levels are associated with a high incidence of LVH and diastolic dysfunction in patients of type 2 DM (p value <0.5). Another study conducted by Casare Russo et al [11], in their study suggests that high blood pressure diabetes are independent risk factors for LV diastolic dysfunction p-value <0.05.

In the present study, there was no significant correlation between duration of diabetes and diastolic dysfunction with a p-value of 0.239 which is insignificant. However in a study conducted by Aaron M MD et al [12], there was a significant association between the E/e' ratio and the time from diabetes diagnosis to echocardiogram using simple linear regression; for every 1 year after the onset of diabetes, the E/e' increased by 0.23 (p value=0.007) after adjustment for age, gender, body mass index, prior coronary disease, prior hypertension and ejection fraction,

Moreover, duration of diabetes ≥ 4 years was independently associated with LV diastolic dysfunction ($E/e' > 15$) in multivariable logistic regression modeling after adjustment for age, gender, body mass index, prior coronary disease, prior hypertension and ejection fraction (p value=0.007).

Conclusion

It was concluded that in the present study, diabetes mellitus is itself a risk factor for developing diastolic dysfunction though its prevalence increases with increasing age, serum creatinine and there is no association found between duration of diabetes and diastolic dysfunction. So screening of every young normotensive diabetic for diastolic dysfunction should be done to prevent early cardiovascular disease.

What does the study add to the existing knowledge?

A positive correlation is found between diastolic dysfunction and normotensive diabetics below 45 years of age but there is no significant association between duration of diabetes and diastolic dysfunction.

Author's contribution

Dr. Nitesh Sukhwani: Concept, study design

Dr. Mohit Jain: Manuscript writing

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