

PREVALENCE OF DIASTOLIC DYSFUNCTION IN PATIENTS WITH TYPE 2 DIABETES MELLITUS.

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Abstract

Introduction: The incidence of diabetes mellitus has increased significantly and cardiovascular disease is the commonest cause of mortality in these patients. **Objective:** To determine prevalence of Diastolic dysfunction and its different sub types in Type 2 diabetic patients. **Design:** Descriptive cross-sectional study. **Place and Duration:** Town teaching hospital Gandhara university Peshawar since 1st October 2016 till 30 September 2017. **Methodology:** Adult male and female age 20 to 80 years age already diagnosed with Type 2 Diabetes mellitus and referred for echocardiography with symptoms of shortness of breath were analyzed for evaluation of diastolic dysfunction and its sub types with the help of pulse and tissue Doppler technique. **Result:** Total 56.31% patients with Type 2 diabetes were diagnosed with diastolic dysfunction Females were more affected than males. Age ranges between 60 -80 years was more common. **Conclusion:** Diastolic dysfunction is more frequent in Type 2 diabetic patients and each patient with Type 2 diabetes should be screened for Diastolic dysfunction

Key Words: Type 2 diabetes mellitus , Diastolic dysfunction , Pulse wave Doppler, Tissue Doppler

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Introduction

The incidence of diabetes mellitus has increased significantly and cardiovascular disease is the commonest cause of mortality in these patients. Two out of three patients suffering from diabetes nearly die of cardiovascular diseases Number of diabetic patients worldwide was 150 million in 2000, that is expected to rise to 300 million in 2025^{1,2}. Diabetic patients may suffer diastolic dysfunction in the early stages and later on develop systolic dysfunction. Diabetics also develop pre-clinical diastolic dysfunction in many patients³ and this pre-clinical diastolic dysfunction is reversible⁴. The pathological process of beat disfunction in diabetic patients is unknown. vital mechanisms could also be the involvement of metabolic abnormalities like inflated free fatty acids, carnitine deficiency ,changes in atomic number 20 physiological condition , will increase in angiotensin II and IGF-I, inflammatory cytokines inflicting cardiac muscle thickening, microangiopathy, impaired coronary flow reserve (CFR), epithelial tissue disfunction ,autonomic pathology and hypoglycemic agent resistance^{5,6}.

Beat disfunction whilenot heartbeat disfunction causes heart disease in regarding five hundredth of patients⁷.The prevalence of beat disfunction in kind a pair of diabetic patients in Pakistani population isn't clearly celebrated therefore this

study is conducted to own an area study on kind a pair of diabetic patients applying updated echocardiographic criteria of beat disfunction.

Materials & Methods

After getting ethical review committee approval, this descriptive cross-sectional study was conducted at Town teaching hospital Gandhara university Peshawar echocardiography department. After taking informed consent, about 190 patients with Type 2 diabetes between 20 to 80 years of age were included in the study. Tissue Doppler and Pulse wave Doppler were used to diagnose diastolic dysfunction and already diagnosed patients of type 2 diabetes mellitus referred for echocardiography were included in the study. This study was conducted for one year started from 1st October 2016 to 30th September 2017. Inclusion criteria was patients with established diagnosis of type 2 DM referred for echocardiography , patients with normal left ventricular systolic function (LVEF: $\geq 50\%$) and $E/e' > 15$. In order to reduce the biasness in our study findings strict exclusion criteria was adopted such as patients with evidence of pre-existing coronary artery disease (history of angina ,chest pain, indicative findings on ECG ,ETT or echocardiography), patients with evidence of valvular heart disease, hypertrophic cardiomyopathy (HCM), restrictive cardiomyopathy (RCM), patients with atrial fibrillation (AF) and other arrhythmias, patients

presenting with New York Heart Association (NYHA) class IV dyspnea and patients with poor transthoracic echocardiography window were excluded

All patients underwent resting transthoracic diagnostic procedure and Doppler imaging to gauge left bodily cavity beat operate. Echo cardiographer wasn't alert to this study to avoid biasness within the interpretation. A transthoracic sonogram (TTE) with periodic {doppler|Doppler|Christian Johann Doppler|physicist} and Tissue Doppler Imaging (TDI) was performed. diagnostic procedure was performed by harmonic imaging mode by Sonos 5500 diagnostic procedure machine (3-4 rate multi-frequency probe) per the quality protocol. Pulsed-wave Doppler (PWD)-derived transmitral influx velocities were obtained within the top 4-chamber read. Measurements enclosed the transmitral early beat speedy filling (E-wave) and chamber contraction late filling (A-wave) velocities were created to calculate E/A magnitude relation. For tissue Doppler imaging, the mitral annulus speed was obtained at the lateral aspect and septate aspect of the mitral annulus. beat disfunction was classified per the rules. Left bodily cavity ejection fraction (systolic function) was calculated by changed Simpson's methodology and LVEF \geq five hundredth was thought of as traditional. All echocardiographic measurements were averaged

over 3 consecutive viscus cycles measured by one investigator unsighted to any or all alternative variables. Diastolic disfunction was classified as Grade I (impaired relaxation) once E wave speed was reduced leading to E/A reversal (ratio < one.0), Grade II (pseudo traditional) once E/A magnitude relation was normal (0.8 +- 1.5) whereas é /á magnitude relation was reversed and E/A magnitude relation was reduced to < one with Valsalva , Grade III (reversible restrictive) once E/A magnitude relation > a pair of.0 and E/A magnitude relation changes to < one.0 with Valsalva and Grade IV (fixed restrictive) once E/A magnitude relation is > a pair of.0 not alert to Valsalva the foremost distinction characteristic grade III from grade IV beat disfunction was the shortage of E/A reversal with the Valsalva maneuver Collected data was obtained on a predefined structural proforma and was analyzed by SPSS Statistics .P value was based on Chi square test

Results

About 190 patients with diabetes type 2 were included according to criteria, 56.3% (107) patients were females, and 46.8% (89) patients were in 60 to 80 years of age bracket. Diastolic dysfunction was observed in 107 (56.3%) patients. Demographic characteristics of patients with type 2 diabetes are shown in Table 1.

Table 1: Demographic characteristics of the patients with diabetes type 2 and diastolic dysfunction

Characteristics	Frequency	Percentage
Age groups		
20-40 years	35	18.4%
40-60 years	66	34.7%
60-80 years	89	46.8%
Gender		
Male	83	43.7%
Female	107	56.3%
Grades of diastolic dysfunction		
Normal	83	43.7%
Grade I	88	46.3%
Grade II	15	7.9%
Grade III	3	1.6%
Grade IV	1	0.5%

Demographic characteristics of patients with diastolic dysfunction are presented in Table 2. Females patients were more common among diabetic patients with diastolic dysfunction, 62.6% (67/107) vs. 48.2% (40/83); p-value =0.047.

Table 2: Demographic characteristics of patients with Diastolic dysfunction

Characteristics	Normal function [N=83]		Diastolic dysfunction [N=107]		*P-value
	Frequency	Percentage	Frequency	Percentage	
Age groups					
20-40 years	15	18.1%	20	18.7%	0.947
40-60 years	28	33.7%	38	35.5%	
60-80 years	40	48.2%	49	45.8%	
Gender					
Male	43	51.8%	40	37.4%	0.047
Female	40	48.2%	67	62.6%	

*p-values are based on Chi-square test

Distribution of patients in different grades of diastolic dysfunction is presented in Table 3. Female patients were found to have more advanced grades of diastolic dysfunction as compared to male patients ($p < 0.001$).

Table 3: Distribution of patients in different grades of diastolic dysfunction

Characteristics	Male [N = 83]		Female [N = 107]		*P-value
	Frequency	Percentage	Frequency	Percentage	
Normal	43	51.8%	40	37.4%	<0.001
Grade I	32	38.6%	56	52.3%	
Grade II	6	7.2%	9	8.4%	
Grade III	1	1.2%	2	1.9%	
Grade IV	1	1.2%	0	0.0%	

*p-values are based on Chi-square test

Discussion:

Patients with Diabetes mellitus are usually accompanied by shortness of breath which may vary from severe shortness of breath with NYHA class 4 to NYHA class 1. Detailed history and examination of these patients reveal no ischemia or hypertensive heart disease but echocardiographic evaluation reveals diastolic dysfunction in many patients. Approximately 50% of the heart failure population has a normal left ventricular ejection fraction, and diastolic dysfunction is responsible for heart failure signs and symptoms in these patients⁷. So it is pertinent to examine each patient thoroughly and do echocardiographic evaluation to determine basic path physiological mechanism before embarking on treatment in each heart failure patient. Prevalence of diastolic dysfunction is 27.3% in general population⁸ which shows the importance of evaluation for diastolic dysfunction even in normal subject

The main objective of our study was to determine frequency of diastolic dysfunction in Type 2 Diabetics patients in Pakistani population which is 56.3% in our study which is almost similar to other studies on prevalence of diastolic dysfunction in Type 2 diabetes^{9,10}.

An important point of our study is that females were affected more than males which is consistent with a study on Pakistani population by Baloch Dad M et al.¹¹

Another important finding in our study was that as the age increases, prevalence of diastolic dysfunction increases which is consistent with a study on Pakistani population by Baloch Dad M et al. 11 and also in a study in Indian population by Patil et al.¹²

According to guidelines Diastolic dysfunction is categorized into 4 Types. In our study Type 1 Diastolic dysfunction was commonest followed by Type 2, 3 and 4

A limitation of our study was that so many patients were excluded based on our inclusion and exclusion criteria because this study was conducted in a very poor populated area of Peshawar where most of the patients were unable to afford costly invasive procedure for determination of LVEDP and some noninvasive

tests like BNP and NT pro BNP, HBA1c, lipid profile so patients with clear cut criteria for diastolic dysfunction with E/e' ratio of more than 15 were included and a gray zone with E/e' ratio >8 and <15 were excluded

Another limitation of our study was that as our study was echo department study and patients were referred by our consultants for echocardiography with short bio data, symptom of shortness of breath and BP so some other clinical features and details of management not included in the study

Conclusion

Diabetes Type 2 is not only accompanied by systolic dysfunction but diastolic dysfunction is also common in Type 2 Diabetics patients it was found in about 56.3% in our study. Females are affected more than males by diastolic dysfunction. As long as Age increases prevalence of diastolic dysfunction increases Type 1 diastolic dysfunction is the commonest one followed by type 2.

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