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Research Article

**LEFT VENTRICULAR DIASTOLIC DYSFUNCTION IN  
ASYMPTOMATIC TYPE II DIABETES MELLITUS  
PATIENTS PRESENTED TO D.H.Q TEACHING HOSPITAL  
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Teaching Hospital Dera Ismail Khan,**Article Received:** January 2020 **Accepted:** February 2020 **Published:** March 2020**Abstract:**

**Aim & Background:** Diabetes mellitus is a growing disease all over the world. Left untreated it can lead to serious health problems. The aim of the study is to determine the frequency of left ventricular diastolic dysfunction in asymptomatic type II diabetes mellitus patients in D.H.Q teaching hospital Dera Ismail Khan Pakistan.

**Methodology:** This descriptive cross-sectional study was conducted in cardiology department D.H.Q teaching hospital Dera Ismail Khan Pakistan. The study population was stratified according to hospital departments and 200 patients fulfilling the inclusion/exclusion criteria were included in the study. Data was analyzed through SPSS version 20.

**Results:** Among 200 participants Frequency of diastolic dysfunction was 116(58%) in the study population while 84(42%) have no diastolic dysfunction. Diastolic dysfunction rate was high in patients with longer duration of DM.

**Conclusion:** Left ventricular diastolic dysfunction rate is higher among asymptomatic type II diabetes mellitus patients. Routinely echocardiography should be performed in asymptomatic DM patients to assess left ventricular function.

**Key Words:** Type II DM, diastolic dysfunction, heart failure.

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**INTRODUCTION:**

Diabetes mellitus is a growing disease all over the world. In developing countries, the increase in incidence of diabetes mellitus is 170% as compared to 47% in developed countries. In Pakistan prevalence of diabetes is high 13.14%<sup>15</sup>. Diabetes mellitus is a risk factor in the development of heart failure<sup>9</sup>. When it comes to function of the heart systolic function of left ventricle affected later than diastolic function in asymptomatic type II DM,<sup>2</sup> long term complication is diabetic cardiomyopathy. While discussing the causes of heart failure in DM most commonly it is due to coronary artery disease and if there is no coronary artery disease or hypertension to explain cardiac muscle abnormality then diabetic cardiomyopathy is the cause<sup>9</sup>. Left ventricular diastolic dysfunction is affected earlier than systolic dysfunction in the development of congestive heart failure. According to Greenberg B diastolic dysfunction is an independent predictor in determining risk of HF, for every unit increase in E/e > 15 there risk for HF increases 3%<sup>3</sup>. Asymptomatic diastolic dysfunction has more prevalence than symptomatic HF. At presentation the symptoms of diastolic dysfunction are difficult to be distinguished from that of systolic dysfunction<sup>7</sup>. Common symptoms include edema, exercise intolerance, orthopnea, and paroxysmal nocturnal dyspnea<sup>6</sup>. In these patients left ventricular end diastolic volume (LVEDV) does not increase on exertion because the chamber stiffness in these patients of diastolic dysfunction, as a result stroke volume decreases, that's why the early symptom to present with oftenly is exercise intolerance<sup>4</sup>. Left ventricular diastolic dysfunction can be assessed by using Doppler echocardiography. Patients with DM but asymptomatic and preserved left ventricular ejection fraction (LVEF) may have diastolic dysfunction as assessed with echocardiography<sup>5</sup>. It is best to do echocardiography routinely in asymptomatic DM patients as it is a simple non-invasive tool and yield much about diastolic dysfunction<sup>6</sup>.

In a study it is stated that diastolic dysfunction is present in 64% of the patients with DM<sup>7</sup>. Another study stated that there is a significant association between diastolic dysfunction and DM, in this study the frequency of diastolic dysfunction was 54.33 % in DM patients<sup>8</sup>.

The aim of our study is to determine the frequency of asymptomatic diastolic dysfunction in type II diabetes mellitus patients with normal systolic function presenting to cardiology department D.H.Q DIK Pakistan.

It is reported that there is high frequency of diastolic dysfunction among DM patients, but in

clinical practice physician do not advise echocardiography as a screening test for cardiac evaluation of diabetic patients. In Pakistan no such study is available for evaluation of diastolic dysfunction in diabetics which results in underdiagnosed and undertreated patients. The result of this study may help in identifying the burden of disease in diabetic patients and to establish local guidelines.

**MATERIALS AND METHODS:**

A criteria was made, in this criteria patient with type II DM (defined as fasting blood glucose greater than or equal to 126mg/dl or on anti-diabetic drugs) between the age 40 and 55 years of both genders, presenting with normal left ventricular systolic function on echocardiography, were included in the study.

Patients with hypertension( BP greater than 140/90 or on antihypertensive medication), chronic renal failure(serum creatinine > 1.2 or blood urea >50 mg/dl), patients with evidence of chronic liver disease(alanine aminotransferase > 40 iu/l, aspartate aminotransferase > 40 iu/l), cardiomyopathy (EF < 50%), CAD (excluded by history of angina, chestpain, electrocardiogram changes) and patients with evidence of valvular heart disease were excluded from study. A total of 200 patients participated.an informed consent was taken from the patients.

All the patients underwent resting transthoracic 2-dimensional echocardiography (TTE) and Doppler imaging to assess left ventricular diastolic dysfunction. A TTE with pulsed waved Doppler evaluation of transmitral inflow and Tissue Doppler Imaging (TDI) were performed to minimize the errors in assessing diastolic dysfunction. Echocardiography was performed in harmonic imaging mode by vivid 7 pro machine according to standard protocol. Pulsed wave (PW) Doppler derived transmitral inflow velocities were obtained in the apical 4-chamber view, with the sample volume placed at the tip of mitral valve leaflets. Measurements included the early diastolic rapid filling(E-wave) and atrial contraction late filling(A-wave) velocities ratio (E/A ratio), isovolumetric relaxation time (IVRT) and deceleration time (DT) were noted. For TDI, the mitral annulus velocity was obtained with a 2mm sample volume placed at the lateral side and septal side of the mitral annulus. Diastolic dysfunction was labeled according to AHA diastolic dysfunction guidelines published in 2009 in journal of American society of echocardiography. It states that diastolic dysfunction is present when early diastolic rapid filling(E-wave) and atrial contraction late filling(A-wave) velocities ratio (E/A ratio) <1 or >2.

Stage 2(pseudo-normal) is differentiated from normal by E/e ratio<8(normal) and >10(pseudo-normal). Deceleration time (DT) <150 or >250ms. Isovolumetric relaxation time (IVRT) <60 or >100ms, and ejection fraction >50%. LVEF (systolic function) was calculated by modified simpson's method; and LVEF greater than or equal to 50% was considered as normal.

#### Data Analysis

The data was analyzed by using SPSS version20. Quantitative variables like age were presented as mean plus minus SD. Qualitative variables like gender and diastolic dysfunction are presented in form of frequency and percentages. Data is stratified for duration of DM.

#### RESULTS:

200 patients fulfilling the inclusion/exclusion criteria were included in the study to determine the frequency of asymptomatic diastolic dysfunction with normal LV systolic function.

Gender distribution of the patients was done which showed that 110(55%) were male and 90(45%) were female.

Age distribution of the patients was done which showed that 31(15.50%) were between 40-45

years, 63(31.50%) were between 46-40 and 106(53%) were between 51-55 years of age, mean age of the study population was  $49.84 \pm 4.2$  years. Frequency of diastolic dysfunction was 116(58%) in the study population while 84(42%) have no diastolic dysfunction.

In our study population 63%(n= 126) patients had duration of DM between 4-9 years and 37%(N=74) had between 10-14 years. There were 84 smokers.

Stratification for gender was done, out of 116 cases of diastolic dysfunction, 64 were male while 52 were females, for which p value was 0.92.

Stratification for age was done, out of 116 cases of diastolic dysfunction, 14 were between 40-45 years of age, 33 were between 46-50 years of age, 33 were between 46-50 years of age and 69 were between 51-55 years of age.

Stratification for duration of DM was done, out of 116 cases of diastolic dysfunction, 58 had duration of DM between 4-9 years and 58 had duration of DM between 10-14 years.

Stratification for smoker was done, out of 116 cases of diastolic dysfunction 63 were smokers and 53 were non-smoker, p value was 0.001.

**TABLE NO 1: Distribution of diastolic dysfunction by gender.**

	Dysfunction		Total	P-value
	YES	NO		
Male	64 (58.2%)	46 (41.8%)	110 (100.0%)	0.954
Female	52 (57.8%)	38 (42.2%)	90 (100.0%)	
Total	116 (58.0%)	84 (42.0%)	200 (100.0%)	

**TABLE NO 2: Distribution for frequency of diastolic dysfunction with regard to age.**

AGE ( in years)	Dysfunction		Total
	Yes	No	
40-45	14 (45.2%)	17 (54.8%)	31 (100%)
46-50	33 (52.4%)	30 (47.6%)	63 (100%)
51-55	69 (65.1%)	37(34.9%)	106 (100%)
Total	116(58%)	84(42%)	200 (100%)

**TABLE NO 3: Distribution for frequency of diastolic dysfunction with regard duration of DM**

Duration of DM ( in years)	Dysfunction		Total
	Yes	No	
4-9	58 (46%)	68 (54%)	126 (100%)
10-14	58 (78.4%)	16 (21.6%)	74 (100%)
Total	116 (58%)	84 (42%)	200 (100%)

**TABLE NO 4: Distribution for frequency of diastolic dysfunction with regard to smoker**

	Dysfunction		Total
	Yes	No	
Smoker	63 (75.0%)	21 (25.0%)	84
Non smoker	53 (45.7%)	63 (54.3%)	116
Total	116 (58%)	84 (42%)	200

**TABLE NO 5: Distribution for frequency of diastolic dysfunction with regard to BMI**

	Dysfunction		Total
	Yes	No	
BMI $\leq$ 30	73 (62.9%)	64 (76.2%)	137 (68.5%)
BMI > 30	43 (37.1%)	20 (23.8%)	63 (31.5%)
Total	116 (100%)	84 (100%)	200 (100%)

**TABLE NO 6: Patients characteristics with respect to distribution of diastolic dysfunction**

Variables		Diastolic dysfunction	
		Yes	No
		116 (58%)	84 (42%)
Gender	Male	64 (58.2%)	46 (41.8%)
	Female	52 (57.8%)	38 (42.2%)
Age	40-45 years	14 (45.2%)	17 (54.8%)
	46-50 years	33 (52.4%)	30 (47.6%)
	51-55 years	69 (65.1%)	37 (34.9%)
Diabetes duration	4-9 years	58 (46%)	68 (54%)
	10-14 years	58 (78.4%)	16 (21.6%)
BMI	$\leq$ 30	73 (62.9%)	64 (76.2%)
	> 30	43 (3.1%)	20 (23.8%)
Smoker		63 (75%)	21(25%)

**DISCUSSION:**

Cardiovascular disease (CVD) currently accounts for nearly half of the noncommunicable diseases (NCDs). NCDs have overtaken communicable diseases as the world's major disease burden, with CVD remaining the leading global cause of death, accounting for 17.3 million deaths per year, a number that is expected to grow to > 23.6 million by 2030<sup>8</sup>.

It is stated that diastolic heart failure is a clinical syndrome in which patients have symptoms and signs of HF, normal or near normal left ventricular (LV) ejection fraction (EF), normal or near normal LV volume and evidence of diastolic dysfunction (e.g., abnormal pattern of LV filling and elevated filling pressures. The prevalence of heart failure with preserved ejection fraction (HF-PEF) and diastolic heart failure increases with age<sup>9</sup>.

We did this study on patients with type II DM to see the frequency of asymptomatic diastolic dysfunction with normal left ventricular systolic function and to help us find high risk patients who need early intervention & more aggressive treatment thus reducing the morbidity and mortality.

In our study, 15.50% (n=31) patients were between 40-45 years, 31.50% (n=63) were between 46-50 years and 53% (n=106) were between 51-55 years of age, mean age of our study population was calculated as 49.84±4.2 years, 55% (n=110) were male and 45% (n=90) were females.

Diastolic dysfunction is the most prominent characteristic of diabetic cardiomyopathy. The Framingham study firmly established the epidemiologic link between diabetes and heart failure<sup>10</sup>. Frequency of diastolic dysfunction was recorded in 58% (n=116) while 42% (n=84) had no diastolic dysfunction.

We found agreement of our findings with a study done by Virendra C. Patil et al the diastolic dysfunction was 54.33% and had a higher prevalence of diastolic dysfunction in patients with longer duration of diabetes mellitus<sup>8</sup>. Further study by Poirier P et al found 60% diastolic dysfunction in patients<sup>12</sup>, which is higher than our study. Another study of Patil MB et al reported higher diastolic dysfunction in patients of diabetes mellitus as 64%<sup>7</sup>, showed dissimilar results probably due to small sample size. It is well observed that asymptomatic diastolic heart failure. Our results showed that the trend toward diastolic dysfunction was found to be higher in 51-55 age groups as 65.1%. The prevalence and severity of diastolic dysfunction increases with age and the development or worsening of diastolic dysfunction

is associated with an increase risk of HF<sup>11</sup>. Unfortunately, limited studies has been carried out in Pakistan. Our study is the first of its kind in Pakistan to evaluate the frequency of asymptomatic diastolic dysfunction in type II diabetic patients. Our study showed higher prevalence of asymptomatic diastolic dysfunction in type II diabetes mellitus. This study guided us that patients having asymptomatic diabetes mellitus should undergo echocardiography for diastolic dysfunction evaluation, should be treated for diastolic dysfunction to reduce morbidity and mortality associated with diastolic dysfunction causing diabetic cardiomyopathy.

**CONCLUSION:**

Overall prevalence of diastolic dysfunction is high in type 2 diabetic patients. Diastolic dysfunction is more prevalent in patients who had prolonged duration of diabetes mellitus. The early diagnosis and treatment for diastolic dysfunction must be instituted to reduce morbidity and improve the outcome of diastolic heart failure.

**CONFLICT OF INTEREST**

The Authors declare that they have no conflict of interests.

**REFERENCES:**

1. Raj RA, Kothari YK, Kenchappa K, Raju N, Girdhar R. STUDY OF DIASTOLIC DYSFUNCTION IN YOUNG (< 40 YEARS) NEWLY DETECTED DIABETES AND ITS CORRELATION WITH OBESITY, GLYCAEMIC LEVELS AND DYSLIPIDAEMIA. JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES-JEMDS. 2018 Jan 13;7(3):342-5.
2. PMC, Europe. *Europe PMC*, www.europepmc.org/.
3. www.uptodate.com
4. Laslett LJ, Alagona P, Clark BA, Drozda JP, Saldivar F, Wilson SR, Poe C, Hart M. The worldwide environment of cardiovascular disease: prevalence, diagnosis, therapy, and policy issues: a report from the American College of Cardiology. *Journal of the American College of Cardiology*. 2012 Dec 25;60(25 Supplement):S1-49.
5. Goyal A, Jain A, Shukla A, Kapoor D. RSSDI 2015 abstracts. *Int J Diabetes Dev Ctries* (December 2015).;35(4):S535-611.
6. Monday, 1 September 2008, *European Heart Journal*, Volume 29, Issue suppl\_1, September 2008, Pages 255–503,
7. Docplayer.net
8. [www.onlinejacc.org](http://www.onlinejacc.org)
9. Henareh L, Lind B, Brodin LÅ, Agewall S. Disturbed glucose metabolism is associated with left ventricular dysfunction using tissue

- Doppler imaging in patients with myocardial infarction. *Clinical physiology and functional imaging*. 2007 Jan;27(1):60-6.
10. Ayubmed.edu.pk
  11. Dhungel A, Wassem T, Upadhyay-Dhungel K. Diabetic: A Comparative Study. *Janaki Medical College Journal of Medical Science*. 2016;4(1):19-26.
  12. Zencirci E, Yeşilaltay A, Yağız V, Değirmencioglu A, Zencirci AE, Buturak A. Myocardial functional abnormalities and serum N-terminal pro-brain natriuretic peptide in type II diabetes mellitus patients with cardiovascular autonomic neuropathy. *International Journal of Diabetes in Developing Countries*. 2017 Sep 1;37(3):272-9.
  13. Mottram PM, Short L, Baglin T, Marwick TH. Is 'diastolic heart failure' a diagnosis of exclusion? Echocardiographic parameters of diastolic dysfunction in patients with heart failure and normal systolic function. *Heart, Lung and Circulation*. 2003 Jan 1;12(3):127-34.
  14. Spinar J, Jarkovsky J, Spinarova L, Mebazaa A, Gayat E, Vitovec J, Linhart A, Widimsky P, Miklik R, Zeman K, Belohlavek J. AHEAD score—long-term risk classification in acute heart failure. *International journal of cardiology*. 2016 Jan 1;202:21-6.
  15. [www.omicsonline.org](http://www.omicsonline.org)
  16. Shishehbor MH, Hoogwerf BJ, Schoenhagen P, Marso SP, Sun JP, Li J, Klein AL, Thomas JD, Garcia MJ. Relation of hemoglobin A1c to left ventricular relaxation in patients with type 1 diabetes mellitus and without overt heart disease. *American Journal of Cardiology*. 2003 Jun 15;91(12):1514-7.
  17. Samadi N, Cembrowski GS, Chan J. Effect of waist circumference on reference intervals of liver-related enzyme tests in apparently healthy adult Mexican Americans, black and white Americans. *Clinical biochemistry*. 2007 Feb 1;40(3-4):206-12.
  18. Imazio M, Cotroneo A, Gaschino G, Chinaglia A, Gareri P, Lacava R, Voci TD, Trincherò R. Management of heart failure in elderly people. *International journal of clinical practice*. 2008 Feb;62(2):270-80.
  19. Wijarnpreecha K, Lou S, Panjawatanan P, Cheungpasitporn W, Pungpapong S, Lukens FJ, Ungprasert P. Association between diastolic cardiac dysfunction and nonalcoholic fatty liver disease: A systematic review and meta-analysis. *Digestive and Liver Disease*. 2018 Nov 1;50(11):1166-75.