

FREQUENCY OF DIASTOLIC DYSFUNCTION IN TYPE-2 DIABETES MELLITUS PATIENTSDr. Muhammad Shahzeb Khan Khakwani^{*1}, Dr. Muhammad Umair² and Dr. Fahad Sardar³^{1,2}(Nishtar Medical University Multan).³(XI'AN Jiaotong University China).***Corresponding Author: Dr. Muhammad Shahzeb Khan Khakwani**
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ABSTRACT

Background: Diabetes Mellitus is a disease which produces multi-system complications. Heart failure is the end result of cardiovascular complications due to presence of diabetic cardiomyopathy, indicated by diastolic left ventricular dysfunction, which can be easily diagnosed with echocardiography. The objective of this study Frequency of diastolic dysfunction in cases of Diabetes Mellitus. **Methods:** In this descriptive case series, 150 consecutive patients with diabetes mellitus having normal blood pressure and normal resting electrocardiogram and without any symptoms of heart failure were selected. Duration of the study was 6 month from July 2017 to December 2017 at Nishtar Hospital Multan. 150 cases of diabetes mellitus of both gender i.e. male/female with age more than 40 years and duration of DM of at least 2 years and of type II DM were included. The cases with previous history of valvular disease, acute coronary syndrome, liver or renal disease were excluded from the study. Presence or absence of diastolic dysfunction was noted in each case. **Results:** Of the total, 63 (42%) of patients had diastolic dysfunction with male predominance. **Conclusion:** We observed Diastolic dysfunction is seen in nearly half of the patients with type 2 diabetes mellitus. We observed that there is no specific time or duration of diabetes after which diastolic dysfunction will occur. It can encounter even younger in younger patients and those having shorter duration of disease. Diastolic dysfunction can be used as an early indicator, as it is a precursor to increased Left Ventricular hypertrophy and clinical left ventricular dysfunction.

KEYWORDS: Diabetes Mellitus, Type-2, Diastolic dysfunction, Normotensive.**INTRODUCTION**

Diabetes and cardiovascular diseases are rapidly gaining pandemic proportions in the South East Asian subcontinent, and Pakistan is leading the race of numbers. Type-2 Mellitus is almost reaching epidemic proportions. With tight hyperglycemic control the risk reduction is 24% for any diabetes related end-point and 32% for death related to diabetes, against only 0.9% decrease in HbA1c level.^[1] The incidence of Ischemic Heart Disease (IHD) is higher in diabetic patient as compared to general population.^[2] Diabetes is associated with increased cardiovascular complications, the most common of which are IHD and left ventricular dysfunction.^[3] Left Ventricular Diastolic dysfunction is the early preclinical manifestation of specific cardiomyopathy. The pathogenesis of Left ventricular diastolic dysfunction in diabetic patients is not clear but it can be due to following mechanisms i.e. "metabolic problems (including high free fatty acids, carnitine deficiency, disturbances in calcium homeostasis), myocardial fibrosis (including increases in angiotensin 2 and inflammation mediators), and importantly small vessel disease (microangiopathy, impaired coronary flow

reserve (CFR), and endothelial dysfunction), autonomic neuropathy and insulin resistance".^[3-4] Cardiac catheterization is the most reliable and gold standard method for assessing left ventricular diastolic dysfunctions. However this method is invasive and cannot be performed in all patients in which we suspecting diastolic dysfunction. In last two decades, Doppler echocardiography has become an important and noninvasive diagnostic tool providing reliable results on diastolic function of heart.^[5] LV diastolic dysfunction may represent as earliest stage of diabetic cardiomyopathy, supporting the importance of early assessment and hence early treatment of diastolic function in diabetic patients. The purpose of this study was to show the occurrence of diastolic dysfunction in asymptomatic, normotensive type-2 diabetic patients. Multiple studies have been done in the recent past to look for this functions and have revealed its incidence from 30 to 80% of the cases. Sharavanan TKV et al, in their study found this prevalence in 55% of cases.^[8] Dikshitet al and Srifevi et al showed that the diastolic dysfunction was seen in 66-79% of the cases in their studies respectively.^[9]

MATERIAL AND METHODS

In this descriptive case study, patients with type 2 diabetes mellitus with normal blood pressure, having normal resting ECG and without any symptoms of heart failure were enrolled in the study.

Inclusion criteria: 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)" were included in the study.

Exclusion criteria: Patients with coronary artery disease diagnosed by symptoms, ECG or regional wall motion abnormalities on echocardiogram or prior coronary angiography, with heart failure, with significant valvular heart disease, Heart rate $<$ 50 or $>$ 100 beat per minute, atrial fibrillation and other arrhythmias that may interfere with Doppler studies, Hypertensive patients. All aforementioned patients were excluded from the study.

Selected patients were then called for Doppler echocardiography at a later date after taking informed consent. Doppler echocardiography was performed on all patients in left lateral position using standard parasternal, short axis, and apical views. Pulmonary venous flow recordings were obtained from the four chamber view directed at the right upper pulmonary vein. Presence or absence of diastolic dysfunction was noted in each case.

RESULTS

A total of 150 patients with type 2 Diabetes Mellitus were enrolled in the study from the Diabetic OPD Nishtar Hospital Multan from July 2017 to December 2017. Amongst them, 90 (60%) were males and 60 (40%) were females. Mean age was 42.23 ± 7.6 years. Of the total one hundred and fifty patients, 63 (42%) were having diastolic dysfunction and 87 (58%) with normal results. (Table-1) Diastolic dysfunction by gender is shown in Table-2.

Table 1: Diastolic dysfunction by Age.

Age range	Diastolic dysfunction		Total (100%)
	Yes	No	
30–40	12	22	34
41–50	23	49	72
51–60	28	16	44
Total	63 (42%)	87 (58%)	150 (100%)

Table 2: Diastolic dysfunction by Gender.

Gender	Diastolic dysfunction		Total (100%)
	Yes	No	
Male	46 (30.6%)	44 (29.3%)	90 (60%)
Female	17 (11.3%)	43 (28.6%)	60 (40%)
Total	63 (42%)	87 (58%)	150 (100%)

DISCUSSION

Diabetic cardiomyopathy may occur due to left ventricular diastolic and systolic dysfunction. The incidence of Diabetes mellitus is increasing day by day in whole world and so are its various complications due to poor diabetic control. Cardiac complications like diastolic dysfunction can add to overall morbidity in such cases and needs early diagnosis and management. In this current study Diastolic dysfunction was seen in 63 (42%) of the diabetic patients. This finding was close the studies done in the past. A study done by Sharavanan et al, on cases of DM and diastolic dysfunction was observed in 66 (55%) of cases⁷. Similar was seen in the study of Patel et al, were this was observed in 54.33% of the wit DM.^[9,10]

Diastolic dysfunction plays an important role regarding morbidity and mortality in patients with metabolic syndrome.^[11] In another study, echocardiography performed in 87 patients with type 1 diabetes mellitus without known coronary artery disease revealed diastolic dysfunction in 34% of cases.^[2] Similarly in a well-controlled survey of Type 2 DM patients revealed a prevalence of diastolic dysfunction in upto 30% cases.^[12] Echocardiography has been of great help in this study to diagnose diastolic dysfunction in diabetic subjects who were not having hypertension and with no known cardiac disease. The use of 2D echocardiogram in diagnosing the cardiac derangements in type 2 diabetes mellitus has been proven helpful in various studies.^[13] Left ventricular diastolic dysfunction denotes the important first stage indicator of diabetic cardiomyopathy and thus evaluation of cardiac status is mandatory in all diabetic patients. Diabetic cardiomyopathy was described in diabetic patients who had no evidence of coronary artery disease, arterial hypertension, or valvular heart disease.^[14] Decreased left ventricular diastolic function in patients with Type 2 Diabetes Mellitus found in this study is in accordance with previous studies.^[14,15] A study conducted for three years of duration also resulted that around 66% of the cases had diastolic dysfunction independent of other factors.^[11] However this aforementioned case control study noticed more females with diastolic dysfunction and they also tested fasting lipid profile of their patients which was lacking in our study. This study has some pitfalls. Other parameters like smoking and hypercholesterolemia were not taken in to consideration which have profound effect on myocardium, were not studied.^[15]

CONCLUSION

We observed Diastolic dysfunction is seen in nearly half of the patients with type 2 diabetes mellitus. We observed that there is no specific time or duration of diabetes after which diastolic dysfunction will occur. It can encounter even younger in younger patients and those having shorter duration of disease. Diastolic dysfunction can be used as an early indicator, as it is a

precursor to increased Left Ventricular hypertrophy and clinical left ventricular dysfunction.

REFERENCES

1. Khan Z, Iqbal MA, Naeem MA, Shoji S. Rosiglitazone and Metformin in patients with type-2 Diabetes Mellitus who are inadequately controlled on Metformin alone. *Ann King Edward Med Unit*, 2005; 11: 20–3.
2. Namra MH, Bilal A, Said M, Amin K. Incidence of Ischemic Heart Disease in patients with non-insulin dependent Diabetes Mellitus. *Professional Med J*, 2004; 11: 320–7.
3. Amir AH. Targets for treating type-2 diabetes and preventing its complications: can we achieve it? *Pak J Med Res*, 2004; 43: 95–6.
4. Rajput R, Jagdish, Swatch SB, et al. Echocardiographic and Doppler assessment of cardiac functions of non-insulin dependent diabetes mellitus. *Journal Indian Academy of Clinical Medicine*, 2002; 3(2): 164-168.
5. Alfred Gering, Michael Guttmann, Tamara Schakowsky, Andrea Vierkotter, Ulrich Raft, and Andreas Mugged. Diastolic dysfunction without abnormalities in left atrial and left ventricular geometry does not affect quality of life in elderly women. *Ext Clin Cardio*, 2011; 16(2): 37–39.
6. Rajput R, Swatch SB, et al. Echocardiographic and Doppler assessment of cardiac functions of non-insulin dependent diabetes mellitus. *Journal Indian Academy of Clinical Medicine*, 2002; 3(2): 164-168.
7. Rajput R, Jagdish, Swatch SB et al: Echocardiographic and Doppler Assessment of Cardiac Functions in Patients of Non- Insulin Dependent Diabetes Mellitus. *Journal, Indian Academy of Clinical Medicine*, 2002; 3(2): 164 – 168.
8. Shan DJ, Demario A, Kisto J et al: Recommendations regarding quantitation in M mode echocardiography: results of a survey of echocardiographic measurements. *Circulation*, 1978; 58: 1072-1083.
9. Corson S, Kevorkian JP. Left ventricular diastolic dysfunction: an early sign of diabetic cardiomyopathy? *Diabetes Metab*, 2003; 29: 455–66.
10. Fakir M, Basal N, Gull S, Endogen M, Attila E, Errol Ç, et al. Microalbuminuria, nondipping and diastolic dysfunction in normotensive type 2 diabetic Patients. *Turk J Endocrinol Metab* 2003; 1:23–9.
11. Chaudhary AK, Naeji GK, Shukla S, Raze SM. Study on diastolic dysfunction in newly diagnosed Type 2 diabetes mellitus and its correlation with glycosylated haemoglobin (HbA1C). *J Claudia Res.*, 2015; 9(8): OC20- OC22.
12. Patel MB, Burin NP. Echocardiographic evaluation of diastolic dysfunction in asymptomatic type 2 diabetes mellitus. *Jasso Physicians Ind.*, 2012; 60: 23-26.
13. Zunair SW, Nest RW. Diabetic cardiomyopathy. *Am Heart J*, 2001; 166-68.
14. Ali L, Abdi AR, Aznar M. Risk factors of Diastolic heart failure; an epidemiological analytic study. *Professional Med J*, 2006; 13: 410–6.
15. Najafian J, Khaled Ian MR, Farinas F. A study of the relationship between myocardial performance index and left ventricular end-diastolic pressure in patients with left ventricular systolic dysfunction. *Pak J Cardio*, 2006; 17: 57–9.