

FREQUENCY OF DIASTOLIC DYSFUNCTION IN TYPE-2 DIABETIC PATIENTS

Dr. Muhammad Atif*¹, Dr. Areesha Seemab² and Dr. Muhammad Nabeel Akbar³

Jinnah Hospital Lahore.

*Corresponding Author: Dr. Muhammad Atif

Jinnah Hospital Lahore.

Article Received on 18/01/2019

Article Revised on 08/02/2019

Article Accepted on 01/03/2019

ABSTRACT

Background: Diabetes mellitus affects heart in multiple ways and can affect virtually any part of heart specifically cardiac myocardium. Diastolic dysfunction has been described as an early sign of diabetic heart muscle disease preceding the systolic damage. Hence this involvement can severely affect the cardiac contractility resulting in severely debilitating symptoms of cardiac failure and hampering life. The objective of this study Frequency of diastolic dysfunction in cases of Diabetes Mellitus. **Methods:** In this descriptive case series, 75 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 Jinnah Hospital, Lahore. 75 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 acute coronary syndrome, valvular disease, liver or renal disease were excluded. Presence or absence of diastolic dysfunction will be documented in each case. **Results:** Of the total, 35 (46.6%) of patients had diastolic dysfunction with male predominance. **Conclusion:** Diastolic dysfunction is seen in almost half of the cases with DM type 2. Diastolic dysfunction can occur in diabetic patients even in young patients and those with shorter duration of disease. Diastolic dysfunction can be used as an early indicator, as it is a precursor to increased LV 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 LV diastolic dysfunction in diabetic patients is not clearly understood but the most reported important mechanisms are: "metabolic disturbances (increased free fatty acids, carnitine deficiency, changes in calcium homeostasis), myocardial fibrosis (increases in angiotensin II, IGF-I, and inflammatory cytokines), and small vessel disease (microangiopathy, impaired coronary flow reserve (CFR), and endothelial dysfunction), autonomic neuropathy and insulin resistance".^[3-4] Cardiac

catheterization with simultaneous pressure and volume measurements is the "Gold Standard" for assessing left ventricular diastolic dysfunctions. Nevertheless this diagnostic method is invasive and cannot be performed in all patients with suspected diastolic dysfunction. During the last two decades, Doppler echocardiography has emerged as an important and noninvasive diagnostic tool providing reliable data on diastolic performance.^[5] Some studies, which used Doppler assessment of trans mitral flow velocity, could have underestimated the prevalence of left ventricular diastolic dysfunctions, because they neglected to account for pseudo-normal patterns of ventricular filling, which are often noted in the evaluation of left ventricular diastolic function.^[6-7] Thus, the frequency of left ventricular diastolic dysfunctions in subjects with diabetes should be reassessed by using methods designed to unmask pseudo-normal ventricular filling patterns. Left ventricular diastolic dysfunction may represent the first stage of diabetic cardiomyopathy, reinforcing the importance of early assessment and hence early treatment of diastolic function at asymptomatic stage in individuals with diabetes. Hence this study was planned to see 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 series, patients with type 2 DM having normal blood pressure and normal resting electrocardiogram and without any symptoms of heart failure were selected. **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 CAD diagnosed by symptoms, ECG or regional wall motion abnormalities on echocardiogram or prior coronary angiography, with heart failure diagnosed by signs and symptoms, chest radiograph or echocardiography, 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 mentioned patients were excluded from the study.

These patients were then booked for Doppler echocardiography at a later date after informed consent. Doppler echocardiography was performed on all patients in left lateral decubitus 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 documented in each case.

RESULTS

A total of 75 consecutive patients with type 2 DM were selected from the Diabetes Management Centre of Jinnah Hospital Lahore from July 2017 to December 2017. Amongst them, 47 (62.5%) were males and 28 (37.5%) were females. Mean age was 44.3 ± 8.6 years. Of the total, 35 (46.6%) patients were found to have diastolic dysfunction and 39 (53.3%) patients did not have diastolic dysfunction. (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	6	11	17
41-50	13	23	36
51-60	16	6	22
Total	35(46.6%)	40 (53.3%)	75 (100%)

Table 2: Diastolic dysfunction by Gender.

Gender	Diastolic dysfunction		Total (100%)
	Yes	No	
Male	24 (32%)	23 (30%)	47 (62%)
Female	11 (14%)	17 (22%)	28 (38%)
Total	35 (46.6%)	40 (53.3%)	75(100%)

DISCUSSION

Diabetes is associated with left ventricular diastolic and systolic dysfunction known as diabetic cardiomyopathy. The incidence of Diabetes mellitus is increasing globally and so are developing its various complications due to poor control; as it is also found in high number in developing countries. Cardiac complications like diastolic dysfunction can add to overall morbidity in such cases and warrant early diagnosis and management. Diastolic dysfunction was seen in 35 (46.6%) of the cases in this study with DM. This finding was close the studies done in the past. Sharavanan et al, carried out a study on cases of DM and it was seen that diastolic dysfunction was observed in 66 (55%) of cases in their study.^[10] Similar was seen in the study of Patel et al, were this was observed in 54.33% of the wit DM.^[11]

Diastolic dysfunction is an important predictor of morbidity and mortality in patients with metabolic syndrome.^[12] In another study, echocardiography performed in 87 patients with type 1 diabetes mellitus without known coronary artery disease revealed diastolic dysfunction.^[13] Similarly in a well-controlled survey of Type 2 DM patients revealed a prevalence of diastolic dysfunction in upto 30% cases.^[14] 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 clinical use of 2D echocardiogram in detecting the cardiac derangements in type 2 diabetes mellitus has been justified in various studies.^[15] Left ventricular diastolic dysfunction represents the earliest first stage indicator of diabetic cardiomyopathy,^[16] 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.^[17,18] Decreased left ventricular diastolic function in patients with T2DM found in this study is in accordance with previous studies.^[19,20,21] One case control study conducted over the course of three years also concluded that around 66% of the patients had diastolic dysfunction independent of other factors.^[22] However this case control study had more females and they also had fasting lipid profile of their patients done which was lacking in current 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.^[23]

CONCLUSION

Type-2 diabetes Mellitus is associated with a higher impairment of left ventricular diastolic function. T2DM was the resilient independent prognosticator of asymptomatic left ventricular diastolic dysfunction in patients without structural heart disease or arterial hypertension.

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. Boyer JK, Thanigaraj S, Schechtman KB, Perez JE. Prevalence of ventricular diastolic dysfunction in asymptomatic, normotensive patients with diabetes mellitus. *Am J Cardio*, 2004; 93: 870–5.
5. Ricardo Madeira's-Lopes, Paulo Butut, Ado Elite-Moira, Ana Aledo. Diastolic dysfunction: association with insulin resistance, metabolic syndrome and type 2 diabetes. *Cardiovascular Dialectology*, 2015; 14: 4.
6. Rajput R, Switch 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. Gull a, Rahman A, Jalal A. Changes in glycosylated proteins in type-2 diabetic patients with and without complications. *J Aye Med Cull Abbottabad*, 2005; 17(3): 33–7.
8. Corson S, Kevorkian JP. Left ventricular diastolic dysfunction: an early sign of diabetic cardiomyopathy? *Diabetes Metab*, 2003; 29: 455–66.
9. 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.
10. Schileeler NB, Shamash PM, Crawford M, Denarii A, Dekvereux R, Feinbaum H, Gutsell H, Reichel N, Shahn D, Schnitzel I, et al. Recommendations for quantitation of the left ventricle by two-dimensional echocardiography. Of Echocardiography Committee on Standards, Subcommittee on Quantitation of Two-Dimensional Echocardiograms. *J Am Sock Echocardiogram*, 1989; 2(5): 358-67.
11. Son S, rain JP. Left ventricular diastolic dysfunction: an early sign of diabetic cardiomyopathy. *Diabetes Metab*, 2003; 29: 4-66.
12. Zunair SW, Nest RW. Diabetic cardiomyopathy. *Am Heart J*, 2001; 166-68.
13. Ali L, Abdi AR, Aznar M. Risk factors of Diastolic heart failure; an epidemiological analytic study. *Professional Med J*, 2006; 13: 410–6.
14. 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.
15. Khan AR, Khan MQ. Association and pattern of Diastolic dysfunction in patients of metabolic syndrome. *J Aye Med Cull Abbottabad*, 2008; 20(2): 70–5.
16. VirendraC.Patil, HarshaV.Patil, Kuldeep B. Shah, Jay D. Vasani, Pruthvi Shetty. Diastolic dysfunction in asymptomatic type 2 diabetes mellitus with normal systolic function. *J Cardiovascular Dis Res*, 2011; 2(4): 213–222.
17. Gering A, Guttman M, Schakowsky S, Vierkotter A. Diastolic dysfunction without abnormalities in left atrial and left ventricular geometry does not affect quality of life in elderly women. *Exp Clin Cardiol*, 2011; 16(2): 37–39.
18. Russo C, Jin Z, Homma S, Rudner T, Elkin MS, Sacco RL et al. Effect of obesity and overweight on left ventricular diastolic function: a community-based study in an elderly cohort. *J Am Coll Cardiol.*, 2011; 57: 1368-76.
19. Bounding S. Clinical manifestations of diabetic cardiomyopathy. *Heart Metab*, 2009; 45: 10–4.
20. Osaka N, Furukawa Y, Morimoto T, Tadamura E, Kita T, Kimura T. Relation among left ventricular mass, insulin resistance, and hemodynamic parameters in type 2 diabetes. *Hyper tens Res*, 2008; 31: 425–32.
21. Ashraf S, Baser F. Association of hypertension and diastolic dysfunction with type-2 diabetes mellitus. *Pak J Med Sic*, 2007; 23(3): 344–8.
22. Anon AK, Fattah AA, Mocha MS, Gharries S, Hendy A. Left ventricular systolic and diastolic functional abnormalities in asymptomatic patients with non-insulin-dependent diabetes mellitus. *J Am Sock Echocardiogram*, 2001; 14: 885–91.