Original Research Article

Indian Journal of Emergency Medicine
Volume 6 Number 4, October–December 2020
DOI: http://dx.doi.org/10.21088/ijem.2395.311X.6420.6

A Study on Left Ventricular Dysfunction in Diabetes Mellitus with No Overt Cardiac Symptoms or Signs

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How to cite this article:
Bhaskara, Ramakrishna Reddy G, Abhilash K. A Study on Left Ventricular Dysfunction in Diabetes Mellitus with No Overt Cardiac Symptoms or Signs. Indian J Emerg Med 2020;6(4):259–262.

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Abstract

Introduction: The association of coronary heart disease and DM is well known, but epidemiologic and clinical data from the last 2 decades reveal heart failure also to be a major contributor to cardiovascular morbidity and mortality in patients with DM and also develop congestive heart failure even in the absence of coronary heart diseases, hypertension or any known structural heart disease.

Methodology: Written informed consent was taken from all the patients who were recruited in the study. Data was collected in the case proforma which included clinical examination. Relevant investigations were carried out and recorded.

Results: The chest X-ray of patients, 4(4.4%) showed COPD, 7(7.8%) showed pneumonia and rest all patients had normal chest X-ray. ECG was reported as normal in all the patients 90(100%). Urine routine was reported as normal in 73(81.1%) of patients.

Conclusion: Out of all the diastolic parameters statistically significant difference was observed in 'A' velocity, E/A ratio and DT parameters.

Keywords: Left Ventricular Diastolic Dysfunction; Diabetes Mellitus; DM.

Introduction

Diabetesmellitus (DM) is a disease known to mankind for the past 2500 years.It is one of the non-communicable diseases (NCDs) which have emerged as a leading global health problem.DM refers to a group of common metabolic disorder that shares phenotype of hyperglycemia. It is a long-standing illness that needs continuing medical care and support to prevent acute complications and to reduce the risk of long-term complications.[1]

There are 352 million adults with impaired glucose tolerance who are at high risk of developing diabetes in the future as per the International Diabetes Federation (IDF) Atlas guideline report. In 2017, it was estimated that 425 million people (20–79 years of age) suffered from DM, and the number is expected to rise to 629 million by 2045.[2]

In 2016, an estimated 1.6 million deaths were directly caused by DM and another 2.2 million deaths were attributable to high blood glucose. World Health Organization (WHO) estimates that diabetes was the seventh leading cause of death in 2016.[3]

Over the years, people suffering from DM tend to progress to several detrimental micro and macrovascular complications such as retinopathy, nephropathy, neuropathy, atherosclerosis and coronary heart disease.[4]

The association of coronary heart disease and DM is well known, but epidemiologic and clinical data from the last 2 decades reveal heart failure also to be a major contributor to cardiovascular morbidity and mortality in patients with DM and also develop congestive heart failure even in the absence of coronary heart diseases, hypertension or any known structural heartdisease.[5,6,7]

This heart failure in diabetics could take the form of diastolic and/or systolic left ventricular dysfunction.[8] Studies have reported a high prevalence of pre-clinical Left ventricular (LV) diastolic dysfunction in DM patients and this cardiac complication may represent the reversible early stage of heart failure which is termed diabetic cardiomyopathy and this can be easily assessed with echocardiography.[9]

Complications like diabetic microangiopathies, retinopathy and autonomic neuropathy and duration of DM correlated with the LV diastolic abnormalities.[10]

There are plenty of mechanisms for diabetic cardiomyopathy which have been proposed. Microvasculardisease, autonomic dysfunction, metabolic derangements, interstitial fibrosis, probably caused by the accumulation of a periodic acid-Schiff-positive glycoprotein are few mechanisms which may lead to diastolic dysfunction.[11]

Hence, the need was felt to carry out this study to highlight the problem of left ventricular diastolic dysfunction in diabetic patients and to pay heed in such patients who are free from symptoms of heart failure.

Methodology

Inclusion Criteria

- Patients diagnosed with diabetes mellitus, without any cardiac symptoms

Exclusion Criteria

- Patients who are known cases of following diseases: Ischemic heart disease
- Valvular heart diseases
- Hypertension
- Connective tissue disorder
- Chronic renal failure

Materials for Data Collection: Case proforma and investigations as follows:

Investigations include,

- Complete hemogram
- FBS, PPBS
- HbA1c
- Complete urine examination
- Serum creatinine
- Blood urea
- ECG
- 2D Echo
- Chest X-Ray

Method Of Collection of Data: Written informed consent was taken from all the patients who were recruited in the study. Data was collected in the case proforma which included clinical examination. Relevant investigations were carried out and recorded.

Results

Table 1: Vitals of patients.

Variables	Mean ± standard deviation	Range (min-max)
HR (beats/min)	80.51 ± 7.32	64-100
Systolic blood pressure (mm of hg)	120.33±10.32	100-140
Diastolic blood pressure (mm of hg	74 ± 9.69	60-90.

The mean heart rate of the patients was 80.51 ± 7.32 beats/min. The mean systolic and diastolic blood pressure recorded was 120.33±10.32 mm of hg and 74 ± 9.69 respectively mm of hg. (Table 1)

Table 2: Chest X- ray of patients.

Chest X-ray	Frequency(n)	Percentage (%)
COPD	4	4.4
Pneumonia	7	7.8
NAD	79	87.8
Total	90	100

The chest X-ray of patients, 4(4.4%) showed COPD, 7(7.8%) showed pneumonia and rest all patients had normal chest X-ray. (Table 2)

ECG was reported as normal in all the patients 90(100%). Urine routine was reported as normal in 73(81.1%) of patients.

Table 3: Distribution of patients according to LVDD.

LVDD	Frequency(n)	Percentage (%)
No	22	24.4
Yes	68	75.6
Total	90	100

LVDD was seen in 68(75.6%) out of the total 90 patients. (Table 3)

Table 4: Left Ventricular Systolic Parameters.

Variables	Patients without LVDD	Patients with LVDD	p value
	Mean ± standard deviation	Mean ± standard deviation	
VSWT (cm)	0.90±0.15	0.83±0.10	0.26
LV PWT (cm)	0.81±0.14	0.82±0.09	0.91
LVEDD (cm)	4.32±0.56	4.19±0.34	0.50
LVESD (cm)	2.54±0.30	2.81±0.26	0.04*
EF (%)	75.33±5.56	67.00±5.49	<0.001*
Aorta Root Dimension (cm)	2.01±0.31	2.77±0.35	0.30
LA Dimension (cm)	2.91±0.29	2.95±0.23	0.62
MV Area (sq.cm)	4.40±0.30	4.34±0.34	0.67

Out of all the systolic parameters, there was statistically significant difference observed in LVESD and EF.

Table 5: Left Ventricular Diastolic Parameters.

Variables	Patients without LVDD	Patients with LVDD	p value
	Mean ± standard deviation	Mean ± standard deviation	
' E ' Velocity (cm/sec)	84.00±0.86	87.11±16.96	0.10
' A' Velocity (cm/sec)	64.33±3.90	50.06±9.86	<0.001*
E/A ratio	1.24±0.17	1.77±0.45	<0.001*
IVRT (ms)	84.00±4.58	84.68±9.63	0.72
DT (ms)	154±4.58	186.35±50.66	<0.001*

Out of all the diastolic parameters statistically significant difference was observed in 'A' velocity, E/A ratio and DT parameters.

Discussion

In our study, LVDD was seen in 68(75.6%) out of the total 90 patients which was high as compared to other studies, the probable reason being high referral to our tertiary centre from surrounding places. It was 66% in a study done by Nikhil M Dikshit et al. and only 30% in a study by K Senthilet al.[11]

Among the patients who had LVDD, the ventricular systolic parameters were as follows: VSWT(cm) is 0.83±0.10, LV PWT (cm) is 0.82±0.0.09, LVEDD (cm) is 4.19±0.34, LVESD (cm) is 2.81±0.26, EF (%) is 67.00±5.49, Aorta Root Dimension (cm) is 2.77±0.35, LA Dimension (cm) is 2.95 ±0.23 and MV Area (sq.cm) is 4.34±0.34. Out of all the systolic parameters, there was statistically significant difference observed in LVESD and EF.(p value<0.05). (Table 4)

Among the patients who had LVDD, the ventricular diastolic parameters were as follows: ' E ' Velocity (cm/sec) is 87.11±16.96, ' A' Velocity (cm/sec) is 50.06±9.86, E/A ratio is 1.77±0.45, IVRT (ms) is 84.68±9.63 and DT (ms) is 186.35±50.66.Out of all the diastolic parameters statistically significant difference was observed in 'A' velocity, E/A ratio and DT parameters. (p value<0.05). (Table 5)

Similar findings were seen in studies done by K Senthilet al.11, V Suresh Kumar et al.5, Kamil Ashour l[9].

In our study, LVDD was seen highest among patients aged >60 years followed by 51-60 years and 31-40 years. The p value is statistically not significant. Similarly, LVDD was seen more in patients aged >45 years in a study done by, T. K. V. Sharavananet al.[12]

In our study, LVDD was present among 42(61.8%) males and 26(38.2%) females. The p value is statistically significant, where as in the study by, T. K. V. Sharavananet al.[12] it was 20.8% in males and 40.0% in females.

In our study, LVDD was seen in 46(67.7%) patients who had DM for more than 5 years, as compared to 22(32.3%) who had DM for less than 5 years. The p value is statistically significant. Similar findings (83.67%) patients who had DM from more than 5 years were seen in study done by Kamil Ashour.[9]

In our study, LVDD was seen in patients who had HbA1c values more than 7.5%, 50(76.5%) as compared to 18(23.5%) who had values less than 7.5%. The p value is statistically significant. Similar findings were seen in the study done by Kamil Ashour[9], wherein 75.43% with LVDD had HbA1c values more than 7.5% as compared to 24.57% who had HbA1c values less than 7.5%.

Conclusion

Among the patients who had LVDD, the ventricular diastolic parameters were as follows: ' E ' Velocity (cm/sec) is 87.11±16.96, ' A' Velocity (cm/sec) is 50.06±9.86, E/A ratio is 1.77±0.45, IVRT (ms) is 84.68±9.63 and DT (ms) is 186.35±50.66.

Out of all the diastolic parameters statistically significant difference was observed in 'A' velocity, E/A ratio and DT parameters. (p value<0.05).

References

1. American Diabetes Association. Standards of medical care for patients with diabetes mellitus. Diabetes care [serial online] 2003 Jan [cited 2018 Aug 2018]; 26(Suppl 1):33-50.
2. Inetrnational Diabetes Fedearation. IDF diabetes atlas eighth edition. [online]. 2017. Available from: URL: https://www.idf.org/e-library/epidemiology-research/diabetes-atlas/134-idf-diabetes-atlas-8th-edition.html
3. WHO Fact sheet Diabetes. [Online]. 2018 [cited 2019 Jun 2];[5 screens]. Available from: URL:https://www.who.int/news-room/fact-sheets/detail/diabetes
4. Tousoulis, D., Oikonomou, E., Siasos, G. and Stefanadis, C. Diabetes Mellitus and Heart Failure. European Cardiology Review. 2014;9(1):37-42
5. Kumar VS, Sreelatha M, Ramesh K, Shekar GC. Study of Left Ventricular Diastolic Dysfunction in Type 2 Diabetes Mellitus Patients. International journal of scientific study 2017 Jul 1;5(4):219-24.
6. Lehrke M, Marx N. Diabetes mellitus and heart failure. The American journal of cardiology 2017 Jul 1;120(1):S37-47.
7. Kannel WB, Hjortland M, Castelli WP. Role of diabetes in congestive heart failure. The Framingham Study. American Journal of Cardiology 1974;34:29-34.
8. Poirier P, Bogaty P, Garneau C, Marois L, Dumesnil JG. Diastolic dysfunction in normotensive men with well-controlled type 2 diabetes: importance of maneuvers in echocardiographic screening for preclinical diabetic cardiomyopathy. Diabetes care 2001 Jan 1;24(1):5-10.
9. Ashour K. Early Detection of Diastolic Dysfunction in Diabetic Patients (Single Center Cross Sectional Study). J Heart Cardio vasc Res [serial online] 2018 [cited 2019 Jun 6]; 2(1):[6 screens]. Avaialble from: URL:http://www.imedpub.com/articles/early-detection-of-diastolic-dysfunction-in-diabetic-patients-single-center-cross-sectional-study.pdf
10. Virendra C. Patil, Harsha V. Patil,1Kuldeep B. Shah, Jay D. Vasani, and PruthviShetty. Diastolic dysfunction in asymptomatic type 2 diabetes mellitus with normal systolic function. J Cardiovasc Dis Res 2011 Oct-Dec;2(4): 213–222.
11. Senthil N, Vengadakrishnan K, Vankineni SS, Sujatha S. Diastolic Dysfunction in Young Asymptomatic Diabetic Patients. International journal of scientific study. 2015 Oct 1;3(7):226-9
12. Sharavanan TK, Prasanna KB, Ekanthalingam S, Sundaram A, Premalatha E, Arumugam B. A study on the prevalence of diastolic dysfunction in type 2 diabetes mellitus in a tertiary care hospital. IAIM. 2016;3(7):216-21