



EVALUATION OF LEFT VENTRICULAR DIASTOLIC DYSFUNCTION BY TISSUE DOPPLER IMAGING IN YOUNG DIABETIC AND HYPERTENSIVE PATIENTS

General Medicine

Dr. Ram Babu Singh

MD, Associate Professor & Head, Dept. of Internal Medicine, MLBMC, Jhansi (U.P.).

Dr. Rajat Jain

MD, Professor, Dept. of Internal Medicine, MLBMC, Jhansi (U.P.).

Dr Madhu Sudan H M*

Junior Resident, Dep of internal medicine, MLBMC, Jhansi, (U.P.). *Corresponding Author

Dr Madhurmay

MD, Associate professor & Head Dep of pulmonary medicine MLBMC, Jhansi (U.P.).

ABSTRACT

Background: Type 2 Diabetes Mellitus and systemic hypertension increases the risk of heart failure independent of other risk factors such as CAD, valvular heart disease, lung disorders and other systemic diseases. The process of myocardial remodelling starts before the onset of symptoms, recent attempts have been done to detect subclinical left ventricular diastolic dysfunction (LVDD) in high risk groups like T2DM and syst. HTN. Timely identification and treating modifiable risk factors should be done to prevent heart failure at early ages. **Objectives:** (1) To assess the prevalence and grading of asymptomatic Left Ventricular Diastolic Dysfunction in T2DM patients and systemic hypertension patients (Age < 45 yrs) and to compare with control group [according to 2016 ASE/EACVI guidelines]. (2) To describe the association TDI parameters like e' and E/e' with stages of LVDD in T2DM patients and Syst. HTN patients with their control group. **Materials And Methods:** This cross sectional study comprised of 150 patients group based on diagnosis of Type 2 DM (n=48), systemic HTN (n=27) and control group (n=75), and they undergone routine investigation basic metabolic parameters were assessed prevalence of LVDD was evaluated by Transthoracic echocardiography and TDI. Multi variable logistic and linear regression analysis were used to identify the determinants of LVDD. Chi-square test was used for comparison of qualitative data. **Results:** In recruited T2DM patients [(n=48) mean age 43.082.18, female (41.6%)] and control group [(n=75), mean age 42.602.08, female 40%] had prevalence of Diastolic Dysfunction (34.42% vs. 6.67%) indeterminate (14.58% vs. 9.33%) normal diastolic dysfunction (50.0% vs. 84%). And in Syst. HTN patients (n=27, mean age 43.112.12) female (37.09%) with study group had prevalence of diastolic dysfunction (33.3% vs. 6.67%) indeterminate (14.81% vs. 9.33%), normal diastolic function (51.85% vs. 84.0%). **Conclusion:** The overall prevalence of Left Ventricular Diastolic Dysfunction (LVDD) in asymptomatic T2DM individual and hypertensive individuals of age <45yrs are 35.42% and 33.3% respectively and in control group LVDD found to be 6.67%. LVDD in T2DM and Syst. HTN were 7.67 and 7 times more prevalent than general population respectively.

KEYWORDS

ASE/EACVI, LVDD, Transthoracic echocardiography, TDI.

INTRODUCTION

Overall the prevalence of type 2 Diabetes mellitus and systemic hypertension in all regions increases with age. Increasing obesity and sedentary life style has a significant repercussion on T2DM and Syst. HTN. By age of 60, more than half of the adults in most regions of the world will be T2DM or Syst. HTN^[(1-2)]. These alarming figures highlights that both T2DM and Syst. HTN are set to remain the single most important preventable causes of premature death worldwide over the next two decades^[(3)].

Role of T2DM In Left Ventricular Diastolic Dysfunction

Individuals with DM have increased incidence of congestive cardiac failure. The etiology of this abnormality is probably multifactorial and include factors like myocardial ischaemia from atherosclerosis, hypertension and myocardial cell dysfunction secondary to chronic hyperglycaemia^[(4)].

Mechanisms Leading To Heart Failure In T2DM,

Diastolic dysfunction and abnormal systolic reserve during exercise may result from Diabetes.

The diagnosis of diabetic cardiomyopathy is sometimes invoked when a patient with diabetes has evidence of heart failure in the absence of identifiable etiology. One of the difficulties in making this diagnosis is lack of definite pathological findings so that differentiation from DCMP remains problematic. The diagnosis of diabetic cardiomyopathy was suggested almost 30 years back. Heart failure is a frequent clinical manifestation of the end stage of cardiovascular complications that affects the patients with DM. Framingham heart study was the first study that showed the risk of symptomatic heart failure with increased 2.4 - fold incidence in men with diabetes and five fold in women with diabetes. Hypertension occurs in is 40% to 60% of patients with type2 DM.

Hyperglycaemia increases calcium activated signalling through protein kinase C which in turn may result in cardiac dysfunction. Abnormalities in myofibrillar proteins including altered

phosphorylation of troponin I and myosin light chains may also play a role in diabetes associated impairment of contractile function. Advanced glycosylation result in abnormal collagen cross-linking, which may contribute to decreased compliance and in turn to diastolic dysfunction. In the United Kingdom Prospective Diabetes Study (UKPDS) the incidence of heart failure correlated with the extent of hyperglycaemia. Myocardial fibrosis underlies the pathologic hypertrophy and dysfunction that are observed in Heart failure.

Pathophysiology Of Diastolic Dysfunction In Hypertensives.

The histological features of hypertensive cardiac remodelling are myocytes hypertrophy and myocardial fibrosis. These changes are basically adaptive responses to pressure overload. It is considered that when hypertension persists. Disproportionate LV hypertrophy and myocardial fibrosis develop and in turn result in diastolic and eventually systolic dysfunction. Given that recent studies have demonstrated the substantial involvement in the inflammatory process in the pathogenesis of various cardiovascular diseases, such as atherosclerosis. Inflammatory changes may play a role in cardiac remodeling in the hypertensive heart as well. In this view the regulation of inflammation is a possible therapeutic strategy for targeting diastolic dysfunction in hypertensive hearts^[(5-6)].

AIMS AND OBJECTIVES

1. To assess the prevalence and grading of asymptomatic Left Ventricular Diastolic Dysfunction in T2DM patients and systemic hypertension patients (Age < 45 yrs) and to compare with age and sex matched control group [according to 2016 ASE/EACVI guidelines].
2. To describe the association TDI parameters like e' and E/e' with stages of LVDD in T2DM patients and Syst. HTN patients with their control group.
3. To describe the effect of regular follow-up and medication and duration of disease with LVDD in Syst. HTN patients and T2DM patients.

MATERIALS AND METHODS

It's a cross-sectional observational study which was conducted in

Maharani Laxmi Bai Medical College, Jhansi (Uttar Pradesh) 284128, with 150 patients Study Group (n = 75) Control Group (n = 75) conducted echocardiographic evaluation for Left Ventricular Diastolic Dysfunction in asymptomatic Type 2 Diabetes Mellitus and Systemic Hypertension patients, comparing with control group population from March 2019 to Feb. 2021.

Inclusion Criteria

- Type 2 diabetic patients who clinically had no symptoms of cardiovascular involvement (Age < 45 yrs).
- Systemic Hypertension patients who clinically had no symptoms of cardiovascular involvement (Age < 45 yrs).
- Left Ventricular Ejection Fraction of > 50%.
- ECG – Sinus rhythm with no conduction defect.

Exclusion Criteria

- Any patients having cardiac diseases like valvular heart disease, ischemic and congestive heart failure; cardiomyopathy, atrial fibrillation, ventricular fibrillations and acute coronary syndromes were excluded from the study.
- Patients > 45 yrs old.
- Documented or suspected cardiomyopathies
- Athletes
- Patients with abnormal EF, EF < 50%
- Lung diseases like COAD, ILD, bronchiectasis.
- Chest wall abnormalities, CKD or any chronic diseases
- Patients with known macrovascular or microvascular complications of T2DM and systemic hypertension.

Methodology

150 patients thus taken were subjected to thorough clinical examination supported by relevant investigations.

- Blood glucose on admission: FBS, PPBS,
- Renal function tests, including electrolytes,
- Glycosylated hemoglobin (HbA1c),
- Fasting Lipid profile,
- Urine routine and microscopy,
- ECG,
- Fundoscopy,
- Chest x-ray,
- Echocardiography,

Echocardiography

Measurements of the different cardiac chambers were made according to recommendations of the ASE / EACVI 2016 guidelines.

A team of two experienced sonographers performed all echocardiography measurements. All echocardiography examinations were recorded for offline analysis by a second team of two investigators blinded to the patient's diagnosis. The study was approved by the Local Ethics Committee and informed consent was obtained from all participants.

Studies were done using ALOCA CO. Ltd Pro Sound Alpha 6 machine with 2.5 to 5 MHz probes.

- Tissue doppler echo was performed by activating the tissue doppler function in the same machine. Images were obtained using the apical 4 chamber view and parasternal long & short axis views.
- Diastolic dysfunction of left ventricle was assessed according to guidelines of ASE and EACVI, 2016 by evaluating
 - e'- Early diastolic septal velocity @ mitral valve
 - E – peak velocity at Early mitral inflow
 - A – peak velocity at late mitral inflow
 - LA volume index
 - TR velocity

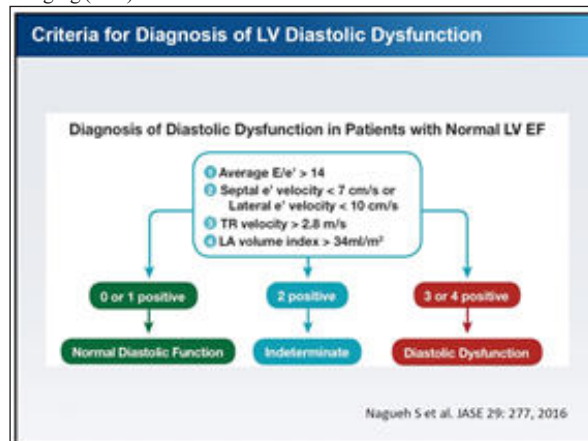


ALOCA CO. Ltd ProSound Alpha 6

Conventional transthoracic echocardiography

Grading Of Diastolic Dysfunction (diastolic Filling Pattern)

Grading of diastolic dysfunction with preserved systolic function done according to 2016 American society of echocardiography (ASE) / European association of cardiovascular imaging (EACVI) guidelines assessed via transthoracic echocardiography and Tissue Doppler Imaging (TDI).



Statistical Analysis

- The statistical analysis was done by using 16.0 version of statistical software SPSS. Chi-square test was used for comparison of qualitative data
- Multiple logistic regression was used to model for LVDD occurrence.

All these tests were routinely carried out among the Diabetic patients and Hypertensive patients, there was no financial burden on patients and all expenditure was incurred by the researchers

RESULTS AND OBSERVATIONS

Table-1 : Distribution Of Patients According To Their Age.

Age	Study Group		Control Group	
	T2DM (n=48)	Syst. HTN (n=27)	(n=75)	
	Mean	SD	Mean	SD
	43.08	2.18	43.11	2.12
			42.60	2.08

Table-2: Distribution Of Patients According To Their Gender.

Sex	Study Group		Control Group	
	T2DM	Syst. HTN		
	No. of Pts.	%	No. of Pts.	%
Male	28	37.33%	17	22.67%
Female	20	26.67%	10	13.33%

Table-3: Prevalence And Grading Of Diastolic Dysfunction In T2DM Patients And Control Group. (according To 2016 ASE/EACVI Guidelines)

Stages of LV diastolic dysfunction	Study Group		Control Group	
	No. of Patients	%	No. of Patients	%
Diastolic dysfunction	17	35.42%	5	6.67%
Indeterminate	7	14.58%	7	9.33%
Normal Diastolic function	24	50.00%	63	84%
TOTAL	48	100%	75	100%

Table-4: Prevalence And Grading Of Diastolic Dysfunction In Hypertension Patients And Control Group. (According To 2016 ASE/EACVI Guidelines)

Stages of LV Diastolic Dysfunction	Study Group		Control Group	
	No. of Patients	%	No. of Patients	%
Diastolic dysfunction	9	33.33%	5	6.67%
Indeterminate	4	14.81%	7	9.33%

Normal Diastolic function	14	51.85%	63	84%
TOTAL	27	100%	75	100%

Table-5: Comparison Of E'-value In Grading Of LVDD Between Study Group (T2DM) And Control Group. (according To 2016 ASE/EACVI Guidelines)

Stages of LV Diastolic Dysfunction	Study Group (T2DM) (n=48)		Control Group (n=75)		P-value
	Mean	SD	Mean	SD	
Diastolic Dysfunction	3.68	0.59	4.74	0.44	0.0001
Indeterminate	5.64	0.67	5.41	0.49	0.0300
Normal Diastolic Function	6.60	0.68	7.76	0.68	0.0001

P value of <0.05 is accepted as statistically significant difference between two groups.

Table-6: Comparison Of E'-value In Grading Of LVDD Between Study Group (Syst. HTN) And Control Group. (According To 2016 ASE/EACVI Guidelines).

Stages of LV Diastolic Dysfunction	Study Group (HTN) (n=27)		Control Group (n=75)		P-value
	Mean	SD	Mean	SD	
Diastolic Dysfunction	3.88	0.60	4.74	0.44	0.0001
Indeterminate	5.05	0.58	5.41	0.49	0.0003
Normal Diastolic Function	7.05	0.72	7.76	0.68	0.0001

P value of <0.05 is accepted as statistically significant difference between two groups.

Table-7: Comparison Of Average E/e' With Grading Of LVDD Between Study Group (T2DM) And Control Group. (According To 2016 ASE/EACVI Guidelines)

Grading of LV diastolic dysfunction	Study Group (T2DM) (n=48)		Control Group (n=75)		P-value
	Mean	SD	Mean	SD	
Diastolic Dysfunction	18.66	1.75	16.38	1.54	0.0001
Indeterminate	15.40	0.77	15.10	0.66	0.0230
Normal Diastolic Function	11.58	1.76	10.90	1.42	0.0200

P value of <0.05 is accepted as statistically significant difference between two groups.

Table-8: Comparison Of Average E/e' In Grading Of LVDD With Study Group (Syst. HTN) And Control Group. (According To 2016 ASE/EACVI Guidelines)

Grading of LV diastolic dysfunction	Study Group (HTN) (n=27)		Control Group (n=75)		P-value
	Mean	SD	Mean	SD	
Diastolic Dysfunction	18.17	1.98	16.38	1.54	0.0001
Indeterminate	15.1	0.60	15.10	0.66	1.0000
Normal Diastolic Function	10.86	1.47	10.90	1.42	0.9013

P value of <0.05 is accepted as statistically significant difference between two groups.

Table-9: Comparison Of LA Volume Index In Grading Of LVDD Between Study Group (T2DM) And Control Group. (According To 2016 ASE/EACVI Guidelines)

Grading of LV diastolic dysfunction	Study Group (T2DM) (n=48)		Control Group (n=75)		P-value
	Mean	SD	Mean	SD	
Diastolic Dysfunction	38.45	2.68	35.68	0.52	0.0001
Indeterminate	28.51	2.60	30.13	1.19	0.0001
Normal Diastolic Function	26.30	3.05	23.84	3.33	0.0001

P value of <0.05 is accepted as statistically significant difference between two groups.

Table-10: Comparison Of LA Volume Index In Grading Of LVDD Between Study Group (Syst. HTN) And Control Group. (According To 2016 ASE/EACVI Guidelines)

Grading of LV diastolic dysfunction	Study Group (Syst. HTN) (n=27)		Control Group (n=75)		P-value
	Mean	SD	Mean	SD	
Diastolic Dysfunction	35.68	2.85	35.68	0.52	1.0000
Indeterminate	29.4	1.02	30.13	1.185	0.0056
Normal Diastolic Function	24.51	3.30	23.84	3.33	0.3710

P value of <0.05 is accepted as statistically significant difference between two groups.

Table-11: Comparison Of 2D-Echocardiographic Parameters Between Study Group (T2DM) And Control Group.

2D-Echocardiographic parameters	T2DM (n=48)	Control (n=75)	p-value
Septal e'	5.281.49	7.34 1.17	0.0001
Average E/e'	13.913.65	11.652.23	0.0001
TR velocity	2.590.84	2.80.46	0.0762
LA volume index	30.157.33	25.214.55	0.0001

Table-12: Comparison Of 2D-Echocardiographic Parameters Between Study Group (Syst. HTN) And Control Group.

2D-Echocardiographic parameters	Syst. HTN (n=27)	Control (n=75)	p-value
Septal e'	5.701.61	7.34 1.17	0.0001
Average E/e'	13.923.72	11.652.23	0.0001
TR velocity	2.810.52	2.80.46	0.9112
LA volume index	28.967.61	25.214.55	0.3191

Table-13: Association Of Duration Of T2DM With Respect To Stages Of LVDD (n=48).

Duration (in month)	Diastolic dysfunction		Indeterminate		Normal diastolic function	
	No.	%	No.	%	No.	%
0-6	6	12.50	3	6.25	6	12.50
06-36	7	14.58	3	6.25	13	27.08
> 36	4	8.33	1	2.08	5	10.42
Total	17	35.42	7	14.58	27	56.25

In asymptomatic T2DM patients of <45 age, duration of disease had no significant effect on prevalence and grading of LVDD.

Table-14: Association Of Duration Of Syst. HTN With Respect To Stages Of LVDD (n=27).

Duration (in month)	Diastolic dysfunction		Indeterminate		Normal diastolic function	
	No.	%	No.	%	No.	%

0-6	4	14.81	2	7.41	8	29.63
6-36	2	7.41	1	3.70	5	18.52
> 36	3	11.11	1	3.70	1	3.70
Total	9	33.33	4	14.81	14	51.85

In asymptomatic Syst. HTN patients of <45 age, duration of disease had no significant effect on prevalence and grading of LVDD.

Table-15: Effect Of Regular Follow Up In T2DM With Respect To Stages Of LVDD (n=48).

Follow-up	Normal diastolic function	Diastolic dysfunction
	No.	No.
Regular	23	6
Irregular	8	11
Total	31	17

Results

Odds ratio	5.2708
95 % CI:	1.4664 to 18.9449
z statistic	2.547
Significance level	P = 0.0109

In asymptomatic T2DM patients of <45 age who had regular follow up and medications were found to be having normal diastolic function 5 times better than who didn't had regular follow up.

Table-16: Effect Of Regular Follow Up In Syst. HTN With Respect To Stages Of LVDD (n=27).

Follow-up	Normal diastolic function	Diastolic dysfunction
	No.	No.
Regulation	15	3
Irregular	3	6
Total	18	9

Results

Odds ratio	10.0000
95 % CI:	1.5576 to 64.2001
z statistic	2.427
Significance level	P = 0.0152

In asymptomatic Syst. HTN patients of <45 age who had regular follow up and medications were found to be having normal diastolic function 10 times better than who didn't had regular follow up

Table-17: Odd's Ratio Of Diastolic Dysfunction In T2DM With Respect To Control Group.

	T2DM (n=48)	Control(n=75)
	No.	No.
Diastolic dysfunction	17	5
Normal diastolic function	31	70
Total	48	75

Odds ratio	7.6774
95 % CI:	2.5992 to 22.6777
z statistic	3.689
Significance level	P = 0.0002

T2DM patients had 7.67 times more prone to get diastolic dysfunction as compare to control group (general population).

Table-18: Odd's Ratio Of Diastolic Dysfunction In Syst. HTN With Respect To Control Group In Regular Medications N Follow Up.

	Syst. HTN (n=27)	Control(n=75)
	No.	No.
Diastolic dysfunction	09	5
Normal diastolic function	18	70
Total	27	75

Odds ratio	7.0000
95 % CI:	2.0879 to 23.4682
z statistic	3.153
Significance level	P = 0.0016

T2DM patients had 7 times more prone to get diastolic dysfunction as compare to control group (general population).

DISCUSSION

This study was undertaken in tertiary care centre MLB Medical

College, Jhansi (U.P.), it's a cross sectional observational study which was conducted with the aim of determining the prevalence and determinants and grading of LVDD (according to ASE/EACVI guideline). Among asymptomatic T2DM patients and Syst. HTN patients to compare them with control group. The participants of our study were aged <45 yrs. Total 150 patients underwent Echocardiographic evaluation and classified based on diagnosis i.e. T2DM (n=48), Syst. HTN (n=27) and rest were control group (n=75).

This study support the evidence that LV diastolic function may impaired early in patients with asymptomatic diabetes mellitus patients and Syst. HTN patients of age <45yrs in great proportions as compared to general population of age n sex matched controls. It precedes before the development of symptomatic LV systolic or diastolic dysfunction and this is seems to be comparable to the previous reports.

Mean age of T2DM patients (43.082.8, 41.6% females). Syst HTN patients (43.112.12, female 37.07%) and control group (42.602.08, 40% female).

In our study prevalence of LVDD in T2DM found to be 34.52% vs. 6.25%. Indeterminate 14.58% vs. 10.42% and normal diastolic function 50% vs. 83.3%, in Syst. HTN. LVDD found to be 33.3% vs. 6.25%, indeterminate 14.81% vs. 10.42% normal diastolic function 51.85% vs. 83.3% which was similar to the result of Tatsunori Toida *et al.*, (2019)^[7] Sixty-three prevalent hemodialysis patients (median age [interquartile range], 69 [64-75] years, 31.7% female) with normal systolic function (LVEF > 50%) were enrolled. LVDD evaluated by echocardiography at baseline was divided into three groups according to ASE/EACVI recommendations (normal diastolic function [ND], n = 24; intermediate, n = 19; diastolic dysfunction [DD], n = 20).

Jain K^[8] *et al.*, Doppler parameters found a total of 50 diabetics out of which 33 (66%) patients had diastolic dysfunction.

Sharavanan TKV^[9-10] *et al.*, reported prevalence of diastolic dysfunction in diabetic patients was 66 (55.0%).

Patil VC^[11] *et al.*, in their hospital based study done on Diastolic dysfunction in asymptomatic type 2 diabetes mellitus with normal systolic function demonstrated that the prevalence rate of diastolic dysfunction was 54.33%.

Nikhil^[12] *et al.*, reported in their study that 66% of diabetic patients had diastolic dysfunction.

Patil^[7] *et al.*, in their study of 127 asymptomatic type II diabetics found a significant incidence (54.33%) of diastolic dysfunction in diabetics.

E' Value In DD In T2DM And Syst. HTN

Among TDI parameters e' (medial annular velocity at early diastolic phase) found to be reduced in T2DM and Syst. HTN patients in comparison to control group which was statistically significant i.e. p-value 0.001.

Our study showed average e' value of T2DM to be 5.431.49 vs 7.341.18 and Syst. Hypertension patients e' found to be 5.701.61 vs 7.341.18 these velocity of mitral annulua at medial annular level which was similar to Vinereanu *et al*^[13], studied patients with Type II DM, recorded the Em velocity at the lateral mitral annulus level. They described that 29% of the patients presented a lateral Em velocity inferior to 8 cm/sec(34).

E/e' n LA volume index

In our study mean E/e' in T2DM found to be 13.91 3.65 vs. 11.102.04 was found to be statistically significant with p-value 0.0001 and in Syst. HTN patients E/e' was 13.92 3.72 vs. 11.102.04 was found to be statistically significant with p-value 0.0001 these results were similar to Tulizo Shemu Sanga *et al*^[14], (2012) i.e Diastolic dysfunction among the admitted participants was statistically associated with larger LA diameter, lower E' velocity and higher E/E' ratio, >>15 i.e. (24.6% among in-patients vs 0.7% of outpatients) p<0.05). This reflects higher left ventricular filling pressures among in-patients.

Nagueh *et al*^[15], while evaluating on the relationship between Mitral E/E' prime and left ventricular filling pressure using tissue Doppler imaging, revealed that 121 E/E' ratio relates well to mean Pulmonary

capillary wedge pressure¹²² Further more, higher E/E' ratio was found to be an independent predictor of more than mild form of diastolic dysfunction $R^2=0.26$, $p<0.001$).

In a study done by Senthil N. *et al*^[16], LVDD was found in 30 (30%) patients. All patients had impaired relaxation by ECHO. None of the patients had pseudonormal pattern or restrictive pattern. They are also observed Echocardiography parameters of normal subjects as follows: IVRT (ms) 106 ± 17 , E wave (cm/s) 69 ± 11 , A wave (cm/s) 52 ± 9 , E/A 1.34 ± 0.17 , DT (ms) 189 ± 42 , A wave duration (ms) 129 ± 16 and Impaired relaxation subjects found Number of IVRT (ms) 109 ± 11 , E wave (cm/s) 56 ± 10 , A wave (cm/s) 71 ± 3 , E/A 0.79 ± 0.07 , DT (ms) 224 ± 51 , A wave duration.

ODDS RATIO

In our study in T2DM patients T2DM patients had 7.67 times more prone to get diastolic dysfunction as compare to control group and in Syst. HTN i.e. 7 times more prone to get diastolic dysfunction as compare to control group which was found similar to Suresh, *et al*^[17]. Prevalence of asymptomatic left ventricular diastolic dysfunction, in that study, odds ratio was 6, indicating a 6 times higher risk of developing diastolic dysfunction among cases compared to the control group subjects (95% confidence interval: 2.528–14.240).

Age And Sex Of The Patient

in our study Age and Sex didn't had statically significance in causal of diastolic dysfunction which was similar to Suresh^[17], *et al.*, Prevalence of asymptomatic left ventricular diastolic dysfunction Age is a known indicator in impaired diastolic function. However, in this study, the prevalence of diastolic dysfunction among the age groups and gender did not show any significant difference in both groups. Grades of diastolic dysfunction also showed no relation to age and gender.

T2DM With Duration Of Disease

In our study since we selected young asymptomatic T2DM Syst. HTN patients of age group <45 yrs. In our study duration of disease did not had statically significant relation with causal of diastolic dysfunction which is similar to Raev *et al*^[18], study, diastolic dysfunction was present even in patients of 6 months duration of diabetes. It was observed in the present study that majority of the patients (56%) had diabetes for <1year while 16 (32%) and 6 (12%) patients had diabetes for 1-3years and >3 years respectively. The mean duration of diabetes was 16.48 ± 13.3 months.

CONCLUSION

The overall prevalence of Left Ventricular Diastolic Dysfunction (LVDD) in asymptomatic T2DM individual and hypertensive individuals of age <45 are 35.42% and 33.3% respectively and in control group LVDD found to be 6.67%. This study shows significantly higher prevalence of diastolic dysfunction in diabetic patients and Syst. HTN patients with a 7.67 and 7 times respectively higher risk of developing diastolic dysfunction as compared to the healthy controls. No correlation between age and gender with diastolic dysfunction was noted in the study.

TDI markers such as e' and E/e are most reliable markers, LA size and peak TR velocity are used along these in early detection of LV diastolic dysfunction since this influence the outcome and prognosis of diabetic and hypertensive patients and has an important therapeutic implications.

When asymptomatic LVDD present in T2DM and Syst. HTN at younger ages suggestive of pre-clinical cardiomyopathy which may progress to heart failure

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