



## COMPARISON OF LEFT VENTRICULAR DIASTOLIC DYSFUNCTION IN CONTROLLED AND UNCONTROLLED DIABETES IN LOCAL POPULATION

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Submission Date : 29-04-2019

Revision Date: 26-08-2019

Publication Date: 20-09-2019

### Author's Contribution

FMA: Conducted the study and wrote the article. QAS: Helped in review the article. AM: Re-arranged data and corrected article. QMT: Tables and figures. AH and AA were consultants in charge of the study and gave frequent advice, corrections and did the proof reading.

### All authors declare no conflict of interest.

This article may be cited as: Awan FM, Saboor QA, Tufail QM, Hilal A, Rehman MA, Malik A. Comparison of left ventricular diastolic dysfunction in controlled and uncontrolled diabetes in local population. (J Cardiovasc Dis 2019;15(1):13 - 16)

### ABSTRACT

**BACKGROUND:** The incidence of diabetes mellitus is increasing day by day throughout the world and it is need of time to cautiously follow the diabetics patients for the development of complications especially cardiovascular complications which is a major cause of morbidity and mortality. One of the cardiovascular complication is the increase in the frequency of diastolic dysfunction in diabetic patients and early detection of diastolic dysfunction is very important.

**OBJECTIVE:** The objective of this study was to determine the frequency of uncontrolled diabetes and to compare the frequency of Left ventricular diastolic dysfunction (LVDD) in controlled and uncontrolled diabetics.

**MATERIAL AND METHODOLOGY:** This was a cross sectional study conducted over a period of five months. A total of 150 patients fulfilling inclusion criteria were enrolled in the study from diabetic clinic of SZH Lahore. Patients were evaluated for hypertension and cardiac diseases so that effect modifiers could be controlled. Weight and height were measured to calculate the BMI of the cases. Patients were assessed for HbA1c by getting 3ml blood and labeled as controlled versus uncontrolled diabetics. Later on all demographics features of patients like age, gender, name and address were noted. A qualified staff nurse took blood pressure readings of patients with standard mercurial sphygmomanometer. Toshiba Aplio diagnostic ultrasound system SSA-700A equipped with TDI technology with probe of 4.2MHz was used to calculate E/A, isovolumic relaxation time (IVRT), deceleration time (DT) and E/e'. and LVDD was recorded on pre-defined proforma.

**RESULTS:** In this study, out of 150 patients of diabetes mellitus, 17.33%(n=26) were in the range of 20-40 years of age while 82.67%(n=124) were between 41-60 years of age, mean  $\pm$  SD was calculated as  $49.72 \pm 7.16$  years. 56.67%(n=85) were male while 43.33%(n=65) were females, frequency of uncontrolled diabetes in diabetic patients was 69.33%(n=104). Frequency of LVDD in controlled and uncontrolled diabetics in local population; 46 cases of controlled diabetics, 60.87%(n=28) and 83.65%(n=87) out of 104 cases in un-controlled diabetics were recorded with Left Ventricular Diastolic Dysfunction, p value was calculated as 0.05 which is significant.

**CONCLUSION:** The frequency of uncontrolled diabetes is higher in diabetic patients while these cases have significantly higher frequency of LV diastolic dysfunction as compared to controlled diabetics

**KEYWORDS:** Diabetes mellitus, control, uncontrolled, LV Diastolic Dysfunction.

(J Cardiovasc Dis 2019;15(1):13 - 16)



## INTRODUCTION

The Prevalence of diabetes mellitus is increasing day by day and is like an epidemic. Diabetes mellitus is considered to be an equivalent of cardiovascular disease. The most common complication in patients with uncontrolled diabetes mellitus HbA1c more than 7.5% is involvement of cardiovascular system. One of the cardiovascular complication is development of diastolic dysfunction of left ventricle which may also occur in asymptomatic diabetic patients. Diastolic heart failure is more common in patients of middle age with longer duration of uncontrolled DM. Proper early diagnoses and its treatment may lead to prevention of more advanced cardiovascular complications and relief for the patients.<sup>1</sup>

Diastolic heart failure (HF) is defined as presence of diastolic dysfunction on echocardiography but with preserved left ventricular contractile function. The diastolic dysfunction in diabetic patients may be due to presence of ischemic heart disease and high blood pressure so there is need to evaluate the diabetic patients for both systolic and diastolic dysfunction of myocardium.<sup>2,3</sup>

The rationale of the study was to determine the impact of diabetes on LVDD. It has been discussed in various studies that diabetes can lead to severe heart conditions and LVDD is one of these, but data is lacking about a comparison between uncontrolled and controlled diabetic population with respect to LVDD. This study will give results for our local population, where more people are suffering from poorly controlled diabetes mellitus.<sup>7</sup> Based on these results we will be able to plan strategies for control of diabetes and LVDD in our population.

## MATERIAL & METHODS:

This was a cross sectional study conducted at Diabetic clinic and Department of Cardiology, Shaikh Zayed Post Graduate Medical Institute, Lahore over the period of five months from 01.03.16 to 31.07.16. A total number of 150 cases calculated with 95% confidence level, 8% (i.e weight %) margin of error with an expected percentage of uncontrolled diabetes mellitus i.e. 63.8% as diabetes patients

Patients of both genders with ages between 20 to 60 years and diagnosed diabetes for at least 1 year were included. Diabetes mellitus was labelled if the patients has fasting golucous level more than 126mg /dl for one year. Controlled diabetes was labelled as HbA1c level less than 7.5 % and uncontrolled diabetes patients were having HbA1c level more than 7.5 %. LVDD was considered to

be present if there was abnormality in the values of E/A ratio, DT, IVRT , E/e' ratio.

Patients with history of coronary artery disease (assessed on ECG), History of valvular problems (assessed on echocardiography), patients with BMI > 30 at the time of enrollment in study, known hypertensive patients (systolic bp > 140 mmHg), patients with atrial fibrillation (assessed on ECG) were excluded.

## DATA COLLECTION:

A total of 150 patients fulfilling inclusion criteria were enrolled in the study from diabetic clinic of SZH Lahore. Patients were evaluated for hypertension and cardiac diseases so that effect modifiers could be controlled. Weight and height was measured to calculate the BMI of the case. Patients were assessed for HbA1c by getting 3ml blood and labeled as controlled versus uncontrolled diabetics. Later on all demographics of patient like age, gender, name and address were noted. A qualified staff nurse took blood pressure readings of patients with standard mercurial sphygmomanometer. Toshiba Aplio diagnostic ultrasound system SSA-700A equipped with TDI technology with probe of 4.2MHz was used to calculate E/A, isovolumic relaxation time (IVRT), deceleration time (DT) and E/e'. LVDD was confirmed as per operational definition. All data was recorded on pre-defined performa.

## DATA ANALYSIS:

Collected data was entered and analyzed using SPSS 20.0. Quantitative data like age, and diabetes duration was described by mean + S.D, while quantitative data like gender, diastolic dysfunction of uncontrolled and controlled DM was described using frequency and percentage. Chi-square test was used to check the significant difference between controlled and uncontrolled diabetic groups for LVDD. After stratification, Chi-Square test was applied. A p-value less than 0.05 was considered significant.

**TABLE No. 1: STRATIFICATION FOR FREQUENCY OF LEFT VENTRICULAR DIASTOLIC DYSFUNCTION WITH REGARDS TO AGE, GENDER AND DURATION OF DIABETIC (n=115)**

		LVDD		P value
		Yes	No	
Age (in years)	20-40	22	4	0.29
	41-60	93	31	
Gender	Male	65	20	1.0
	Female	50	15	
Duration of diabetes mellitus	1-5 years	59	26	0.01
	>5 years	56	9	

**TABLE No. 2: FREQUENCY OF LVDD IN CONTROLLED AND UNCONTROLLED DIABETICS IN LOCAL POPULATION (n= 150)**

LVDD	Controlled diabetic (n=46, 30.67%)		Un-controlled diabetic (n=104, 69.33%)	
	No. of patients	%	No. of patients	%
Yes	28	60.87	87	83.65
No	18	39.13	17	16.35
<b>Total</b>	<b>46</b>	<b>100</b>	<b>104</b>	<b>100</b>

**P value=0.002****RESULTS:**

Age distribution of the patients was done, it showed that 17.33%(n=26) were between 20-40 years of age while 82.67%(n= 124) were between 41-60 years of age, mean+SD was calculated as 49.72±7.16 years. Patients were distributed according to gender, it shows that 56.67%(n=85) were males while 43.33%(n=65) were females. Frequency of uncontrolled diabetes in diabetic patients was recorded in 69.33%(n=04) while remaining 30.67%(n=46) had no findings of the morbidity.

Frequency of LVDD in controlled and uncontrolled diabetics in local population was 46 cases of controlled diabetics, 60.87%(n=28) and 83.65%(n=87) out of 104 cases in un-controlled diabetics were recorded with Left Ventricular Diastolic Dysfunction, p value was calculated as 0.002. The data is given in tables. (Table No.1,2)

**DISCUSSION**

Diabetes mellitus (DM) is very common disease worldwide and is increasing day by day. Its frequency is on the rising trend in South East Asia and throughout the world due to which the rate of ischemic heart diseases and diabetic cardiomyopathy is quite common which may lead to development of heart failure both systolic and diastolic. The diastolic dysfunction of myocardium develops relatively at an early stage when the patient is asymptomatic.<sup>3</sup>

This study determined the impact of diabetes on LVDD as there is no previous local study carried out so far. It has been discussed in various studies that diabetes can lead to severe heart conditions and LVDD is one of these.

Different studies have shown that the patient with uncontrolled diabetes and HbA1c level more than 7.5% had a greater probability of developing LVDD (p-value < 0.02). Similarly the more the duration (more than 10 years) of diabetes mellitus the greater the frequency of LVDD(p-value < 0.02). A study published in Journal of Cardiovascular

disease research 2011 showed more than 50% frequency of LVDD in 127 diabetic patients.<sup>4</sup> Our findings are in agreement with previous study regarding higher frequency of diastolic dysfunction in cases with longer duration of diabetes mellitus, while the frequency of LVDD was slightly higher in our study.

In another study of 603 patients with DM and its multivariate analysis showed strong correlation between the values HbA1c level, age, gender and development of LVDD (p-value < 0.0001). This analysis also showed there is no effect of HbA1c level, the medications of diabetes mellitus and LVDD. Sharif et al. conducted a study 306 diabetic patients 63.8% had uncontrolled diabetes mellitus and showed diastolic dysfunction (p-value 0.0001).<sup>5</sup> Our findings are in agreement with the above study regarding higher frequency of LVDD in cases with uncontrolled diabetes mellitus.

The results obtained in our study were also compareable with another study conducted by Alur VC in 2012 which showed higher prevalence of uncontrolled diabetes mellitus and its strong correlation of LVDD.<sup>6</sup> This study also supports our hypothesis that uncontrolled diabetics have significantly more frequency of LVDD as compared to controlled diabetes.

Our findings are supported by a recent study<sup>8</sup> that recorded 60% of the diabetic cases with poor glycemic control (>7HbA1c), another recent study recorded 78.6% of the cases with poor glycemic control.<sup>9</sup>

In our study, out of 150 cases of diabetes mellitus, 17.33%(n=26) were between 20-40 years of age while 82.67%(n= 124) were between 41-60 years of age, mean+sd was calculated as 49.72+7.16 years, 56.67%(n=85) were male while 43.33%(n=65) were females, frequency of uncontrolled diabetes in diabetic patients was recorded in 69.33%(n=04), frequency of LVDD in controlled and uncontrolled diabetics in local population was recorded, it shows that out of 46 cases of controlled diabetics, 60.87%(n=28) and 83.65%(n=87) out of 104 cases in un-controlled diabetics were recorded with Left Ventricular Diastolic Dysfunction, p value was calculated as 0.002, showing a significant difference.

The findings of our study determined that the frequency of uncontrolled diabetes mellitus is significantly higher while these cases are having significantly higher risk of LVDD than controlled diabetics. Based on these results we are able to



plan strategies for control of diabetes and LVDD in our population. However, being the primary data, some-other trials are inevitable for validation of our results.

### CONCLUSION:

The frequency of uncontrolled diabetes is higher in diabetic patients while these cases have significantly higher frequency of LV diastolic dysfunction as compared to controlled diabetics

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