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# ASYMPTOMATIC DIABETICS; DIASTOLIC DYSFUNCTION

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**ABSTRACT… Background:** Diabetes mellitus (DM) is not only a significant independent risk factor for developing of atherosclerotic ischemic heart disease or ventricular hypertrophy but it is also able to trigger a diabetic cardiomyopathy due to dysmetabolic processes resulting heart failure. Cardiovascular complications are known to be the main cause of death and morbidity in diabetic patients. **Objectives:** How frequent is the diastolic dysfunction in asymptomatic diabetic? **Study Design:** Descriptive cross sectional. **Setting:** Echocardiography department Faisalabad Institute of Cardiology Faisalabad. Patients were recruited from outpatient department of Faisalabad institute of cardiology Faisalabad. **Duration of Study:** Six months from: 28-06-2015 to 28-12-2015. **Methodology:** 200 patients were included in the study. Patient's bio data was recorded and informed consent was taken. All echocardiographic studies were performed with VIVID-07 echo machine by the same operator. Detailed assessment of left ventricular systolic and diastolic function by using standard 2-dimensional, color flow Doppler and tissue Doppler imaging (TDI) was done. Images were obtained in all patients. Each patient underwent left ventricular (LV) diastolic function assessment by conventional Doppler, tissue Doppler imaging (TDI). LV ejection fraction was calculated using conventional method. Blood flow velocities at mitral valve leaflets and pulmonary veins were recorded with averaged from 3 end-expiratory cycles at a sweep of 100 mm/s. This information was collected through a specially designed proforma by the author. **Results:** In our study, out of 200 cases, 52%(n=104) were between 50-55 years of age while 48%(n=96) were between 56-60 years of age, mean+sd was calculated as 55.54+2.59 years, 49%(n=98) were male while 51%(n=102) were females, frequency of diastolic dysfunction in asymptomatic, normotensive patients with diabetes mellitus was recorded as 45.5%(n=91) while 54.5%(n=109) had no findings of the morbidity. **Conclusion:** We conclude that the frequency of diastolic dysfunction is quite high (45.5%) in asymptomatic diabetics.

**Key words:** Type II diabetes mellitus, normotensive, diastolic dysfunction

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## INTRODUCTION

Patients with diabetes mellitus are high risk for cardiovascular deaths even diabetic women have greater risk than non-diabetics.[1] International Diabetic Federation indicated significant increase number of diabetic.[2]

Cardiac disease in diabetes mellitus consists of both vascular and myocardial abnormalities. The latter are characterized predominantly by diastolic dysfunction.[3] Diastolic dysfunction is an early sign of diabetic cardiomyopathy.[4] Myocardial diastolic dysfunction with normal systolic function causes exertional symptoms in type 2 diabetic subjects may lead to heart failure require an aggressive treatment.[5,6]

High prevalence of diastolic dysfunction in diabetic best assessed with echocardiography.[7,8] However different studies documented different prevalence of diastolic dysfunction in diabetics.[9,10]

The objective of this study is to estimate the frequency of diastolic dysfunction in asymptomatic diabetics by Doppler echocardiography in our population. Literature has reported controversial results as one study has reported low frequency while other reported it to be high. Moreover, previous studies were conducted on small sample size.[9-10] we will conduct this study on relatively large sample size to gain more precise results. This will help for early detection of heart failure in diabetic patients.

## OBJECTIVE

How frequent is the diastolic dysfunction in asymptomatic diabetic?

## OPERATIONAL DEFINITION

### Diastolic Dysfunction

All of the followings echocardiographic criteria was used for Diastolic dysfunction.

- Mitral valve E/A ratio less than 1 or greater than 2.
- Mitral valve Deceleration time (DT) less than 160 or greater than 240 (msec).
- Isovolumic relaxation time (IVRT) less than 60 or greater than 90 (msec).
- Tissue Doppler imaging velocity (eTDI) at septal and lateral mitral annulus less than 8 (cm/s).
- The pulmonary vein S/D less than 1.

## ASYMPTOMATIC PATIENTS

- The patients having no cardiac symptoms i.e. chest pain, shortness of breath, peripheral edema (swelling of feet) on the basis of history.

### Diabetes mellitus

- It is defined as presence of FBS >126mg/dl and RBS >186mg/dl on consecutive two readings and patient is taking anti-diabetic drugs for one year.

## MATERIALS AND METHODS

### Study Design

Descriptive cross sectional.

### Setting

Echocardiography department Faisalabad Institute of Cardiology Faisalabad.

### Duration of Study

Six months after approval of synopsis.
From: 28-06-2015 to 28-12-2015

### Sample Size

By using WHO sample size calculator.
P = 48 % [10]
Confidence level = 95 %
Absolute precision required = 7%
Sample size = 200

### Sampling Technique

Non probability consecutive sampling.

### Inclusion Criteria

1. Patients having at least one year history of diabetes mellitus insulin and non-insulin dependent.
2. Patients 50 to 60 years of age, including both genders.
3. Asymptomatic, normotensive patients with diabetes mellitus as per operational definition.

### Exclusion Criteria

1. Evidence of coronary, valvular, congenital heart disease, myocardial, infiltrative pericardial or pulmonary disease.
2. Diabetic patients with complications like Nephropathy, Neuropathy, and Retinopathy on history and available medical records.

### Data Collection Procedure

200 patients were included in the study. Patient's biodata was recorded and informed consent was taken. All echocardiographic studies were performed with VIVID-07 echo machine by the same operator. Detailed assessment of left ventricular systolic and diastolic function by using standard 2-dimensional, color flow Doppler and tissue Doppler imaging (TDI) was done. images were obtained in all patients. Each patient underwent left ventricular (LV) diastolic function assessment by conventional Doppler, tissue Doppler imaging (TDI). LV ejection fraction was calculated using conventional method. Blood flow velocities at mitral valve leaflets and pulmonary veins were recorded with averaged from 3 end-expiratory cycles at a sweep of 100 mm/s. This information was collected through a specially designed proforma by the author.

### Data Analysis Procedure

SPSS version 20.0 was used for data analysis. Qualitative variables i.e. age was presented as mean and standard deviations. Categorical variables i.e. gender was presented as frequencies and percentages. Presence and absence of diastolic dysfunction in diabetics was presented by calculating frequency and percentage. Effect modifiers like age and gender was controlled by

stratification. Post-stratification chi-square test was applied. Significant P-value was less than 0.05.

## RESULTS

200 cases were enrolled in the study.

### Age Distribution

Age distribution of the patients was done showing that majority of the patients were between 50-55 years of age, mean+sd was calculated as 55.54+2.59 years. (Table-I)

| Age (in years) | No. of patients | % |
|---|---|---|
| 50-55 | 104 | 52 |
| 56-60 | 96 | 48 |
| **Total** | **200** | **100** |

**Table-I. Age distribution (n=200) Mean+sd: 55.54+2.59**

### Gender Distribution

Distribution of cases according to gender showing that majotity of the patients were females. (Table-II)

| Gender | No. of patients | % |
|---|---|---|
| Male | 98 | 49 |
| Female | 102 | 51 |
| **Total** | **200** | **100** |

**Table-II. Gender distribution (n=200)**

### Frequency of Diastolic Dysfunction

Frequency of diastolic dysfunction in asymptomatic patients with diabetes mellitus was recorded as 45.5% (n=91). (Table-III)

| Diastolic dysfunction | No. of patients | % |
|---|---|---|
| Yes | 91 | 45.5 |
| No | 109 | 54.5 |
| **Total** | **200** | **100** |

**Table-III. Frequency of diastolic dysfunction in asymptomatic patients with diabetes mellitus (n=200)**

### Stratification

Stratification for age and gender was calculated and presented in Table-IV & V respectively.

| Age (in years) | Diastolic Dysfunction | | P value |
|---|---|---|---|
| | Yes | No | |
| 50-55 | 53 | 51 | 0.10 |
| 56-60 | 38 | 58 | |

**Table-IV. Stratification for frequency of diastolic dysfunction with regards to age**

| Gender | Diastolic Dysfunction | | P value |
|---|---|---|---|
| | Yes | No | |
| Male | 43 | 55 | 0.65 |
| Female | 48 | 54 | |

**Table-V. Stratification for frequency of diastolic dysfunction with regards to gender**

| | Male | Female | P-Value |
|---|---|---|---|
| E/A Ratio | 0.90 SD ± 2.73 | 0.94 SD ± 1.81 | 0.10 |
| DT | 251 SD ± 4.76 | 244 SD ± 2.80 | 0.24 |
| IVRT | 95 SD ± 1.47 | 98 SD ± 3.20 | 0.08 |
| ETDI (Septal) | 7.75 SD ± 0.20 | 7.68 SD ± 0.13 | 0.32 |
| ETDI (Lateral) | 9.70 SD ± 0.22 | 9.65 SD ± 18 | 0.45 |
| E/e- | 15.95 SD ± 0.56 | 15.78 SD ± 0.37 | 0.10 |

**Table-VI. Stratification for frequency of diastolic dysfunction with regards to gender**

## DISCUSSION

Diabetes is among the most common chronic disease in the world. The mounting incidence and prevalence of type 2 diabetes is related to increasing age, obesity and physical inactivity. Diabetics have more cardiovascular complications leading to death. In ambulatory setting diabetes is independently associated with two to five fold increased risk of heart failure over that in person without diabetes. Diabetes cause deposition of collagen and glycation end products in myocardium leading to left ventricular diastolic dysfunction resulting heart failure.

We was planned to determined frequency of asymptomatic diastolic dysfunction in diabetics

by Doppler echocardiography. Literature has reported controversial results as one study has reported low frequency(48%) while other reported it to be high (63,2%). Moreover, previous studies have been conducted on small sample size. We conducted this study on relatively large sample size to gain more precise results.

In our study, out of 200 cases, 52%(n=104) were between 50-55 years of age while 48%(n=96) were between 56-60 years of age, mean+sd was calculated as 55.54+2.59 years, 49%(n=98) were male while 51%(n=102) were females, frequency of diastolic dysfunction in asymptomatic diabetics was recorded as 45.5%(n=91) while 54.5%(n=109) had no findings of the morbidity. These findings are comparable with several studies.[7] Previous studies reported very high incidence (63.2%).[9] Similarly Boyer et al[10] reported high prevalence (75%). However local studies have comparable prevalence (48%) with our findings.[11] Diastolic dysfunction is more often documented with TDI, these findings are also higher than reported in our study. This study confirms that diastolic dysfunction is more prevalent in diabetics.

## CONCLUSION

We concluded that the frequency of diastolic dysfunction is quite high in asymptomatic patients with diabetes mellitus.



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## AUTHORSHIP AND CONTRIBUTION DECLARATION

| Sr. # | Author-s Full Name | Contribution to the paper | Author=s Signature |
|---|---|---|---|
| 1 | Dr. Liaqat Ali | Concept and study design Drafting | |
| 2 | Dr. Naeem Asghar | Data collection, crirical revision of article | |
| 3 | Dr. Imran Khan | Data interpretation and analysis | |