

## Frequency of Left Ventricular Diastolic Dysfunction among Type-II Diabetics with Non-Alcoholic Fatty Liver Disease

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### ABSTRACT

**Aim:** To determine the frequency of left ventricular diastolic dysfunction among type-II diabetics with non-alcoholic fatty liver disease.

**Methods:** This was a cross sectional descriptive study carried out in Bahawal Victoria Hospital Bahawalpur. Patients were taken from Diabetic Clinic of General Medicine OPD from January 2013 to June 2013. They underwent ultrasonography in radiology department and echocardiography in cardiology department of the same institution.

**Results:** In this study, most of the patients i.e., 26(34.21%) were between 41-50 years, common age was calculated as 47.65±3.61 years, 44(57.89%) male and 32(42.11%) females, frequency of left ventricular diastolic dysfunction among type-II diabetics with NAFLD reveals in 38.16% patients.

**Conclusion:** Results of this study revealed that frequency of left ventricular diastolic dysfunction is high among type-II diabetics with NAFLD but comparatively lower than other countries. So, it is recommended that every patient with type-II DM along with NAFLD should be sort out for left ventricular diastolic dysfunction. However, it is also necessary that every health care center should have close observation to know the exact prevalence of this disease.

**Keywords:** Fatty liver disease, non-alcoholic, type-II diabetics, left ventricular diastolic dysfunction

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### INTRODUCTION

In adults of Western world, Non-alcoholic fatty liver disease (NAFLD) is one of the common causes of abnormal liver function. Its spectrum ranges from simple steatosis to non-alcoholic steatohepatitis (NASH), which may progress to end-stage liver disease<sup>1</sup>. NAFLD has common association with type-II DM, obesity, insulin resistance and dyslipidemia and all of these are components of metabolic syndrome, very strongly supporting the notation that NAFLD is the hepatic manifestation of the syndrome<sup>2</sup>.

In comparison with non-diabetics, individuals of type-II DM have an increased risk of development of NAFLD and surely have appeared risk of development of cirrhosis and fibrosis<sup>3</sup>. It is estimated that a significant number of type-II diabetics may have some form of NAFLD. In a study conducted by Bonapace et al. showed that frequency of NAFLD was found 64% in type-II diabetics<sup>4</sup>. In type-II diabetics, cardiac dysfunction and cardiac structure abnormalities may develop, even in absence of ischemic heart disease or hypertension. These abnormalities of cardiac function and structure are attributed to diabetic cardiomyopathy, in which the

basic pathophysiologic mechanisms still unclear. Diabetic cardiomyopathy may induce changes in cardiac structure such as fibrosis, myocardial hypertrophy and fat droplet deposition<sup>5,6</sup>.

Recent research suggest that in type-II diabetics, presence of NAFLD may linked to increased risk of cardiovascular disease (CVD) which is one of the components of metabolic syndrome and having an abnormal fasting glucose carries an even higher risk. About 62% of cases in the Dallas Heart Study who had either known diabetes mellitus or a fasting plasma glucose level >110mg/dl had hepatic steatosis. Several investigators have examined the association of NAFLD with markers of clinical or subclinical CVDs<sup>7</sup>. Early changes in cardiac functions are also manifested as left ventricular diastolic dysfunction that with time can lead to loss of contractile function<sup>8</sup>. Impaired left ventricular (LV) function may frequently be detected in symptomatic diabetic subjects and is related to the extent of diabetes and evidence of micro vascular complications<sup>9</sup>. In a study prevalence of left ventricular diastolic dysfunction in normotensive, asymptomatic patients with type-II DM without significant coronary artery disease was found out to be 75%<sup>10</sup>. While frequency of left ventricular diastolic dysfunction among type-II diabetics with NAFLD was 73%<sup>11</sup>.

The aim of this study was to see the magnitude of left ventricular diastolic dysfunction among type-II diabetic patients with NAFLD as no work has been

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done on it in our population. Therefore this study will create local data. Furthermore, strategy will be developed for early intervention to decrease the mortality and morbidity related to cardiovascular disease.

## MATERIAL & METHODS

This cross sectional study was carried out in Bahawal Victoria Hospital Bahawalpur. Patients were taken from Diabetic Clinic of General Medicine OPD from January 2013 to June 2013. They underwent ultrasonography in radiology department and echocardiography in cardiology department of the same institution.

Well controlled diabetic patients (HbA1c <7%) taking oral antidiabetics for the last 3 years or more and having NAFLD on ultrasonography (hyperechogenicity of the liver relative to the kidneys, ultrasound beam attenuation, and poor visualization of intrahepatic vessel borders), having age 35 years or above, either male or female were included in this study.

Patients already having any previous history of myocardial infarction, patients with previous history of valves dysfunction due to rheumatic heart disease or endocarditis, those patients who had known causes of chronic liver disease (CLD) (drug or alcohol induced liver disease, hemochromatosis, or autoimmune or viral hepatitis), patients having overt nephropathy and patients on insulin were excluded from the study.

Patients with fasting plasma glucose level  $\geq 126$  mg/dl was labeled diabetic, nonalcoholic fatty liver disease (NAFLD) defined as: on ultrasonography, hyperechogenicity of the liver relative to the kidneys, ultrasound beam attenuation, and poor visualization of intrahepatic vessel borders and left ventricular diastolic dysfunction was diagnosed by using pulse wave Doppler on the basis of: E/A ratio of less than 1, mitral deceleration time (DT) >240 ms and Isovolumic relaxation time (IVRT) > 90 msec<sup>12</sup>.

The study was approved from hospital ethical committee. All the patients who fulfill the inclusion criteria were included in this study. After taking the informed written consent from each patient, patients were taken to Department of Cardiology, Bahawal Victoria Hospital Bahawalpur where trans-thoracic echocardiography on pulse wave Doppler mode was performed for left ventricular diastolic dysfunction by measuring E/A ratio at mitral valve tip, DT and IVRT in left lateral position in four chamber view by one assistant professor having at least 3 years post fellowship experience. The machine for echocardiography used was Siemens acuson cv 70. The collected data was entered on pre-designed proforma.

Data was analyzed using SPSS version 15.0. Mean and SD was calculated for age, duration of diabetes. Frequencies and percentages were calculated for gender and left ventricular diastolic dysfunction. Stratification was done for age and gender. Post stratification chi-square test was applied to see the effect of these on outcome variable i.e. left ventricular diastolic dysfunction. P value  $\leq 5\%$  was taken as statistically significant.

## RESULTS

Total 76 patients of type-II DM with NAFLD were selected to determine the frequency of left ventricular diastolic dysfunction. Mean age of selected cases was  $47.65 \pm 3.61$  years. Age distribution of the patients was done and two age groups were made, age group 35-50 years and age group 51-65 years. Out of 44 (57.89%) patients of age group 35-50 years, Ventricular Diastolic Dysfunction was noted in 15 (34.1%) patients. Total 32 (42.11%) belonged to age group 51-65 years and Ventricular Diastolic Dysfunction was noted in 14 (43.75%) patients. Insignificant (P= 0.4754) association of Ventricular Diastolic Dysfunction with age was noted. (Table 1)

Out of 76 patients, male patients were 44 (57.89%) and female patients were 32 (42.11%) and Ventricular Diastolic Dysfunction was noted in 18 (40.91%) patients and 11 (34.38%) female patients. Statistically insignificant (P=0.6365) association of Ventricular Diastolic Dysfunction with gender was noted (Table 2).

Fig. 1: Frequency for Left ventricular diastolic dysfunction

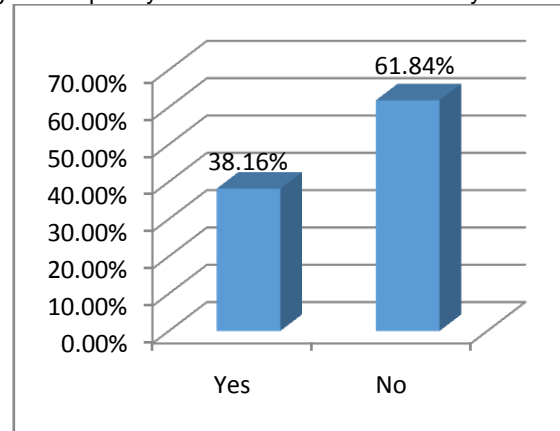


Table 1: Stratification in relation to age

Age	Ventricular Diastolic Dysfunction		Total
	Yes	No	
35-50	15(34.1%)	29(65.9%)	44(57.89%)
51-65	14(43.75%)	18(56.25%)	32(42.11%)
Total	29(38.16%)	47(61.84%)	76

P value = 0.4754

Table 2: Stratification in relation to gender

Gender	Ventricular Diastolic Dysfunction		Total
	Yes	No	
Male	18(40.91%)	26(59.09%)	44(57.89%)
Female	11(34.38%)	21(65.62%)	32(42.11%)
Total	29(38.16%)	47(61.84%)	76

P value = 0.6365

## DISCUSSION

The prevalence of type-II diabetes mellitus and obesity has reached epidemic proportions globally<sup>13,14,15</sup>. It is well known that type-II diabetes mellitus is associated with premature death and it is also an established risk factor of CVD, particularly for chronic heart failure and ischemic heart disease (IHD)<sup>14,15</sup>.

In this study, majority of the patients i.e., 34.21% were between 41-50 years, mean age was 47.65±3.61 years, 57.89% patients were male and 32(42.11%) females patients were female, frequency of left ventricular diastolic dysfunction among type-II diabetics with NAFLD reveals in 38.16% patients. The results of the study are in contrast with Serban A and co-workers regarding frequency of left ventricular diastolic dysfunction among type-II diabetics with NAFLD i.e., 73%, the frequency in our population is comparatively low<sup>11</sup>.

Giovanni Targher and colleagues are of the view that impact of NAFLD regarding on risk for type II – DM and development of major vascular complications needs attention among hepatologist/cardiologist/endocrinologist for screening and surveillance strategies due to increase number of patient NAFLD. Hepatologist and clinicians who are managing patients NAFLD should also focus on increased risk of type-II DM and its vascular complications so that they should undertake aggressive early steps for modification of risk factors<sup>16</sup>.

Previous studies concluded that non-diabetic subjects with NAFLD had early alteration in left ventricular diastolic dysfunction, as detected by using tissue Doppler imaging, compared with control subjects without steatosis<sup>17,18</sup>. Conversely, Perseghin et al<sup>19</sup> showed that non-diabetic male with higher intrahepatic fat content, as measured by 1 H-MRS, had significant alterations in myocardial high-energy phosphate metabolism (i.e., lower myocardial phosphocreatinine-to-ATP ratio) compared with those with lower intrahepatic fat content. However, these alterations of myocardial energy metabolism were detected despite similar values of LV morphology and function (by cardiac MRI)<sup>19</sup>.

## CONCLUSION

We concluded that left ventricular diastolic dysfunction is high among patients with type-II DM with NAFLD but comparatively lower than other

countries. So, it is recommended that every patient who present with type-II DM along with NAFLD, should be sort out for left ventricular diastolic dysfunction. However, it is also necessary that every health care center should have close observation to know the exact prevalence of this disease.

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