

## Correlation of Blood Sugar, Serum Lipid Profile, Blood Pressure, Duration of Diabetes in A Patient With Diabetic Cardiomyopathy - A Hospital Based Study In Manipur.India

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### Abstract:

**Objective:** To access the correlation of Blood Pressure, Serum Lipid Profile, Duration of diabetes in a patient with diabetic cardiomyopathy in Manipur.

**Material and methods:** A total of 100 type2 diabetic patient were selected randomly. Anthropometric parameters were recorded, blood pressure, glucose level and serum lipid profile were determined and echocardiography study were performed in all patient according to standard technique.

**Results and conclusions:** Lipid profile of patient with diabetic cardiomyopathy showed higher level of total cholesterol 207 mg/dl (male) and 212 mg/dl (female) compared to 163mg/dl (male) and 188mg/dl (female) in diabetic patient without cardiomyopathy Serum triglycerides and LDL are also found to be higher in patient with cardiomyopathy, The mean blood pressure both systolic and diastolic was observed to be lower with diabetic cardiomyopathy for both male and female.

**Keywords:** Diabetic Cardiomyopathy, Dyslipidemia, Type2 Diabetes.

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### I. Introduction

A number of clinical, epidemiological and pathological studies attributed the increases occurrence of clinical congestive heart failure in diabetic to cardiomyopathy. The prevalent of diabetic cardiomyopathy varies between 20 to 40% according to different worker. Several studies showed a correlation between glycaemic control, dyslipidemia and blood pressure with ventricular functions. Ethnicity is believed to play a role in the development of heart failure, espicially in association with diabetis..-Manipur is a small state in north eastern part of India which is ethnically different from the mainland India. To date, there has not been any study to evaluate the abnormalities of cardiac functions in diabetic patient in Manipur and its correlation with different clinical parameters. This study was taken up to fine out the correlation of dyslipidemia, blood pressure and duration of diabetes in a patient with diabetic cardiomyopathy. Diabetic cardiomyopathy in diabetic subject can take the form of left ventricular dysfunctions. This dysfunction mechanism is proposed to be the deleterious effect of hyperglycaemia, hypertension and impair endothelial dysfunction.. Others abnormalities observed in diabetic heart include micro vascular constrictions, interstitial fibrosis and edema.

### II. Material And Methods-

A total of 100 Type 2 diabetic patients were randomly selected .Patient who are suffering from acute and chronic complications, cardiovascular, respiratory disease were excluded from the study. A detail history of the clinical information including the age, sex, duration of diabetes, weight, height and religion were noted. Blood glucose levels, fasting, post prandial, and lipid profile were determined according to standard .procedures. Echocardiography examinations were performed in all patients according to standard procedure.Results are given a mean  $\pm$ SD. Means are compared by unpaired student t test. Chi square is used as appropriate. The observations and data were analyzed in the statistical package social sciences (SPSS). The level of significance was set at  $P < 0.05$ .

### III. Results And Observations

The age of diabetics with cardiomyopathy was found higher than those without cardiomyopathy ( $P < 0.397$ ).The duration of diabetes, blood pressure and blood glucose level were not significantly different between the cardiomyopathy and the non cardiomyopathy groups as shown in table 1. The average BMI of all the patients with diabetes was 23. The Diabetics with cardiomyopathy was found slightly more obese than without cardiomyopathy ( $p < 0.5$ )

**Table 1: Clinical Characteristic**

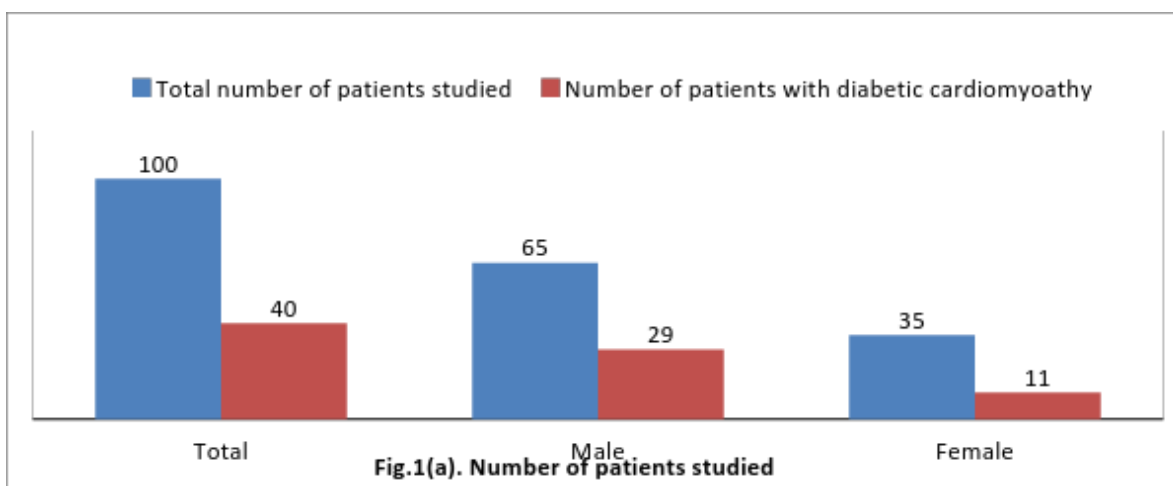
Clinical characteristic	DCM (n=40)	Non DCM (n=60)	P value
Age	60.325 ± 13.211	58.18 ± 11.79	0.3979
Sex (Male/Female)	29/11	36/24	
Duration in years	6.6 ± 2.372	6.91 ± 2.76	0.5624
BMI (kg/m <sup>2</sup> )	23.6 ± 2.687	23.26 ± 2.35	0.5050
Systolic BP (mmHg)	113.7 ± 37.046	123.86 ± 2.88	0.0365
Diastolic BP (mmHg)	76 ± 16.517	79.58 ± 22.83	0.3955
Random BG (mg%)	261.85 ± 36.279	259.36 ± 107.02	0.9096
Fasting BG (mg%)	140.925 ± 37.279	145.08 ± 42.55	0.6135
Postprandial BG (mg%)	287.7 ± 101.604	295.63 ± 100.09	0.7005
S. Cholesterol (mg %)	208.6 ± 145.852	173.15 ± 96.13	0.1458
S. Triglyceride (mg%)	156.025 ± 96.781	113.45 ± 68.44	0.0114
S. LDL (mg%)	102.8 ± 34.429	85.91 ± 32.07	0.0139
S. HDL (mg%)	36.8 ± 13.864	40.2 ± 13.07	0.2165

DCM: Diabetic Cardiomyopathy; BMI: Body Mass Index; BP: Blood Pressure; BG: Blood Glucose; LDL: Low Density Lipoprotein; HDL: High Density Lipoprotein

Serum cholesterol was found higher among the diabetic cardiomyopathy than those without cardiomyopathy although not statistically significant (p<0.145). Serum triglycerides and low density lipoprotein (LDL) are found to be significantly higher in cardiomyopathy group (p<0.011) and p<0.013), where as HDL was found lower among the diabetics with cardiomyopathy although not significant. (P<0.216).

**Sex and Age Distribution**

In most of the measurements, the arithmetic means of the observations were studied and compared between patients with and without diabetic cardiomyopathy. Out of 100 patients studied, the number of males and females and the prevalence of diabetic cardiomyopathy amongst them are shown in the bar chart in Fig.1 (a).



In this study, there were 65% male and 35% female, the ratio being 1.9:1. Further, 29% of males had cardiomyopathy while 11% of the females in the study had diabetic cardiomyopathy.

Sex	With Cardiomyopathy N (%)	Without Cardiomyopathy N (%)	Total N (%)
Male	29 (44.6)	36 (55.4)	65 (100)
Female	11 (31.4)	24 (68.6)	35 (100)

**Table 2: Distribution of Prevalence of Cardiomyopathy in Male and Female; P = 0.28**

Table 2 shows that out of 65 diabetic Male patients, 29 of them (44.6%) had cardiomyopathy as compared to 11 Female patients out of 35 patients, that is, 31.4 %. This difference in prevalence of cardiomyopathy by sex is found to be statistically insignificant (P = 0.28).

The age wise distribution of the total number of patients studied along with the total number of male and female patients is shown in Fig. 1 (b). The percentage of patients having diabetic cardiomyopathy along with age among the patients studied is also shown in Fig. 1 (c).

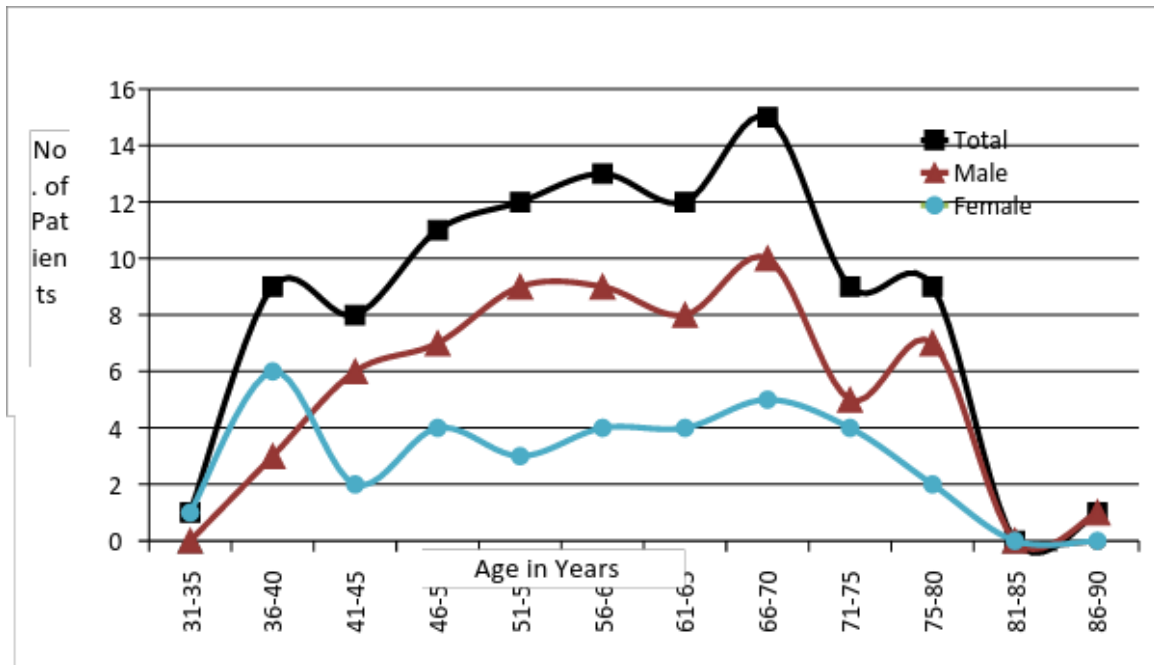


Fig. 1(b). Age wise distribution of patients studied.

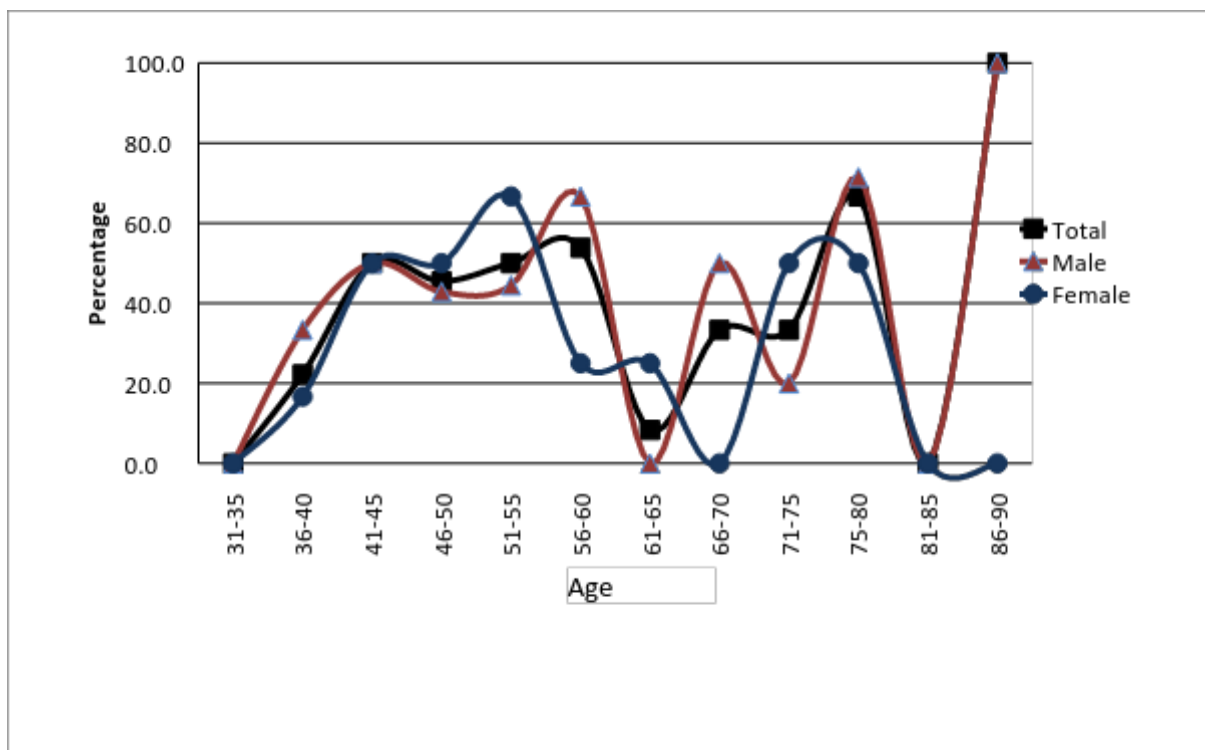


Fig. 1 (c) Percentage-wise distribution of patients with diabetic cardiomyopathy

It can be seen from the above figure that the percentage distribution followed a similar pattern for both the sexes and instances of patients with diabetic cardiomyopathy for both male and female patients were higher in the age group 41 to 60 and from 71 to 80 years.  
Blood Pressure

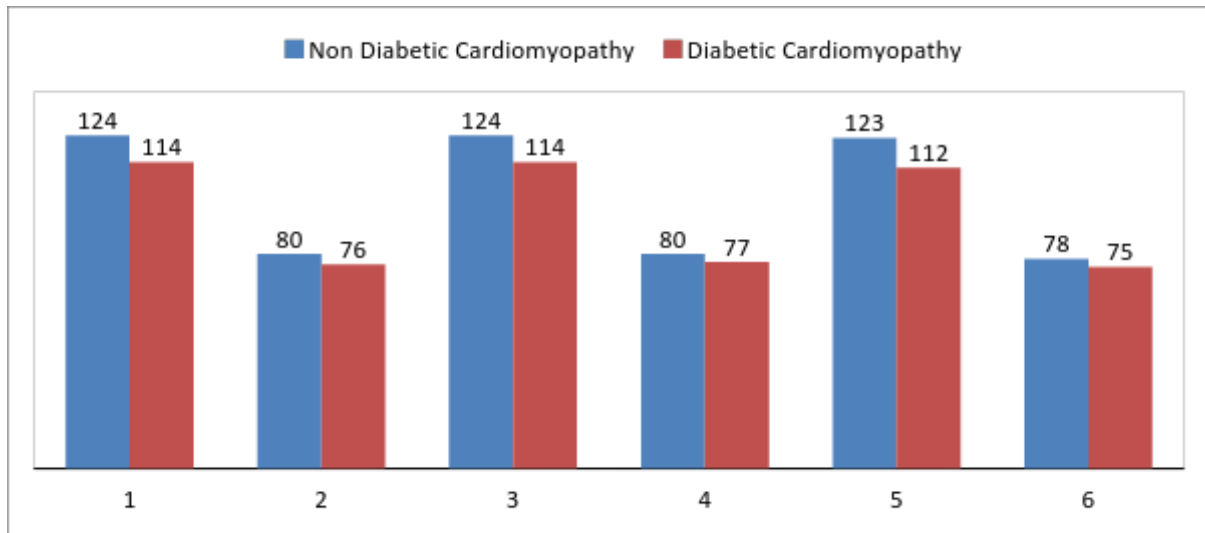


Fig. 1 (d). Mean Blood pressures of patients with and without diabetic cardiomyopathy.

An attempt was made to study the variations of systolic and diastolic blood pressures between patients with and without diabetic cardiomyopathy and the differences are shown in Fig. 1 (d). As seen from the figure, the mean BP, both systolic and diastolic were marginally lower for patients with diabetic cardiomyopathy for both male and female.

**Duration of Diabetes**

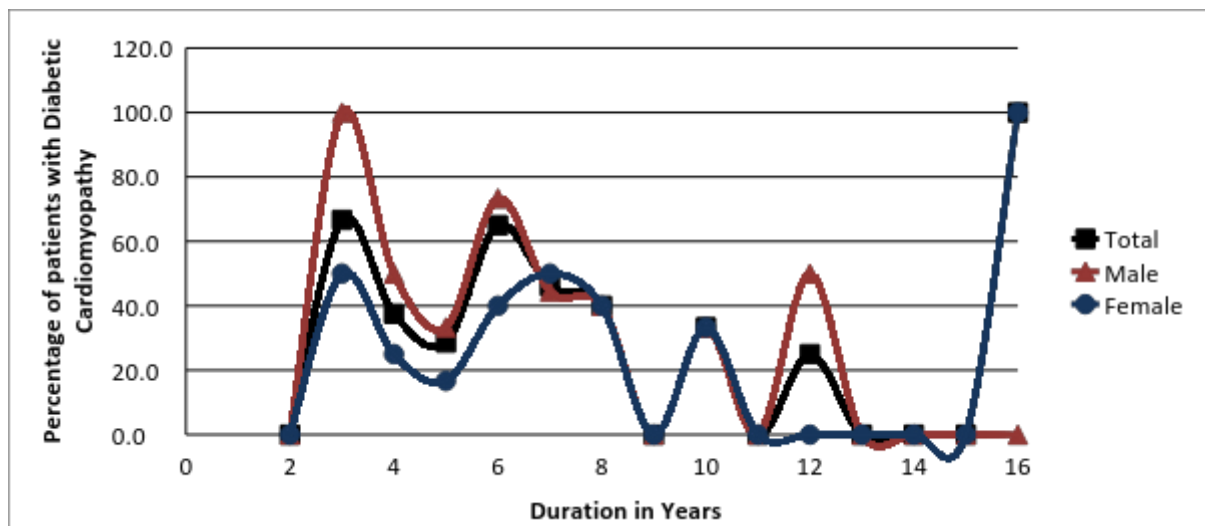
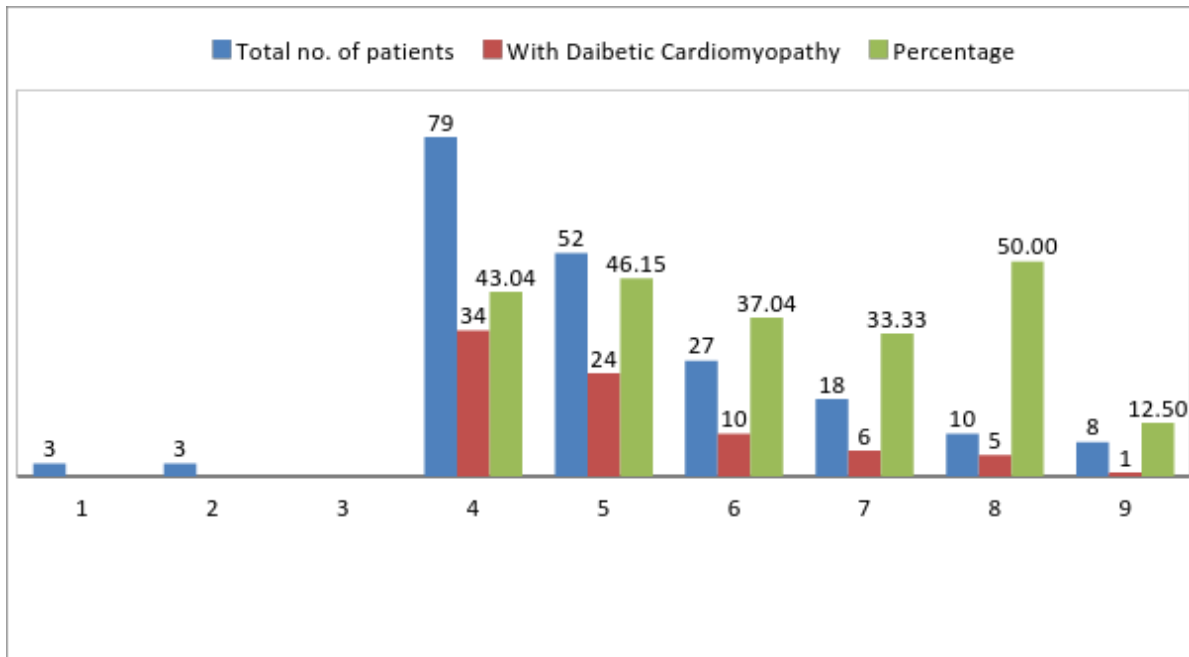


Fig. 1 (e). Percentage of patients with diabetic cardiomyopathy against duration of diabetes.

The prevalence of diabetic cardiomyopathy amongst patient of diabetics in relation to duration is shown in Fig. 1 (j) where the percentages of patients with diabetic cardiomyopathy are plotted against the duration in years. The behaviour was similar for both males and females and the percentages of patients with diabetic cardiomyopathy were found higher for patients having diabetes between 3 to 7 years.

**Body Mass Index (BMI)**

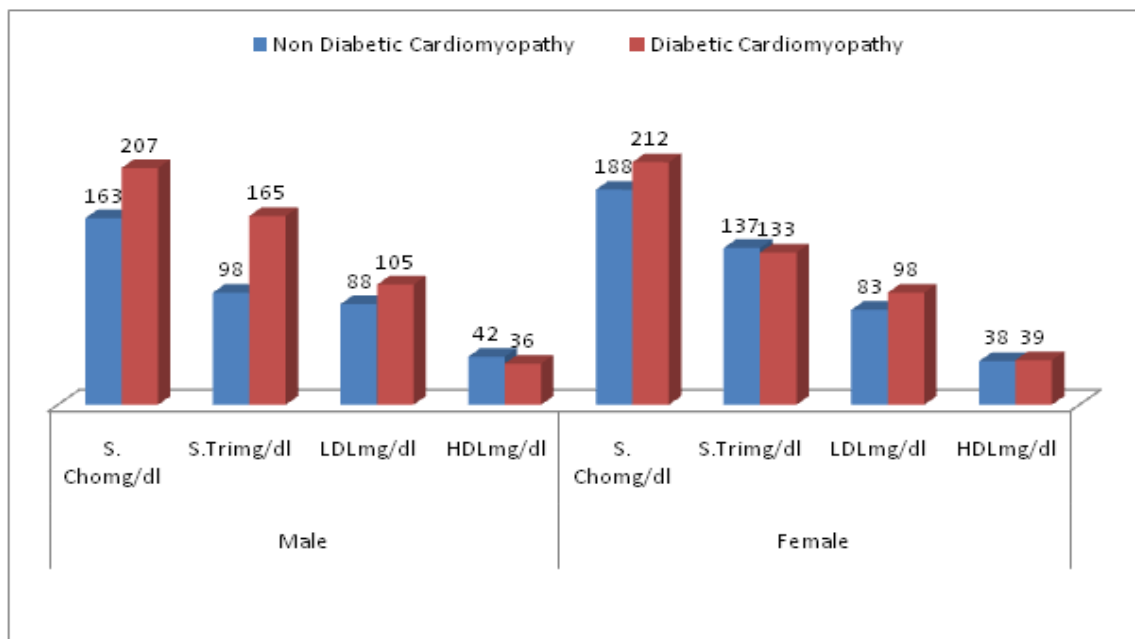


**Fig.1 (f).** Distribution of diabetic cardiomyopathy patients with BMI

With respect to BMI, the percentage of patients with diabetic cardiomyopathy for patients with BMI between 20 to 25 was 43.04% and for patients with BMI greater than 25 was 33.33% { Fig.1 (k)}. The figure is comparable between male and female patients having BMI between 20 to 25. However, for patients with BMI higher than 25, the percentage of patients with diabetic cardiomyopathy was much higher for males (50%) as compared to females (12.5%).

**Lipid Profile**

For lipid profiles, Fig. 1 (l), the mean values were higher for patients with diabetic cardiomyopathy for both male and female patients except for HDL in males and serum triglycerides in females where the mean values were found higher for patients without diabetic cardiomyopathy.



**Fig. 1 (g).** Mean values of lipid profiles.

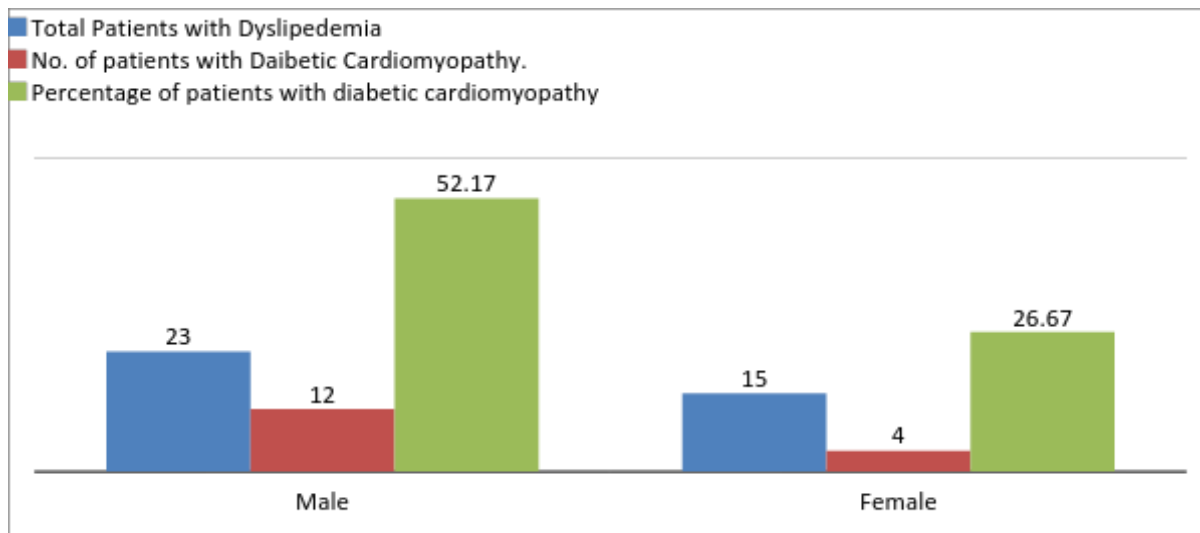


Fig.1 (h). No. of patients with dyslipidemia and diabetic cardiomyopathy.

As given in fig. 1(h), out of the total 65 male patients, 23 suffered from dyslipidemia, and out of this 12 had diabetic cardiomyopathy. For female patients, out of the total 35 patients, 15 suffered from dyslipidemia, and out of this 4 had diabetic cardiomyopathy. The percentage of patients having diabetic cardiomyopathy amongst patients with dyslipidemia was much higher in males than in females.

Blood Sugar (Random, Fasting, Post-prandial)

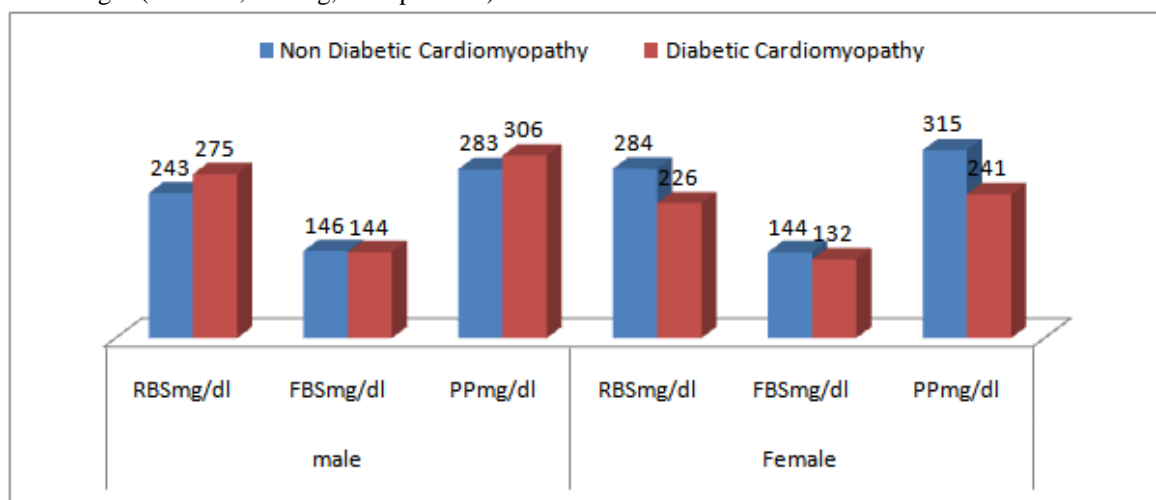


Fig. 1 (i). Mean blood sugar levels of patients with and without diabetic cardiomyopathy.

Comparison of the mean blood sugar levels of patients with and without diabetic cardiomyopathy showed that FBS levels were lower for patients with diabetic cardiomyopathy for both males and females. However in case of RBS and PPBS, the levels were higher for males with diabetic cardiomyopathy while it was lower for females.

#### IV. Discussion

Diabetic is a multi-factorial disease initiated by hyperglycemia and change in myocardial energy metabolism. Our study did not find any correlation between BMI, blood pressure, duration of diabetes and glycaemic control with diabetic cardiomyopathy which was also observed by other workers. Serum cholesterol, triglycerides and LDL cholesterol were found higher and Serum HDL Cholesterolol was lower among the diabetes with cardiomyopathy compared to those without cardiomyopathy. Fang et al also did not find significant difference in diabetic durations, types, Hemoglobin A1c, blood sugar and lipid profile except LDL cholesterol between the diabetes with and without LVH. They observed a significant greater LDL cholesterol in the diabetic with LVH than the diabetics without LVH(P<0.019).

Lipid profile of patients with diabetic cardiomyopathy showed higher level of total cholesterol 207mg/dl (males) and 212mg/dl (females) compared to 163mg/dl (males) and 188mg/dl (females) in the diabetic patients without cardiomyopathy. Serum Triglyceride levels (165mg/dl in males and 133mg/dl in females: 98mg/dl in males and 137mg/dl in females) and serum LDL (105mg/dl in males and 98mg/dl in females: 88mg/dl in males and 83mg/dl in females) were also found to be much higher in those with cardiomyopathy than those without.

Out of the total 65 male patients in the study, 23 suffer from dyslipidemia, and out of those 23 patients, 12 had diabetic cardiomyopathy. For female patients, out of the total 35 patients 15 suffered from dyslipidemia, and out of which, 4 had diabetic cardiomyopathy. The percentage of patients having diabetic cardiomyopathy amongst patients with dyslipidemia was much higher in males than in females.

Agarwal et al (1980) opined that hyperlipidemia increased the risk of atherosclerosis in diabetes. In their study of 50 cases of diabetic patients and 40 cases of normal healthy individuals, it was found that the serum cholesterol, triglycerides, free fatty acids were significantly higher than non diabetics. Low level of lipid profile was found in patients of insulin as compared to OHA.

### **Vitals**

In the study, the mean BMI is 24 with 79% of the patient belongs to BMI of 20 - 25. 18 % belongs to BMI of >25 and 3% belongs to BMI of <20. 43% of the 79 patient belonging to BMI of 20 - 25 had cardiomyopathy with higher incidence in male than female.

### **Age And Sex Distribution**

In the series, there were 65 males (65%) and 35 females (31%). The ratio is 1.9:1. Of the 65 males, 29 of them had diabetic cardiomyopathy while 11 out of the 35 females in the study had diabetic cardiomyopathy. Most of the patients were in the age group 66-70 years (15%), followed by 56-60 years (13%); 12% each in the age group of 51-55 and 61-65, 11% in 46-50 years, 9% each in 36-40, 71-75 and 76-80 years, 8% in 41-45 years and 1% each in 31-35 and 86-90 years.

### **Blood Sugar**

The average blood sugar recording in mg/dl was found to be 259 (random), 145 (fasting) and 296 (post-prandial) in study group without cardiomyopathy while in those with cardiomyopathy, the average recordings were 262 (random), 141 (fasting) and 288 (post-prandial).

Raheja (1984) observed that hyperglycaemia was an independent risk factor for cardiovascular and macrovascular disease affecting both medium and large arteries in diabetes mellitus. About 1/3 and 1/2 of all diabetics exhibited some degree of hyperlipidemia with or without hypercholesterolaemia. There was a statistically significant relationship of heart disease with diabetes. He also opined that diabetics had lower HDL cholesterol level and this accelerated atherogenesis and contributed to cardiovascular disease in patient with diabetes.

### **Lipid Profile**

Lipid profile of patients with diabetic cardiomyopathy showed higher level of total cholesterol 207mg/dl (males) and 212mg/dl (females) compared to 163mg/dl (males) and 188mg/dl (females) in the diabetic patients without cardiomyopathy. Serum Triglyceride levels (165mg/dl in males and 133mg/dl in females: 98mg/dl in males and 137mg/dl in females) and serum LDL (105mg/dl in males and 98mg/dl in females: 88mg/dl in males and 83mg/dl in females) were also found to be much higher in those with cardiomyopathy than those without.

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Haffer SM et al (1990) observed that individuals with Type2 diabetes developed after 8 yrs of follow up had higher level of total LDL Cholesterol, triglycerides and lower HDL than subjects without diabetes.

Fernado et al (1993) studied 500 patients with NIDDM and 250 controlled, 21% of diabetes patients and 14.3% of controls had hypercholesterolaemia. Macrovascular disease was present in the 13.4% of diabetes and 8.2% controlled. Significant differences were seen in the prevalence of electrographic abnormalities 12% of diabetes v/s 6% of controlled.

### **Relation With Sex**

Of the 35 female diabetic patients, 11 females (31.43%) were diagnosed with cardiomyopathy while of the 65 male diabetic study patients, 29 males (44.62%) had associated cardiomyopathy.

Hamby et al (1974) in an analysis of 292 diabetes and 490 non diabetes subjects that there was 2.4 fold increased in incidence of congestive cardiac failure in diabetes as compare to 5 fold increased in diabetic women over 18 years.

Ceylan Isik AF and Ren J (2004) stated that heart disease was twice as common in diabetic man and 5 times as common in diabetic women. Sex hormone and intrinsic myocardial and endothelial functions between men and women may be responsible for this female 'advantage' and 'disadvantage' in normal and diabetic conditions.

Braxton D Mithcel (2004) in Framingham's study showed that diabetes was associated with a 2.2 times excess risk of congestive heart failure in men and a 5.4 times excess risk in women. When analysis was adjusted for age, systolic pressure, smoking and left ventricular hypertrophy, ECG abnormalities, the association between diabetes and congestive heart failure remained significant but was diminished to 1.8 in men and 3.8 in women.

### **Relationship With Duration Of Symptoms**

The percentages of patients with diabetic cardiomyopathy were found higher for patients having diabetes between 3 to 7 years with the highest incidence in duration of 16years (a single female) of 100% followed by 66.7% in 3 years duration and then by 65% in 6 years duration.

Hassenn RE et al (1992) observed that the incidence of diabetes heart disease did not strongly correlate well with the duration of diabetes or level of glycaemic control. The lack of strong correlation between heart disease and those variables may reflect the fact that heart disease had a variety of causes and diabetes may be one.

### **Relationship With Blood Pressure**

The mean BP, both systolic and diastolic was observed to be lower for patients with diabetic cardiomyopathy for both male and female.

Monnier et al (1986) showed that increase skin collagen fluorescence in type 1 diabetes was associated with arterial stiffness (assessed in vivo) and with elevated systolic and diastolic blood pressure. The presence of aortic stiffness in patient with type 1 diabetes was confirmed by autopsy studies by Oxlund et al.

Vinereanu et al (2003) demonstrated an association between conduit arterial stiffness and impaired LV function. Their results suggested that subendocardial function of the left ventricle may be depressed in patient with stiff and relatively non compliant conduit arteries. Reduced compliance of the large arteries modified the timing of wave reflections and thus was a factor affecting a ventricular load. In patient with increased arterial stiffness, the reflected wave returned early during LV ejection which leads to an increase in systolic pressure and LV after load, resulting in decreased central diastolic and coronary perfusion pressure.

Our study did not find any correlation between BMI, blood pressure, duration of diabetes and glycaemic control with diabetic cardiomyopathy which was also observed by other workers. Serum cholesterol, triglycerides and LDL cholesterol were found higher and Serum HDL Cholesterol was lower among the diabetes with cardiomyopathy compared to those without cardiomyopathy. Fang et al also did not find significant difference in diabetic durations, types, Hemoglobin A1c, blood sugar and lipid profile except LDL cholesterol between the diabetes with and without LVH. They observed a significant greater LDL cholesterol in the diabetic with LVH than the diabetics without LVH(P<0.019).

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## **V. Conclusion**

Diabetic cardiomyopathy is a common complication of Type2 diabetes. The study shows that the serum cholesterol, triglycerides and LDL are higher and Serum HDL cholesterol is lower among the diabetes with cardiomyopathy compare to those without cardiomyopathy, However, there is no correlation between obesity, blood pressure, duration of diabetes and glycaemic control with diabetic cardiomyopathy.



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