

Type II diabetes mellitus associated cardiac dysfunction- An outpatient ward study in a medical college and hospital of northern India

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Abstract

Diabetes mellitus is a group of metabolic disease characterized by high blood sugar that results from defects in Insulin secretion or action or both. This present study was designed to study various cardiac dysfunctions in diabetes and associated abnormalities and to find Ventricular dysfunction in patients by help of echocardiography. For this study, 100 diabetic patients of Type 2 Diabetes Mellitus were taken based on the inclusion and exclusion criteria. All patients were on oral hypoglycemic. The patients were in the age group of 30-80 years. The youngest patient was 30 years old and the eldest was 80 years. There were 72 males and 28 females. Patients of both sexes were included with the intention to study the variation in their cardiac dysfunction if any. Many cardiac Dysfunctions and Associated abnormalities are found in patients with Type-II Diabetes Mellitus. These include IHD, CHF, HTN, Dyslipidemia, various types of arrhythmias, systolic or diastolic cardiac dysfunction. This can be detected by routine, clinical examination, X-ray Chest, ECG and Echo Doppler Study. Diastolic Left ventricular Dysfunction is more common than systolic Dysfunction. Incidence of cardiac dysfunction

and complications increase with increase in duration of Diabetes.

Keywords: Diabetes mellitus, oral hypoglycemic, cardiac dysfunction, echocardiography

Introduction

Diabetes mellitus is a group of metabolic disease characterized by high blood sugar that results from defects in Insulin secretion or action or both. Metabolic derangement results from an absolute or relative deficiency of Insulin. The worldwide prevalence of Diabetes Mellitus has risen dramatically over the past two decades from an estimated 30 million cases in the year 1985 to 177 million in the year 2000. Based on current trends more than 360 million individuals will have diabetes by the year 2030. Although the prevalence of both Type-I and Type – II Diabetes Mellitus is increasing worldwide, the prevalence of Type – II Diabetes Mellitus is rising much more rapidly because of increasing obesity and reduced activity levels as countries become more industrialized. (Shen Weu Feng, 2010)

In India, by the year 2025, there will be 69 million people suffering from diabetes. Among Indians, Type II diabetes has become most common metabolic disorder

and is a growing problem in our country with over 40 million diabetic subjects. Among Indians, the onset of Type II diabetes occurs at a younger age and hence they are vulnerable to all the complications of diabetes due to longer duration of disease (Shlomo Stern, 2009).

Cardio Vascular Disorders in Diabetes

Several cardiovascular disorders are significantly more common in diabetics than in non-diabetics. American Heart Association has designated Diabetes Mellitus as a major risk factor for cardio vascular disease. Presently vast majority of patients suffering from diabetes die as a result of cardio vascular disease. Cardio vascular disease in diabetes also impacts the economic resources of the health care system. Atherosclerosis of coronary, cerebral and peripheral arteries account for approx. 80% of mortality and 75% of hospitalization in persons with diabetes.

Diabetes and Heart

The increased incidence of mortality from cardio vascular disease in diabetics compared with non-diabetics has been established by the middle of the last century. The Framingham Heart Study revealed marked increase in PAD, CHF, CAD, MI and sudden death (risk increase from one to five fold) in Diabetes Mellitus.

People with diabetes have an increased prevalence of atherosclerosis and coronary heart disease and experience higher morbidity and mortality after acute coronary syndrome and myocardial infarction than people without diabetes. Diabetes also has dramatic impact on outcomes following unstable angina or MI. Clinically Coronary Artery Disease in diabetic subjects is associated with premature and asymptomatic heart disease. Silent MI is an entity with a greater prevalence in diabetic subjects (R. Deepa 2002 & Frustaci A 2002).

Diabetes also increases the risk of heart failure. Patients with diabetes are 2 to 5 times more likely to develop heart failure than those without diabetes and following development of heart failure diabetic patients have higher mortality and heart failure morbidity (Shapiro LM et al, 1982)

In addition to the classical atherosclerosis affecting the large extra mural vessels, occlusive disease process affecting the smaller vessels is hallmark of diabetic heart disease. Resultant ischemia produces widespread fibrosis in the ventricular interstitium with impaired left ventricular function. Clinically, the angina due to small vessel disease much more severe and lasts longer compared to classical angina. Functional disturbances of myocardium with cardiac dilatation are encountered in diabetic subjects. Diffused ischemia has been found to be associated with this condition.

Diabetic cardiomyopathy refers to derangement in the myocardium in the absence of extra mural coronary atherosclerosis. Non-invasive and invasive techniques have enabled the identification as well as quantification of degree of ventricular impairment. ST and T wave changes in ECG are very early changes in diabetic cardiomyopathy (John A et al 1979). Cardiac Autonomic Damage is widely prevalent among diabetic subjects. It is possible that disturbance of autonomic innervation of heart may predispose to cardiac dysrhythmia, painless myocardial infarction and spontaneous cardiac arrest.

Hypertension occurs with twice the frequency in diabetics population as compared to Nondiabetics. Prevalence of Hypertension in Type 2 Diabetics is estimated to be 50% (Wojczech Kusmala et al, 2004). Diabetes Mellitus increases the risk of Atherosclerotic Vascular Disease because of associated Dyslipidaemia. Diabetes Mellitus is a common secondary cause of

Hyperlipidaemia particularly if glycaemic control is poor.

Abnormal Resting ECG, (ST- T wave changes, conduction abnormalities, chamber hypertrophy, rhythm disturbance, pattern of old MI) has been documented in about

40% of normotensive ambulant diabetic subjects. On exercise the prevalence of ECG abnormalities among diabetic subjects is twice as common to non-diabetics. Besides ECG changes diabetics have a greater predilection for increased systolic BP during exercise and this abnormality has been observed to correlate with duration of diabetes.

Diabetics have abnormalities both in systolic function and diastolic function. Diastolic function occurs earlier than Systolic function (Sanderson, J.E et al 1978).

Various Cardiac Dysfunction and associated abnormalities occurs in Diabetes like Atherosclerosis and consequent Ischaemic Heart Disease, Heart Failure, Cardiomegaly, Hypertension, Dyslipidaemia, Left Ventricular Diastolic Dysfunction (ascribed to be early sign of Diabetic Heart muscle disease).

Keeping these in view it was thought pertinent to study patients of Diabetes Mellitus for analysis of various cardiac dysfunction and associated abnormalities non-invasively by clinical, lab, radiological examination.

Aims and Objectives

The basic aim of this study is to evaluate the cardiac dysfunction and its types in Type II Diabetes Mellitus by non-invasive techniques.

Accordingly, the objectives of the proposed study are:

1. To study the incidence of cardiac dysfunction and its types in Type II Diabetes Mellitus by non-invasive techniques.
2. To study the relation between duration of Diabetes and cardiac dysfunction.

Materials and Methods

The present study was carried out in Dept. of Medicine at Santosh Medical College and Hospital, Ghaziabad. A minimum of 100 patients of type II Diabetes Mellitus with or without cardiac symptoms were selected for this study.

Inclusion criteria

The patients of diabetes Mellitus II admitted or coming to medicine department were taken. Patients of type II Diabetes Mellitus in the age group above 30, irrespective of gender, socioeconomic status and duration of diabetes were taken.

Exclusion criteria

Patients of Type 2 Diabetes Mellitus with known CAD, Pericardial disease were excluded.

Criteria for Diagnosis of Diabetes

The diagnosis of diabetes was done by American Diabetes association (ADA) Criteria 2007.

1. Fasting plasma glucose > 126 mg/dl or
2. Two hour plasma glucose > 200 mg/dl during an oral glucose tolerance test.
3. Symptoms of diabetes plus random blood glucose concentration > 200 mg/dl

Method of Study

Clinical Study

All the patients were subjected to detailed history taking and thorough clinical examination as described below:

History Taking

History in respect of diabetes with particular attention to age of onset, Duration of diabetes, any anti diabetic drugs or Insulin was taken. History regarding cardiac system i.e. anginal pain, palpitation, dyspnoea on exertion, orthopnoea, PND, fatiguability, syncope also included. History of IHD, Hypertension, CVA were taken into consideration.

Physical Examination

General survey was made in all patients in respect of height, weight, pulse and blood pressure, B.P. of more than 140/90 mm of Hg was taken as hypertension. B.M.I. (Body Mass Index) was calculated from Height and weight of each patients to correlate nutritional status. It was obtained by dividing the weight of individual (w) in kg by the square of the height in meters (H) (Weight by Height²). Normal BMI was taken as 18.5 to 24.9; Less than 18.5 was taken as underweight and more than 25 was taken as overweight.

Laboratory Examination

Laboratory investigations were done to find out severity of diabetes, evidence of hyperlipidaemia, Kidney involvement. These include.

1. Fasting blood sugar (FBS)
2. Post Prandial Blood Sugar (PPBS)

[Sugar testing was done by GOD-POD (Glucose Oxidase and Peroxidase Method)

Methodology: Following substance are added in a tube

- 1.8 ml sodium sulphate zinc sulphate
- 0.1 ml blood
- 0.1 ml NaOH (0.1m)

All the contents were mixed carefully and centrifuged at 3000 RPM for 5 minutes.

The supernatant was transferred into new test tube. Glucose concentrate in supernatant is 1/20 concentration in blood sample.]

3. Lipid Profile
4. Blood Urea
5. Serum Creatinine
6. Urine analysis
7. Haematological Examination –Hb, TLC, DLC, ESR

Radiological Examination

Chest X-ray PA view done to find out cardiac size and to calculate cardiothoracic ratio, to see for features of congestive heart failure-cardiomegaly, Kerley B lines, pulmonary vascular redistribution.

Electrocardiography

Seen for p wave abnormality, widened P wave, flat P wave, LVH pattern, ST segment and T wave changes, conduction disturbances, Premature Ventricular contraction, myocardial infarction, Bundle Branch Block, Ischaemia. ECG was done in all patients via ECG machine BPL 108 T.

Echocardiography

Done in all patients Seen for left ventricle diastolic dysfunction, left Ventricular systolic dysfunction and other Echo abnormalities like Global Hypokinesia, Regional wall motion abnormality, increase posterior wall thickness.

Result

Table-I: Age distribution in patients

Age in years	No. of cases	Percentage
30-39	9	9%
40-49	12	12%
50-59	35	35%
60-69	23	23%
70 & Above	21	21%
Total	100	100.00%

Age distribution of cases is shown in Table-1. The youngest patient was 30 years old and eldest was 80 years. The range of age was 30-80 years. Mean age was 59.08± 11.378

Table-II: Sex distribution in cases

Sex	No. of cases	Percentage
Male	72	72%
Female	28	28%

Total	100	100
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Out of 100 Diabetics, 72 were Male, 28 were Female

Table-III: Body mass index of patients

Body Mass Index	No. of cases	Percentage
< 18.5	8	8%
18.5 – 24.9	43	43%
> 25	49	49%
Total	100	100

Out of 100 Patients 8 Cases had Body Mass Index less than 18.5, 43 cases had Body Mass Index between 18.5 to 24.9 and 49 cases had Body Mass Index above 25. Mean BMI was 23.3120 ± 3.01103

Table-IV: Duration of diabetes in 100 cases

Duration In Years	No. of cases	Percentage
Up to 5 Years	32	32%
6-10 Years	44	44%
Above 10 Years	24	24%
Total	100	100

Out of 100 patients 32 patients (32%) were having diabetes for less than 5 Years, 44 patients (44%) were having diabetes from 6-10 Years, 24 patients (24%) were having diabetes more than 10 Years. Range of duration of Diabetes was 1 to 14 years. Mean Duration was 7.3100 ± 3.51 Years.

Table-V: Socio economics status of diabetes

Income Group	No. of cases	Percentage
High	50	50%
Medium	30	30%
Low	20	20%
Total	100	100%

Out of 100 cases, 50 cases were from High Income Group, 30 were from Middle Socioeconomics Status and only 20 were from Low Income Group

Table-VI: Presenting features at the time of evaluation

Presenting Features	No. of Patients	Percentage
Polyuria, Polydipsia	40	40%
Loss Of Weight	12	12%
Ulcer Foot	0	0%
Blurring Of Vision	8	8%
Gangrene	0	0%
Anginal Pain	18	18%
Dyspnoea	21	21%
Palpitation	1	1%
Total	100	100%

On analysis the presenting features of 100 patients, 40 patients had complaints referable to cardiac disease such as anginal pain, palpitation and dyspnoea. 60 patients did not have any cardiac symptoms.

Commonest presentation was polyuria, polydipsia.

Table-VII: Incidence of various cardiac dysfunction and associated abnormalities in 100 diabetics.

Cardiac dysfunction and associated abnormalities	No. of cases	Percentage
IHD	26	26%
HF	16	16%
Cardiomegaly	22	22%
HTN	55	55%
Dyslipidaemia	50	50%

Out of 100 patients, 16 cases had evidence of HF, 26 cases had history of angina and / or evidence of myocardial infarction, 55 cases had evidence of Hypertension, 50 cases had Dyslipidaemia, 22 cases had cardiomegaly.

Table-VIII: Incidence of non-cardiac complications.

Non-cardiac	No. of cases	Percentage
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complications		
Retinopathy	30	30%
Nephropathy	14	14%
Peripheral Neuropathy	28	28%

Out 100 patients, Retinopathy was found in 30 cases (30%), Nephropathy in 14 cases (14%), Peripherals Neuropathy in 28 cases (28%).

Table-IX: Chest X-ray abnormality (cardiothoracic ratio) of 100 diabetics.

Cardiothoracic Ratio	No. of cases	Percentage
Less than 0.5	78	78%
More than 0.5	22	22%
Total	100	100%

Chest X-ray in 78 patients (78%) was normal with normal Cardiothoracic ratio, 22 (22%) had increased Cardiothoracic ratio (ie. they had Cardiomegaly).

Table-X: Various ECG abnormalities in diabetics.

Abnormalities	No. of cases	Percentage
Acute Myocardial Infarction (AMI)	8	8%
Old Infarction (OI)	1	1%
Ischaemic (I)	4	4%
LBBB	9	9%
RBBB	9	9%
Bifascicular Block (BB)	3	3%
Atrial Flutter (AFI)	1	1%
Atrial Fibrillation (AF)	8	8%
LVH	5	5%

Ventricular Ectopics (VE)	2	2%
Diffuse ST-T changes (ST-T changes.)	5	5%

Electrocardiographic Abnormalities were found in 43 patients out of 100 cases. Out of 40 patients with Cardiac Symptom 34 had abnormal ECG (85%), Out of 60 patients without any cardiac symptom, 9 cases had ECG abnormality. 13 had evidence of Ischaemic Heart Disease, 9 cases had RBBB, 3 cases had BB, 1 case had Atrial flutter (AFI), 8 cases had Atrial fibrillation (AF), 5 cases had LVH, 2 had VE & 5 had Diffuse ST- T changes.

Table-XI: Relation of duration of DM with cardiac dysfunction.

Duration of Years	No. of Cases	Cases with abnormal Cardiac Function (No. & Percentage)		
		Cardiac Symptom	CHF	ECG Abnormal
< 5 Years	32	11(34%)	4(12.5%)	8(25%)
> 5 Years	68	30(44%)	10(14%)	34(50%)

Those who had duration of Diabetes more than 5 years showed more incidence of Cardiac Dysfunction.

Table-XII: Percentage of patients with abnormal ejection fraction.

Types Of Classes	No. of Cases (100)	No. Of Cases Abnormal EF	Percentage
Symptomatic	40	40	100%

Asymptomatic	60	29	48%
Total	100	69	

All symptomatic patients had Abnormal Ejection Fraction. Mean Ejection fraction was 0.56 ± 0.089

Table-XIII: Percentage of patients with abnormal diastolic function.

Types of Classes	No. of Cases (100)	No. of Cases Abnormal Diastolic Function	Percentage
Symptomatic	40	40	100%
Asymptomatic	60	36	60%
Total	100	76	

All symptomatic patients had Abnormal Diastolic function.

Table-XIV: Comparison of incidence of abnormal systolic function (EF) with abnormal diastolic function.

Total No. of Patients	No. of cases With Abnormal EF	No. of Cases With Diastolic Dysfunction
100	69 (69%)	76 (76%)

From observation table it was evident that the incidence of abnormal Ejection Fraction was 69% and incidence of LVDD was 76% this difference was statistically not significant.

Table-XV: Relation of duration of diabetes with abnormal cardiac function.

Duration In Years	No. of Cases	Cases With Reduced EF	Cases With Abnormal Diastolic Function
Up to 5 Years	32	12 (37.5%)	16 (50%)
6-10 Years	44	37 (84.86%)	39 (87.9%)
Above 10 Years	24	20 (83.3%)	21 (88.9%)

Total	100	69	76
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Those who had duration of diabetes for more than 5 Years showed more incidence of EF and Abnormal Diastolic Function.

Table-XVI: Blood sugar in 100 diabetics.

Fasting Blood Glucose				
TOTAL No.	MEAN	MEDIAN	MODE	STD. DEVIATION
100	165.7400	160.0000	180.00	25.70250

PPBG				
TOTAL NO.	MEAN	MEDIAN	MODE	STD. DEVIATION
100	226.1700	230.0000	230.00	24.03283

Range of FBG of 100 study cases was 130 to 240 mg/dl. Mean FBG of study cases was 165.7400 ± 25.70 mg/dl.

Range of PPBG of 100 study cases was 184 to 290 mg/dl. Mean PPBG of study cases was 226.1700 ± 24.03 mg/dl.

Table-XVII: Blood pressure in 100 diabetics

Average range of SBP in study group was 100 to 180 mm Hg. Mean SBP was 143.71 ± 23.446 mm Hg. Average range of DBP in study group was 60 to 116 mm Hg. Mean DBP was 88.00 ± 11.58 mm Hg

DIABETIC CASES WITH HTN (NO.-55)

SBP (Cases with Systolic BP)

	n	Mean	Median	Maximum	Minimum	SD
Cases With HTN	55	161.8000	160.0000	180.00	140	10.78648
Cases Without HTN	45	120.71	120.00	140	100	10.695
Total	100	143.71	146.00	180	100	23.446

p value < .05 Significant

Average range of SBP of 55 diabetics with HTN was 140 to 180 mm Hg. Mean SBP was 161.80 ± 10.78 mm Hg Average range of DBP in 55 diabetics with HTN

was 92 to 116 mm Hg. Mean DBP was 97.3818 ± 6.89 mm Hg.

**DIABETIC CASES WITHOUT HTN (NO.-45)
DBP (Cases with Dystolic BP)**

	n	Mean	Median	Maximum	Minimum	SD
Cases With HTN	55	97.3818	94.0000	116	92	6.89469
Cases Without HTN	45	78.84	80.00	90	60	7.586
Total	100	88.00	90.00	116	60	11.582

p value < .05 Significant

Average range of SBP of 45 diabetics without HTN was 100 to 140 mm Hg. Mean SBP was 120.71 ± 10.695 mm Hg. Average range of DBP in 45 diabetics without HTN was 60 to 90 mm Hg. Mean DBP was 78.84 ± 7.586 mm Hg

**Table-XVIII: Serum cholesterol in 100 diabetics.
Dyslipidemia**

	n	Mean	Median	Maximum	Minimum	SD
Cases without Dyslipidemia	50	171.00	172.50	200	140	16.269
Cases with Dyslipidemia	50	246.52	242.50	310	210	26.1629
Total	100	208.76	205.00	310	140	43.704

Average range of Cholesterol in 100 diabetics was 140 to 310 mg/dl. Mean S. Cholesterol was 208.76 ± 43.70 mg/dl. Average range of Cholesterol in 50 diabetics with cholesterol > 200 (Dyslipidemia) was 210 to 310 mg/dl. Mean S. Cholesterol was 246.52 ± 26.16 mg/dl.

SERUM LDL IN 100 DIABETICS.

LDL

	n	Mean	Median	Maximum	Minimum	SD
Cases without Dyslipidemia	50	86.180	88.00	100	70	6.664
Cases with Dyslipidemia	50	110.60	109.00	144	102	9.251
Total	100	95.61	96.00	144	70	16.943

Average range of S. LDL in 100 diabetics was 70 to 144 mg/dl. Mean S. LDL was 95.61 ± 16.943 mg/dl. Average range of S. LDL in 50 diabetics with LDL > 100 (Dyslipidemia) was 102 to 144 mg/dl. Mean S. LDL was 110.60 ± 9.251 mg/dl

Discussion

A substantial morbidity and mortality in the diabetic population is due to cardiovascular diseases. Atherosclerotic coronary artery disease is responsible for cardiac manifestations in the majority of diabetic patients. Diabetes is an independent risk – factor for coronary artery disease (Kannel et al 1979). Other major form of heart disease in diabetes include hypertension. These two are recognized causes of heart failure in diabetics. But Framingham study showed incidence of heart failure in excess of that predicated from these two risk factors (Kannel et al, 1979). Before this Tripathy et al (1967) reported clinical evidence of heart failure in diabetics in the absence of clinically recognizable heart disease. Authors observed that patients with cardiac symptomatology may have considerable malfunction of the ventricle in the absence of significant large vessel occlusive disease.

It is now well established that diabetics have various cardiac dysfunctions and associated abnormalities. The advent of echocardiography and its rapid development in the last decade has helped in the evaluation of left ventricular functions.

This present study was designed to study various cardiac dysfunctions in diabetes and associated abnormalities and to find Ventricular dysfunction in patients by help of echocardiography.

For this study 100 diabetic patients of Type 2 Diabetes Mellitus were taken. All patients were on oral hypoglycemic. The patients were in the age group of 30-80 years. The youngest patient was 30 years old and

the eldest was 80 years. There were 72 males and 28 females. Patients of both sexes were included with the intention to study the variation in their cardiac dysfunction if any. Senneviratne (1977) had taken only females for his study. All other workers included patients from both the sexes in their study.

Patients having diabetes of varying durations were taken into consideration to observe the effect of duration of diabetes on heart. In this study 32 patients had duration less than 5 years, 44 had diabetes for 6-10 years, 24 had diabetes for more than 10 years. Incidence of cardiac dysfunction was found to be higher in patients with diabetes more than 5 years. Study carried by Raheja et al, V.S. Zadanov and A.M.Vihert also reported the same. IHD is more in long standing cases of diabetes (Raheja et al 1970). In WHO study by V.S.Zadanov and A.M.Vihert (1976) concluded that incidence of atherosclerosis who had diabetes for 7 to 10 years was significantly higher.

BMI of all 100 patients was calculated. Only 4 cases were underweight, 45 patients had BMI within normal range, maximum cases that is 51 were overweight.

Out of 100 cases 50 were from High Socioeconomic status, 30 from medium, and only 20 were from low socioeconomic status.

Out of 100 patients, 40 had various cardiac symptoms. Other presenting symptoms were polyuria, polydipsia, loss of weight. Commonest presentation was polyuria, polydipsia.

Out of the 100 patients, 26 cases had evidence of Ischaemic Heart Disease in the form of history of angina and/or evidence of myocardial infarction, 55 cases had evidence of hypertension, 16 cases had evidence of HF, 22 cases had cardiomegaly. Dyslipidaemia was found in 50 cases. Nicholas (2001) reported incident cases of CHF in 7.7% of diabetic

subjects. Nicholas (2004) study updated previous estimate of CHF incidence rates in patients with Type 2 diabetes to be 3-15 times greater than previously reported 2-10. B.S.Raheja et al (1969) reported 24% of IHD. Jamal S. Alwakeel et al (2009) reported 23% of IHD. Our study reported 26% of IHD. Various studies have reported different frequency of HTN in diabetics ranging from 17% to 78%. Abdul Basit et al (2004) reported 50%, S. M. Sohail Ashraf (2007) have reported HTN 54.6% similar to our study.

Out of 100 patients among non-cardiac complications Retinopathy was found in 30 cases, Peripheral Neuropathy in 28 cases, Nephropathy in 14 cases.

Chest X-Ray P.A. View was taken in all cases, 22 patients had cardiomegaly. Their cardiothoracic ratio was >0.5 . Other patients had no cardiomegaly and cardiothoracic ratio was within normal limits.

Electrocardiographic abnormalities were found in 43 patients out of 100. 13 patients had evidence of Ischemic heart disease in form of Acute Myocardial infarction, old infarction, old infarction, ischaemia, 9 had left bundle branch block, 9 had RBBB, 3 had bifascicular block, 11 patients had arrhythmias (1 with atrial flutter, 8 with atrial fibrillation, 2 with ventricular ectopics) and 5 had left ventricular hypertrophy. Out of 40 patients with cardiac symptoms, 34 had abnormal ECG. Abnormal ECG were found in 9 patients without any cardiac symptoms.

All patients were studied by Echocardiogram for Left Ventricular systolic dysfunction (Ejection Fraction), Left Ventricular Diastolic Dysfunction and any other echocardiographic abnormality if present like Hypokinesia, Regional Wall Motion Abnormality Hypertrophy of left ventricular posterior wall and interventricular septum. 69 (69%) of our total patients had reduced ejection fraction. Out of these all

symptomatic patients had reduced ejection fraction and 29 out of 60 asymptomatic patients (48%) had reduced ejection fraction. Ejection fraction is very sensitive index of left ventricular systolic function. Thanikachalam (1978) observed that 42% of his asymptomatic patients had abnormal systolic function. Out of 100 patients 21 patients had Global Hypokinesia, Regional wall motion abnormality was found in 19 patients who had clinical evidence of IHD and hypertrophy of left ventricular posterior and interventricular septum in 9 patients who had hypertension.

Along with systolic function abnormality, the diabetics also have abnormality in diastolic function. 76% of our total patients had Left ventricular diastolic dysfunction. All symptomatic patients had diastolic dysfunction and 36 out of 60 (60%) of asymptomatic patients had abnormal diastolic function. Uusitupa et al (1985) took 133 NIDDM patients and showed impaired left ventricular function may be early phenomenon in the clinical course of NIDDM. From this study it was observed that there is definite co relation between duration of diabetes to Left ventricular dysfunction. Diabetics having less than 5 years duration had less incidence of reduced Ejection fraction than the diabetics having the disease for 6-10 years and more than 10 years. Shapiro et al (1981 & 1982) observed the correlation between duration of diabetes and abnormal systolic and diastolic indices. More abnormalities was found in patients with prolonged duration of diabetes.

In this study it was observed that incidence of left ventricular diastolic dysfunction is higher than left ventricular systolic dysfunction. 69% of total patients had reduced ejection fraction, 76% of patients had abnormal diastolic function. This difference was not statistically significant. Authors have reported that

systolic dysfunction in 23% of cases, diastolic dysfunction in 54% cases and both systolic and diastolic dysfunction in 23% of his cases. These observations proved that diabetics had abnormalities in both systolic and diastolic functions. Both symptomatic and asymptomatic had cardiac dysfunction though symptomatic had more. Moreover, incidence of diastolic dysfunction in diabetics was higher than systolic dysfunction. The cause of these abnormalities are yet to be established and further studies are needed for the same. Diastolic dysfunction is the earliest left ventricular abnormality. Myocardial involvement in diabetics initially impairs early diastolic relaxation, and when more extensive further impairs relaxation and then contractions (Shapiro et al 1981).

Summary and Conclusion

100 patients of diabetes Mellitus II were taken up in the present study. Detailed clinical, laboratory, radiological, electrocardiography study was done. Echocardiography was done in all patients to see Left Ventricular Ejection Fraction, LVDD or any other Echo finding. Out of 100 cases, 72 were Males, 28 were females. Age varied from 30 to 80 years. Out of 100 cases 40 cases had cardiac symptoms in the form of angina, palpitation dyspnoea. They had evidence of various cardiac dysfunctions.

Out of 100 cases, 26 cases had evidence of Ischaemic Heart Disease, 55 had Hypertension, 16 had HF, 50 had Dyslipidaemia, 22 had cardiomegaly. Out of 100 cases, other Diabetes complications were found in 80 cases. Out of 100 cases 30 cases had Retinopathy, 28 had peripheral Neuropathy, 14 cases had Nephropathy. No complication were found in 20 cases.

In Chest X-ray PA view 22 patients had Cardiomegaly (Cardiothoracic ratio > 0.05). Of these 6 were free of cardiac symptoms. ECG Abnormalities were found in

43 patients out of 100 patients in the form of Myocardial Infarction (acute or old) in 8 patients, Ischaemia in 4 patients, LBBB in 9 patient, RBBB in 9 patients, Bifascicular block in 3 patients, LVH in 5 patient and Arrhythmia in form of Atrial flutter Atrial fibrillation, Ventricular Ectopic in 11 patients, and diffuse ST-T changes in 5 patients.

Out of ECG Abnormality in 43 patients, 34 were found in patients with cardiac symptom and 9 were found in patient with no cardiac symptom. Of these 3 patients with LBBB, 1 patient with old Infarction, 1 patients with ventricular ectopic and 1 patient with Anterior Ischaemia were found in patient who did not have cardiac symptom.

The patients having diabetes for less than 5 years had less incidence of cardiac dysfunction whereas patients having diabetes for more than 5 years had more incidence of all cardiac dysfunction and associated abnormalities HF, Cardiomegaly, IHD, HTN, Dyslipidaemia.

On Echo, Ejection Fraction was found to be reduced in 69 cases out of 100 (69%). All patients with cardiac symptom had reduced Ejection Fraction. Left Ventricular Diastolic Dysfunction was found in 76 out of 100 cases (76%). All symptomatic patients had abnormal diastolic function and 36 out of 60 (60%) asymptomatic patients had abnormal Diastolic function. The patients having diabetes for less than or equal to 5 years duration had less incidence of reduced EF in comparison to those having for more than 5 years.

Both systolic and diastolic Dysfunction of Left Ventricular is found in diabetics. Diastolic dysfunction was observed more common in this group of patients.

Thus it is concluded that, many cardiac Dysfunctions and Associated abnormalities are found in patients with Type-II Diabetes Mellitus. These include IHD,

CHF, HTN, Dyslipidaemia, various types of arrhythmias, systolic or diastolic cardiac dysfunction. This can be detected by routine, clinical examination, X-ray Chest, ECG and Echo Doppler Study. Diastolic Left ventricular Dysfunction is more common than systolic Dysfunction. Incidence of cardiac dysfunction and complications increase with increase in duration of Diabetes.

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