ORIGINAL RESEARCH PAPER

Volume-6 | Issue-10 | October-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

TO STUDY THE INCIDENCE AND PREVALENCE OF DIFFERENT TYPE OF ARRHYTHMIAS AND CONDUCTION DEFECTS IN PATIENTS WITH DIABETES MELLITUS IN RELATION TO ELECTROCARDIOGRAPHY AND ECHOCARDIOGRAPHY

General Medicine

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ABSTRACT

Aim: To find out the incidence and prevalence of different type of arrhythmias and conduction defects in patients with diabetes mellitus in relation to electrocardiography and echocardiography in patient admitted to department of medicine RIMS, Ranchi.

Material and Method: The present study comprised of 50 diabetic patients admitted to indoor and outdoor medical wards of RIMS Ranchi .The diagnosis was made on the basis of detailed history, through clinical examination with particular attention to examination of cardiovascular system. Patient were labeled to be diabetic on WHO criteria.

Result : In our study we included 50 diabetic patients. one case was of type I diabetes and forty nine case belonged to type II diabetes. In our study we found myocardial infarction in 12% cases, ischemic changes in 12% cases and left ventricular hypertrophy in 22% cases of diabetes mellitus. Various type of conduction defect was found in 20% of cases. Arrhythmias and non-specific ST-T changes were found in 10% cases.

Conclusion: Changes of infarction and ischemia were noted in 24% diabetics. Left ventricular hypertrophy was noted in 20% diabetics. Various conduction blocks were found in 20% and arrhythmia in 4% diabetics. Non-specific ST-T changes was found in 12% diabetics

KEYWORDS

Diabetes mellitus, Arrhythmias, conduction blocks

INTRODUCTION:

Diabetes mellitus has reached epidemic proportions worldwide as we enter the new millennium. The World Health Organization has commented there is 'an apparent epidemic of diabetes which is strongly related to lifestyle and economic change'. Most will have type-2 diabetes, and all are at risk of the development of complications. According to Diabetes Atlas published by the International Diabetes Federation (IDF), there were an estimated 40 million persons with diabetes in India in 2007 and this number is predicted to rise to almost 70 million people by 2025[1]. Diabetes mellitus has been found to be associated with multitudes of cardiovascular complications, which manifest in mainly three clinical settings of coronary artery disease, diabetic cardiomyopathy, cardiac autonomic neuropathy. The facts about CAD in diabetics noted earlier have also been confirmed by recent studies. Type 2 Diabetes mellitus and CAD are close companions[2]. Cardiovascular complications are the main cause of morbidity and death in Type 1 Diabetes mellitus[3]. This association has been also shown in Type 2 Diabetes mellitus. Many Type 2 Diabetes mellitus subjects suffer from cardiovascular complications already at the time diabetes is diagnosed[4].With an increase in the number of older diabetic persons and the proven success of new methods to reduce microvascular complications, the importance of diabetic macrovascular complications will increase[5]. Recent epidemio logical studies have confirmed the relationship between Type 2 Diabetes mellitus and CAD and cardiac heart failure[6].Triple vessel disease and left main stem lesion are common, but intramural arteries are also involved[7] producing coronary microangiopathy. Silent myocardial ischaemia and silent clinical presentation and course of acute myocardial infarction (AMI) in diabetics are different from those seen in non-diabetics[8]. According to Epstein H et al[9] there is increased frequency of sudden death, and IHD and AMI in DM. The relative risk of myocardial infarction is 50% greater in diabetic men and 150% greater in diabetic women. The diabetic men have sudden death 50% more often and diabetic women 300% more after than do age matched non-diabetics. 30% of all death in diabetic patients is as a result of AMI. The reported mortality from AMI varies from 10% to 43%[5].This high mortality Multiple electrocardiographic abnormalities have been reported among diabetics. There may be Q wave changes, P wave abnormalities, conduction blocks, arrhythmia or non-specific ST-T changes. The most common ECG abnormalities in diabetics are non-specific ST-T changes with or without evidence of prior MI. But ST-T wave abnormalities are common in general population with a prevalence of 8.5% for men and 7.7% for women in the Framingham Heart Study [10]. Most sudden death episodes are due to ventricular tachycardia or ventricular fibrillation. The combination of a triggering event and a susceptible myocardium is evolving as a fundamental electrophysiological concept for the mechanism of initiation of potentially lethal arrhythmias. Myocardial vulnerability, either structural (infarction, hypertrophy, myopathy, structural electrical abnormality, etc.) or functional (transient ischemia, reperfusion, systemic factors, neurophysiological interactions, toxic effects, etc.), has to be present for triggering events such as frequent and complex PVCs to disorganize patterns of myocardial activation into multiple uncoordinated reentrant pathways. Among the many causes of increased myocardial vulnerability to ventricular arrhythmia, diabetes mellitus is one that has not generally received much recognition that it deserves. In addition to causing coronary heart disease by microangiopathic or endothelial proliferative changes of arterioles, diabetes can cause cardiomyopathy (with both systolic and diastolic dysfunction), chest pain, and, most importantly, arrhythmia indep endent of coronary disease or hypertension[11].

AIMS AND OBJECTIVES:

To find out incidence and prevalence of different type of arrhythmias and conduction defects in patients with diabetes mellitus in relation to electrocardiography and echocardiography.

MATERIAL AND METHOD:

The present study "Study of cardiovascular complications in patient with diabetes mellitus specially arrhythmias and conduction defects in relation to electrocardiography and echocardiography" was carried out in the Department of General Medicine, Rajendra Institute of Medical Sciences, Ranchi in the admitted indoor patients and patients attending out-patient department. Fifty diabetic patients admitted to indoor and outdoor medical wards of Rajendra Institute of Medical Sciences were taken in this study. Ten healthy persons without family history of diabetes mellitus were taken as control in this study. These controls were selected from doctors, ward attendants, and attendants of indoor patients. Neither of these subjects was diabetics nor hypertensive and was not taking any drugs, which would alter the echocardiography assessment. echocardiography was done in department of cardiology by cardiologist rims.

STATISTICAL ANALYSIS:

All data collected and their distribution as per age and diagnosis was tabulated, and their percentage was calculated. Data obtained from all the admitted cases of diabetes mellitus was also tabulated and analyzed using SPSS version 23. Independent t-test was used to compare mean values of continuous variables. The significant value was kept below 0.05.

RESULT:

Maximum numbers of patients developing cardiac complications were in 5th and 6th decade of life. No patients under 40 had ischemic heart

disease or other cardiovascular complications. Myocardial infarction occurred in 2 cases (14.28%) out of 14 in patients > 60 years, while in 4 cases (11.42%) out of 35 in patients of 40-60 years of age.[Table no-I]. There was no major difference in the incidence of hypertension in different age group, but only mild increase in the incidence (21.42%) in patients over 60 years than in patients on the age group 40-60 years (22.85%).Left ventricular hypertrophy was present in 10 patients (20%) and was frequent finding followed by changes of infarction and ischemia (24%). Anterior wall MI and ischemia was commoner (14%) than inferior wall changes.[Table no-II]. Left anterior hemiblock was commoner among conduction defects (8%), followed by right bundle branch block(6%) [Table no-III].Non-specific ST-T segment changes was present in 6 patients (12%).Atrial ectopics and ventricular ectopics were found in 2% cases each [Table no-III]. Echocardio graphy measurements done in 10 normal healthy controls and 10 diabetics. As compared to controls, a significant difference was noted in diastolic closure curve (EF-slope), IVRT, MD-DMVO, %FD and Ej.FR.The difference was not significant in EDD, SV, CO, PWt and left ventricular mass [Table no-V].Diabetics with more than 5 years duration had significantly more abnormal values than those under 5 year duration. Patients having greater abnormality expressed higher values of IVRT, MD-DMVO, EDD and reduced values of EF-slope, %FD and ejection fraction.

DISCUSSION:

In the present study, 24% of diabetics suffered from IHD of which 12% had MI and 12% had angina. Similar figures were found by Singh et al[12] and Ramchandran A et al[13] .Diabetic cardiomyopathy was found in one patient (2%). There is substantial increase in the incidence of diabetic cardiomyopathy in diabetics. This could be the result of diffuse coronary fibrosis (Reagan TJ et al,)[11] microangiopathy or increased perivascular and interstitial deposition of glycoprotein and insulin collagen (Reagan TJ et al, Perez JE et al,)[11,14]. Prevalence of IHD increased with duration of diabetes[13]. In the present study, changes of infarction and ischemia were noted in 24% of all diabetes, 12% AMI and 12% myocardial ischemia. Anterior wall M.I. was more common (8%) as anterior wall ischemia (6%). This is similar to the findings of Dash R et al[15], Weitzman S et al [16].Left ventricular hypertrophy was noted in 20% of diabetics, and its incidence was associated with the incidence of hypertension. Various conduction blocks were noticed in 20% of patients and arrhythmia in 4% cases. The increased incidence of bradyarrhythmia has been believed to be due to the microvascular effects of diabetes damaging the cardiac conduction system.Non-specific ST-T changes was found in 12% cases in the present study which is more or less similar to the findings observed in general population by Kannel WB et al[10], which is not consistent with the findings of other workers (Zoneraich Samuel et al)[17].Echocardiographic indices for systolic function showed Left Ventricular dysfunction. Percentage fractional shortening (%FD) and mvcf among diabetics were 24.3±2.4 and 0.78±0.16 circ/s respectively. While control values were 34.2±4.5 and 1.14±0.30 circ/s. The differences were highly significant ($P < 0.001$). These observations closely resemble the findings of Das et al 1982.The end diastolic diameter (EDD) in diabetics (4.76±0.76 cm) was not much different from control value (4.68±0.98 cm). In the present study, significant Prolongation ($P < 0.001$) of IVRT and MD-DMVO (dimension of mitral valve opening) were observed in diabetics (78.3±20.3 msec and 36.7±26.7 msec respectively). Corresponding figures in controls were 57.20±9.4 msec and 19.4±11.8 msec. Early diastolic closure rates in diabetics and controls were 64.1±23.8 mm/s and 96.2±27.6 mm/s ($P < 0.001$). Stroke volume and cardiac output did not show a significant difference between diabetics and controls. However, ejection fraction was significantly ($P < 0.001$) reduced. Values were 51.2±4.5% and 63±5.5% for diabetics and controls respectively. Similar observations were made by Das et al[18]. 1982.Posterior wall thickness in diabetics was 9.5±2.9 mm as against the thickness in controls (8.5±2.1 mm). The difference was insignificant ($P > 0.01$). Similarly, the difference of LV mass between diabetics and controls were insignificant ($P > 0.20$). A consistent relationship between the deterioration of LV function and duration of diabetic illness was observed in the present study.LV dysfunction in diabetes is not uncommon and is the single most important determinant of long-term survival.

CONCLUSION:

Frequent resting ECG abnormalities were noted among diabetics. Changes of infarction and ischemia were noted in 24% diabetics. Anterior wall M.I. was more common (8%) as anterior wall ischemia (6%). Left ventricular hypertrophy was noted in 20% diabetics. Various conduction blocks were found in 20% and arrhythmia in 4% diabetics. Non-specific ST-T changes was found in 12% diabetics. Echocardiographic indices for systolic function showed left ventricular dysfunction. %FD and mvcf among diabetics were 24.3±2.4 and 0.78±0.16 circ/s respectively, while control values were 34.2±4.5 and 1.14±0.30 circ/s. the differences were highly significant ($P < 0.001$); IVRT was significantly prolonged.

TABLE – I INCIDENCE OF CARDIOVASCULAR COMPLICA TIONS IN DIFFERENT AGE GROUPS

Age groups (years)	No. of patients	Ischaemic heart disease		Unexplained CHF (DCM)	Hypertension
		MI	Angina		
< 40	1	--	--	--	--
41 – 60	35	4 (11.42)	5 (16.28)	1 (2.85)	8 (22.85)
> 60	14	2 (14.28)	1 (7.14)	--	3 (21.42)
Total	50	6	6	1	11

TABLE – II INCIDENCE OF IHD AND LV HYPERTROPHY IN DIABETES

ECG abnormalities	No.	%
IHD	4	8
• Myocardial infarction	2	4
- Anterior		
- Inferior	3	6
• Ischaemia	2	4
- Anterior	1	2
- Inferior		
- Anterior + Inferior		
Hypertrophy- Left ventricular	11	22

TABLE – III INCIDENCE OF CONDUCTION DEFECTS

Type of disorder	No.	%
10 AV block	1	2
CHB	1	2
RBBB	3	6
LBBB	1	2
LAHB	4	8

TABLE –IV INCIDENCE OF ARRHYTHMIAS AND NON-SPECIFIC ST-T CHANGES

Type of disorder	No.	%
Atrial ectopics	1	2
Ventricular ectopics	1	2
Non-specific ST-T changes	3	6

TABLE –V ECHOCARDIOGRAPHIC MEASUREMENTS AND INDICES IN CONTROLAND DIABETICS

Echocardiographic indices	Echocardiographic measurements		P
	Controls (n=10)	Diabetics (n = 10)	
EF-slope (mm/s)	96.3±27.6	64.1±23.8	< 0.001
IVRT (m. sec)	57.20±9.4	78.3±20.3	< 0.001
MD-DMVO (m. sec)	19.4±11.8	36.7±26.7	< 0.001
EDD (cm)	4.68±0.98	4.76±0.76	> 0.70
SV (ml)	59.32±24.22	61.2±27.0	> 0.80
CO (l/m)	4.96±1.33	4.31±2.3	> 0.20
%FD (%)	34.2±4.5	24.3±2.4	< 0.001
Ej.FR (%)	63±5.5	51.2±4.5	< 0.001
mvcf (Circ/sec)	1.14±0.30	0.78±0.16	< 0.001
PWt (mm)	8.5±2.1	9.5±2.9	> 0.01
LV mass (gms)	101.5±34.56	114.4±40.36	> 0.20

IVRT = Isovolumic relaxation time,
EDD = End diastolic diameter
SV = Stroke volumePWt = Posterior wall thickening
MD-DMVO = Time interval from minimal dimension to dimension at mitral valve opening
CO = Cardiac output
FD = % fractional shortening of internal diameter
Ej.FR = Ejection fraction,
mvcf = Mean velocity of circumferential fibre shortening

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