Cardiac Manifestations of Diabetes Mellitus: Findings From A Tertiary Care Hospital.

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Abstract:
Introduction: Diabetes with cardiac complications is a well-known global problem. Coronary Artery Disease is more prevalent, more severe and occurs early in diabetics than non-diabetics.
Methods: One hundred patients admitted or attending outpatient clinics of Sri Venkateswara Ramnarain Ruia Government General Hospital and fulfilling the inclusion criteria (mentioned below) were evaluated clinically. A baseline ECG was taken in all cases irrespective of cardiac involvement. Patients with normal ECG pattern are further evaluated with stress test for latent coronary artery disease.
Results: The maximum numbers of patients were found to be in the age group of 41-60 years (73% of patients) and majority (64%) were males. In this study forty percent of patients had evidence of Ischemic Heart Disease. 36% of patients had cardiac autonomic neuropathy. 10% of patients developed Congestive Cardiac Failure and 4% of patients had Dilated Cardiomyopathy. Among 40 patients of Ischemic Heart Disease 18 patients had Angina and 22 patients had Myocardial Infarction. Among 36 cases of cardiac autonomic neuropathy, Parasympathetic involvement (n=22) was more common than sympathetic involvement (n=14).
Conclusion: With the present study it can be concluded that there is a high occurrence of Coronary Artery Disease with Coronary risk factors in patients with Diabetes Mellitus. Even modifiable risk factors like smoking are present in a significant proportion of patients. All patients with Diabetes Mellitus should be screened for latent Coronary Artery Disease.
Keywords: diabetes mellitus, cardiac manifestations, Ischemic Heart Disease, cardiac autonomic neuropathy

I. Introduction
Diabetes with cardiac complications is a well-known global problem. There are three major types of diabetes: type 1 diabetes, type 2 diabetes, and gestational diabetes. Diabetes if left untreated will lead to microvascular and macrovascular complications which can eventually cause heart disease, stroke, kidney disease, blindness, and nerve damage to nerves in the feet [1,2]. Ageing populations, increasing urbanization, dietary changes, reduced physical activity and unhealthy behavior are the risk-potential cultural and social changes, which causes DM to increase. In India, a greater degree of insulin resistance and a stronger genetic predisposition to diabetes prevails, and the trend will continue to exist in low- and middle-income countries [3,4].

According to International Diabetes Federation, India is one of the 6 countries of the IDF South East Asian region. 425 million people have diabetes in the world and 82 million people in the SEA Region; by 2045 this will rise to 151 million. There were over 72,946,400 cases of diabetes in India in 2017. The prevalence of diabetes in adults in India is 8.8% [5].

Coronary Artery Disease is more prevalent, more severe and occurs early in diabetics than non-diabetics. Higher incidence of Angina Pectoris, Myocardial Infarction (Including Silent M.I.) and Congestive Cardiac Failure has been reported in Diabetes Mellitus. Early recognition of Coronary Artery Disease in Diabetes Mellitus patients may therefore be important for management and prognostic purposes.

Objectives of the present study were to study the various cardiac manifestations in Diabetes Mellitus like, to evaluate the Associated risk factors in patients with Diabetes Mellitus and Cardiac diseases and to find the correlation between cardiac disease and duration of Diabetes Mellitus.

II. Material & Methods

Source of data:
Patients admitted to medical wards and ICCU or attending outpatient clinics of Sri Venkateswara Ramnarain Ruia Government General Hospital, Tirupati over a period from May 2018 to October 2019.
Method of Collection of Data:

One hundred patients admitted or attending outpatient clinics of Sri Venkateswara Ramnarain Ruia Government General Hospital and fulfilling the inclusion criteria (mentioned below) were evaluated clinically. A baseline ECG was taken in all cases irrespective of cardiac involvement. Patients with normal ECG pattern are further evaluated with stress test for latent coronary artery disease. All the patients subjected to the following investigations.

1) Fasting blood sugar level
2) Postprandial blood sugar level.
3) Blood urea.
4) Serum creatinine
5) Lipid profile
6) Cardiac enzymes (if necessary)
7) Echocardiography (if necessary)
8) Glycosylated haemoglobin

INCLUSION CRITERIA

I. Patients above the age of 18 years
II. Patients with Type 1 Diabetes mellitus.
III. Patients with Type 2 Diabetes mellitus.

EXCLUSION CRITERIA

I. Patients with Hypertensive heart diseases
II. Patients with Cor pulmonale.
III. Patients with Rheumatic heart disease and congenital heart disease.
IV. Patients with Gestational diabetes mellitus.

Criteria for selection of Patients:

Criteria for selection of DIABETIC patients: The selection of patients for Diabetes mellitus was made as per AMERICAN DIABETIC ASSOCIATION CRITERIA.

Criteria for selection of IHD patients: The patients with symptoms of angina and or unstable angina, with or without ECG changes. Asymptomatic patients with typical ECG changes for silent ischemia were also included.

III. Results

One hundred patients of Diabetes mellitus Type 1 and Type 2 attending the outpatient clinics and admitted in ICCU and medical wards who satisfied the inclusion criteria were studied and the following observations were made.

The maximum numbers of patients were found to be in the age group of 41-60 years (73% of patients). Majority (64%) were males. Majority (43%) were suffering from diabetes between 5-10 years duration. The mean body mass index of male patients in this study group was 22.6 and that of females was 23.1. Body mass index of females was higher. 13 males and 5 females had B.M.I above 25.

Smoking and Alcoholism

16 males (25%) and one female (2.7%) among the study group were chronic smokers (Bidies and or Cigarettes). Eighteen males (28.12%) consumed alcohol; none of the female patients were alcoholics.

Lipid profile:

The mean total cholesterol level was higher in females compared to males (214.8 Vs 200.4 mg %). The mean triglyceride level was again higher in females (163.5 mg % Vs 161.5 mg %). HDL-Cholesterol was less in females compared to males (40.3 mg % Vs 40.9 mg %).

Blood Glucose levels:

Fasting blood glucose at the time of presentation found that 46% of patients had FBS between 120-180 mg%. 30% had between 181-250 and 14% had more than 250 mg%.

Post prandial blood sugar level at the time of presentation showed that 65% of patients had blood sugar level between 200-400 mg % followed by 21% in the range of 200-300 mg%. 16% of the patients had <200 mg%.

Most common presenting complaint was chest pain and palpitation in 18% patients each, followed by breathlessness in 14%, swelling of feet in 10% and dizziness in 14%.
Clinical presentation:
In this study forty percent of patients had evidence of Ischemic Heart Disease. 36% of patients had cardiac autonomic neuropathy. 10% of patients developed Congestive Cardiac Failure and 4% of patients had Dilated Cardiomyopathy.

Pattern of IHD:
Among 40 patients of Ischemic Heart Disease 18 patients had Angina and 22 patients had Myocardial Infarction. Out of 18 patients of angina only 4 had typical Ischemic changes on resting ECG, rest of the 14 patients had latent Coronary Artery disease, which was detected by stress test.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angina</td>
<td>9</td>
<td>9</td>
<td>18</td>
<td>18%</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>10</td>
<td>12</td>
<td>22</td>
<td>22%</td>
</tr>
<tr>
<td>Cardiac Autonomic Neuropathy</td>
<td>20</td>
<td>16</td>
<td>36</td>
<td>36%</td>
</tr>
<tr>
<td>Congestive cardiac failure</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td>10%</td>
</tr>
<tr>
<td>Dilated cardiomyopathy</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4%</td>
</tr>
<tr>
<td>Sudden cardiac death</td>
<td>0</td>
<td>0</td>
<td>--</td>
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</tr>
</tbody>
</table>

Pattern of Myocardial Infarction:
36.36% of patients in this study presented with atypical symptoms or Silent Myocardial Infarction, which was detected on routine ECG recording.
Four patients out of 22 patients presenting with myocardial infarction had atypical presentations. 4 out of 22 (18.20%) patients with myocardial infarction were totally silent detected on routine ECG.
With regards to pattern of infarction, anterior or antero-lateral infarction was seen in 55.54% cases. Inferior wall infarction and Non-Q wave MI was seen in 18.18% patients. Inferior wall infarction with right ventricularextension was seen in 2 cases.
Among 36 cases of cardiac autonomic neuropathy, Parasympathetic involvement (n=22) was more common than sympathetic involvement (n=14). The most common symptoms of Autonomic neuropathy in this study were Postural Giddiness (22.2%), Impotence (15%), and Bowel disturbances.
Four patients (2 Males and 2 Females) who presented with congestive cardiac failure were evaluated with echocardiography. All four patients had dilated chambers and Four patients (2 Males and 2 Females) who presented with congestive cardiac failure were evaluated with echocardiography. All four patients had dilated chambers and decreased ejection fraction. Diagnosis of diabetic cardiomyopathy was made excluding other causes of dilated cardiomyopathy.

IV. Discussion
In the present study one hundred patients of Diabetes Mellitus were studied and following observations were made:
AGE: The mean age of the study group was 55.54 years (males-55.73 years and females-55.19 years). The mean age group of the study group by Bhuyan AK et al[6] was 53.3 ± 10.37 years (range: 36–72 years).
SEX
In the present study group of 100 patients 64 were male patients and 36 were female patients. The ratio of male: female is 1.7: 1. Similar findings were observed in Bhuyan AK et al[6] where 60% were males and 40% females.
DURATION OF DIABETES MELLITUS
The mean duration of diabetes mellitus in this study was 9.00 years. 9.07 years being in males and 8.86 years in females. Bhuyan AK et al[6] observed mean duration of diabetes was 9.03 ± 6.4 years ranging from 6 months to 25 years.
LEVELS OF HYPERGLYCEMIA
The mean fasting blood glucose level in this study was 185.9 mg % (males-184.5mg % and females-188.55 mg%). The mean post prandial blood sugar level at the time of presentation in the study group was 263.3 mg % (males 264.15 mg% and females-261.89 mg %). Shetty et al[1] reported 46% of patients had FBS between 120 and 180 mg%. 65% of patients had blood sugar level between 200 and 400 mg%.

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ISCHEMIC HEART DISEASE
In this study of one hundred patients of diabetes mellitus 40 patients had ischemic heart disease. Out of 40 patients of ischemic heart disease 18 patients had angina pectoris. Only 4 patients had typical history of chest pain correlating with angina pectoris and resting ECG was showing ischemic changes. Rest of 14 patients (17.94%) had latent coronary artery disease which was detected by thread mill test. Shetty et al.[7] reported 40% of patients in their study had evidence of Ischemic heart disease. Among 40 patients of IHD 18 patients had angina and 22 patients had MI. Out of 18 patients of angina, only 4 had typical ischemic changes on resting ECG, rest of the 14 patients had latent coronary artery disease, which was detected by stress test. Various other studies report widely variable prevalence of coronary heart disease among diabetics in India (6.6 to 33%).

MYOCARDIAL INFARCTION
Among 22 patients with myocardial infarction in the present study 10 patients were males and 12 patients were females. Females outnumber males in this study, which correlates with the study reported by Jeanno-partamian and Robert F Bradley in their series[8].

In this series of 22 patients with myocardial infarction 18 patients (36.36%) of patients presented with atypical manifestations or silent infarction which was detected during routine electrocardiographic recording.

James R Morgolis et al reported 23% of silent infarctions in their study[9]. Other authors have estimated the occurrence of unrecognized myocardial infarction between 0 to 60%.

The immediate mortality (within one week) in this series of 22 patients was 31.2%. Seven patients died within one week of admission. Four died within 24 hours of admission. Three died between 24 hours to one week. Partamian and Robert F Bradley have reported immediate mortality in their patients at 38% (immediatemortality was arbitrarily defined as 2 months of attack in their study)[8]. Two patients out of four who died within 24 hours presented with Cardiogenic shock (systolic BP less than 90 mm Hg).

Two patients who died between 24 hours and 1 week had diabetic ketoacidosis and one patient developed fatal ventricular arrhythmias.

PATTERN OF MYOCARDIAL INFARCTION
Twelve out of 22 patients had evidence of anterior/ anterolateral infarction (55.54%). Four patients (18.18%) had evidence of inferior wall myocardial infarction. Two patients had evidence of inferior wall myocardial infarction with rightventricular extension. Four patients had subendocardial infarction (18.18%).

CARDIAC AUTONOMIC NEUROPATHY
Thirty-six out of one hundred patients studied had evidence of cardiac autonomic neuropathy (36%). In our study parasympathetic involvement was more common than sympathetic involvement. Predominant symptoms of patient with autonomic neuropathy in our series were postural giddiness (22.22%), constipation (19.45%), and impotence (15%).

Behera BK et al.[10] study on cardiac autonomic neuropathy in diabetes mellitus patients found that 57.5% of patients with DM had CAN and its incidence increased with severity of hyperglycemia, duration of DM, BMI and age of the patient. All cases had some form of autonomic disturbance. Dizziness was the most common symptom. Dysphagia was seen only in one case.

V. Conclusions
With the present study it can be concluded that there is a high occurrence of Coronary Artery Disease with Coronary risk factors in patients with Diabetes Mellitus. Even modifiable risk factors like smoking are present in a significant proportion of patients. All patients with Diabetes Mellitus should be screened for latent Coronary Artery Disease (as it has prognostic implications). Also all patients with prolonged history of DM should be screened clinically with simple tests for the presence of Cardiac Autonomic Neuropathy and managed accordingly.

References

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