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Original Research Article

TO STUDY THE PREVALENCE OF ST-T CHANGES IN ASYMPTOMATIC PATIENTS WITH TYPE 2 DIABETES MELLITUS.

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Abstract

Background & Methods: The aim of the study is to Study the prevalence of ST-T changes in asymptomatic patients with Type 2 Diabetes Mellitus. 50 patients with ECG showing ST-T changes suggestive of ischemia were included as study sample for stress cardiac test. An informed, bilingual and written consent was obtained before the patients were included as study sample. Clearance from institutional ethical committee was obtained before the study was started.

Results: The systemic examination had shown normal findings on respiratory, cardiovascular and per abdominal examination among the males and females. The hemogram was normal in both males and females.

Conclusion: Out of which 50 patients had ST depression and T wave inversion in ECG. Hence the prevalence rate was 12.5%. These ST-T changes in ECG were more after age of 40 years in diabetics of more than 5 years of duration in males and less than 5 years of duration in females. All the patients having ST-depression and T-wave inversion in the ECG were further included in the stress cardiac test group (study group). 94% of patients in this study group had poor glycemic control and 58% (HBA1c > 8%) had positive TMT. 40% of patients had triglycerides level more than 150mg/dl, out of which 50% had positive TMT.

Keywords: prevalence, ST-T, asymptomatic & diabetes mellitus.
Study Design: Observational Study.

1. INTRODUCTION

Coronary artery disease (CAD) is one of the macrovascular complications and leading cause of cause of death and disability in the developed countries and is increasing rapidly in the developing world.[1] The cardiovascular disease accounts for 80% of death in diabetic patients, furthermore the prevalence of silent myocardial ischemia among the individuals with DM is high ranging from 20% to >50%.4 Patients with diabetes have two to four fold higher risk of developing coronary artery disease.5 Cardiovascular disease (CVD) accounts for 65 – 75% of deaths in people with diabetes.[2]

Diabetes Mellitus (DM) is a heterogenous chronic metabolic disorder principally characterized by persistent hyperglycemia resulting from defect in insulin secretion, insulin action or both.[3] The diabetes mellitus is an “iceberg disease” affecting 382 million people worldwide and set to increase to 592 million by the year 2035. It is the commonest endocrine disease with every fifth diabetic in the world lives in India. Diabetes mellitus is an established risk factor for morbidity and mortality. Diabetes Mellitus may be accompanied by other

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biochemical disturbances and the presence of progressive diabetic tissue damage with microvascular complications including retinopathy, neuropathy and nephropathy and macrovascular complications including cardiovascular, cerebrovascular and peripheral vascular diseases.[4]

Coronary artery disease is a major macrovascular complication of DM and reveals high mortality. Men with diabetes are up to three times more likely to die of CVD than men without diabetes; the relative risk for women with diabetes is even higher.

CAD in diabetics is often asymptomatic because of silent myocardial ischemia. It has been suggested that painless myocardial infarction occurs more frequently among diabetic patients than in general population and that this may be due to cardiac denervation as a result of diabetic neuropathy, making it a major cause of morbidity and mortality.[5] Evidence demonstrates that hyperglycemia in diabetes correlates well with risk and severity of microvascular and macrovascular complications and improving hyperglycemia reduces the risk. Thus "DEADLY TRIANGLE'' of coronary artery disease, cerebrovascular disease and peripheral vascular disease is the major cause of morbidity and mortality in the diabetic population.[6]

Furthermore, an abnormal exercise Electrocardiogram (ECG) is more common in diabetic patients without cardiac symptoms than in non-diabetic controls. Such reports whilst suggesting that asymptomatic myocardial ischaemia is commoner among diabetic subjects. The association between diabetes and asymptomatic coronary artery disease has been attributed to autonomic neuropathy.[7] Early detection of asymptomatic CAD in type 2 diabetes may prevent catastrophic cardiac events. Hence sophisticated cardiovascular non–invasive tests should be proposed for early detection of CAD in these patients. Exercise is a common physiologic stress used to elicit cardiovascular abnormalities not present at rest and to determine the adequacy of cardiac function.

2. MATERIAL AND METHODS

A cross sectional study was conducted among the patients with type 2 diabetes mellitus without signs & symptoms of coronary artery disease among 400 asymptomatic diabetic patients coming to Rohilkhand Medical College and Hospital, Bareilly, out of which total 50 patients with ECG showing ST-T changes suggestive of ischemia were included as study sample for stress cardiac test. An informed, bilingual and written consent was obtained before the patients were included as study sample. Clearance from institutional ethical committee was obtained before the study was started. All the patients who were fulfilling the inclusion and exclusion criteria were selected and subjected for thorough clinical examination. A detailed history pertaining to the symptoms suggestive of diabetes mellitus were taken and also the features suggestive of coronary artery disease including chest pain and associated symptoms including dyspnea, sweating and other related symptoms were assessed.

The inclusion and exclusion criteria were as follows:-

INCLUSION CRITERIA

1. Patients of type 2 DM in the age range of 25-75 years of either sex without signs & symptoms of coronary artery disease.
2. Electrocardiogram with ST-T changes suggestive of Ischemia.
3. No past history of Ischemic heart disease, cerebrovascular accident, peripheral vascular disease.

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EXCLUSION CRITERIA

The following patients was excluded from the study:

1. History of Myocardial infarction, heart failure, coronary revascularisation.
2. History of Angina or Angina equivalent symptoms.
3. Normal resting Electrocardiogram
4. Tachyarrhythmia or bradyarrhythmias
5. Left bundle branch block

3. RESULT

Table No. 1: Demographic profile of the study group.

Age group	Males N (%)	Females N (%)	Total N (%)
21 – 30 years	1 (4.5)	2 (7.1)	3 (6.0)
31 – 40 years	3 (13.6)	8 (28.6)	11 (22.0)
41 – 50 years	7 (31.8)	8 (28.6)	15 (30.0)
51 – 60 years	10 (45.5)	8 (28.6)	18 (36.0)
More than 60 years	1 (4.5)	2 (7.1)	3 (6.0)
Total	22 (100)	28 (100)	50 (100)
Mean ± SD	49.2 ± 9.4	46.39 ± 11.1	47.62 ± 10.41

The mean (± SD) age of the study group was 47.62 (± 10.41) years in this study. The mean age of the males was 49.2 (± 9.4) years and the mean age of the females was 46.39 (± 11.1) years.

Table No. 2: Distribution of the study group according to family history of CHD.

Family history	Males N (%)	Females N (%)	Total N (%)
Absent	7 (31.8)	25 (89.3)	32 (64.0)
Present	15 (68.2)	3 (10.7)	18 (36.0)
Total	22 (100)	28 (100)	50 (100)

χ^2 Value= 17.659 df=1 p value=0.000, Sig

Thirty Six four percent of the total study subjects had the family history of cardiovascular diseases. About 68.2% of the males and 10.7% of the females had family history of cardiovascular diseases in this study. The family history was statistically significant between the males and females.

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Table No. 3: Distribution of the study group according to Vital signs.

Mean ± SD	Males	Females	Total	T value	P value, sig
Pulse rate (beats/min)	83.01 ± 7.97	82.57 ± 8.59	82.8 ± 8.24	0.219	0.828, NS
Systolic blood pressure (mm of Hg)	123.09 ± 10.36	124.36 ± 11.27	123.8 ± 10.79	0.408	0.685, NS
Diastolic blood pressure (mm of Hg)	76.9 ± 7.75	76.64 ± 8.5	76.8 ± 8.1	0.114	0.91, NS

The mean (± SD) pulse rate among the males was 83.01 (± 7.97) and among females was 82.57 (± 8.59). The mean systolic blood pressure among the males was 123.09 (± 10.36) mm of Hg and among the females was 124.36 (± 11.27) mm of Hg. The mean diastolic blood pressure among the males was 76.9 (± 7.75) mm of Hg and among females was 76.64 (± 8.5) mm of Hg. There was no statistically significant difference between the pulse rate, systolic blood pressure and diastolic blood pressure between the males and females.

Table No. 4: Distribution of the study group according to blood glucose levels, HbA1c.

Mean ± SD	Males	Females	Total	T value	P value, sig
HbA_{1c} (%)	8.38 ± 1.4	8.39 ± 1.38	8.39 ± 1.37	0.007	0.994, NS
FBS (mg/dl)	176.36 ± 78.99	188.79 ± 65.55	183.32 ± 71.28	0.608	0.546, NS
PPBS (mg/dl)	234.95 ± 95.13	253.25 ± 78.16	245.2 ± 85.61	0.747	0.459, NS

The mean (± SD) HbA1c among the males was 8.38 (± 1.4)% and 8.39 (± 1.38)% among the females. The mean (± SD) fasting blood sugar was 176.36 (± 78.99) mg/dl among the males and 188.79 (+ 65.55) mg/dl among the females. The mean post prandial blood sugar was 234.95 (± 95.13) mg/dl among the males and 253.25 (± 78.16) mg/dl among the females.

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There was no statistically significant difference between the HbA1c, fasting blood sugar and post prandial blood sugar between the males and females.

Table No. 5: Distribution of the study group according to findings on systemic examination.

Systemic examination	Males N (%)	Females N (%)	Total N (%)
Normal RS	22 (100)	28 (100.0)	50 (100.0)
Normal CVS	22 (100)	28 (100.0)	50 (100.0)
Normal PA	22 (100)	28 (100.0)	50 (100.0)
Normal hemogram	22 (100)	28 (100.0)	50 (100.0)

The systemic examination had shown normal findings on respiratory, cardiovascular and per abdominal examination among the males and females. The hemogram was normal in both males and females.

4. DISCUSSION

Diabetes Mellitus is a heterogenous chronic metabolic disorder principally characterized by persistent hyperglycemia. The Coronary artery disease (CAD) is one of the macrovascular complications and leading cause of death and disability in the developed countries and is increasing rapidly in the developing world. Cardiovascular disease accounts for about 80% of deaths in diabetic patients, furthermore the prevalence of silent myocardial ischemia among the individuals with DM is high ranging from 20% to >50%.

Coronary artery disease is a major macrovascular complication of DM and reveals high mortality. Men with diabetes are up to three times more likely to die of CVD than men without diabetes; the relative risk for women with diabetes is even higher.[8]

CAD in diabetics is often asymptomatic because of silent myocardial ischemia. It has been suggested that painless myocardial infarction occurs more frequently among diabetic patients than in general population and that this may be due to cardiac denervation as a result of diabetic neuropathy, making it a major cause of morbidity and mortality. Thus "DEADLY TRIANGLE'' of coronary artery disease, cerebrovascular disease and peripheral vascular disease is the major cause of morbidity and mortality in the diabetic population.[9]

Tread Mill Test can identify the majority of patients likely to have significant ischemia during their daily activities and remain the most important screening & specific test for significant CAD. The sensitivity of the exercise ECG in patients with CAD is approximately 68% and specificity is 77%.

The mean (± SD) pulse rate among the males was 83.01 (± 7.97) and among females was 82.57 (± 8.59). The mean systolic blood pressure among the males was 123.09 (± 10.36) mm of Hg and among the females was 124.36 (± 11.27) mm of Hg. The mean diastolic blood pressure among the males was 76.9 (± 7.75) mm of Hg and among females was 76.64 (± 8.5) mm of Hg.[10]

The mean (± SD) HbA1c among the males was 8.38 (± 1.4)% and 8.39 (± 1.38)% among the females in this study. The mean (± SD) fasting blood sugar was 176.36 (± 78.99) mg/dl among the males and 188.79 among the females. The mean post prandial blood sugar was 234.95 (± 95.13) mg/dl among the males and 253.25 (± 78.16) mg/dl among the females. A study by Gupta et al had shown that, the mean HbA1c among the patients with positive TMT

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was 8.2% and among the patients with negative TMT was 8.1%. The mean fasting blood sugar level among the patients with positive TMT was 159.84 mg/dl and negative TMT was 164.42 mg/dl. The post prandial blood sugar among the patients with positive TMT was 208.13 mg/dl and negative TMT was 213.67 mg/dl. In DIAD study, the mean HbA1c percentage was 7.1%.73 In another study by Kim et al, the HbA1c percentage was 6.7 among the asymptomatic patients and 7.2 among the symptomatic patients.[11] In a study by Eltahawy et al, the mean HbA1c was 8.3%.[12]

5. CONCLUSION

Out of which 50 patients had ST depression and T wave inversion in ECG. Hence the prevalence rate was 12.5%. These ST-T changes in ECG were more after age of 40 years in diabetics of more than 5 years of duration in males and less than 5 years of duration in females. All the patients having ST-depression and T-wave inversion in the ECG were further included in the stress cardiac test group (study group). 94% of patients in this study group had poor glycemic control and 58% (HBA1c > 8%) had positive TMT. 40% of patients had triglycerides level more than 150mg/dl, out of which 50% had positive TMT.

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