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To Study the Clinical Profile and Electrocardiogram Findings in Obese Type 2 Diabetes Mellitus Patients in Central India

Dr. Vinod Verma[1], Dr. Dattaprasad Ganganpalli[2*], Dr. Dharmendra Jhavar[3], Dr. Sumit Kumar Vishwakarma[4], Dr. Bharat Kumar Paramar[5]

[1]MD Medicine, Senior Resident, [2,4]Junior Resident, [3]MD Medicine, DNB, Professor, [5]MD Medicine, Ex Resident, Department of Medicine, MGM Medical College, Indore, MP, India

***Corresponding Author:**

Dr. Dattaprasad Ganganpalli
Junior Resident, Department of Medicine, MGM Medical College, Indore, MP, India

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ABSTRACT

Introduction

Obesity has major adverse effect on health. Obesity is associated with an increase in mortality in type 2 diabetics, with a 50-100% increased risk of death from all causes compared to normal weight individual, mostly due to cardiovascular causes. Mortality rates rise as grade of obesity increases, particularly when obesity is associated with increased intra-abdominal fat. Electrocardiogram changes may help in early diagnosis of cardiovascular disease before leading to its fatal complications.

Materials and Methods

This work was conducted in department of medicine, MGM Medical College, Indore, from October 2012 to September 2013. 100 cases with type 2 diabetes mellitus (DM) having associated obesity were taken for present work.

Results

7(23%) male cases had normal ECG, while 23(32%) female cases had normal ECG. 12 (40%) male cases showed ECG changes (QS complex, ST elevation, ST depression, T inversion in lead II, III, aVF, T inversion in V5-V6) suggestive of myocardial infarction. In female cases, 22 (31%) cases out of 70 cases studied had ECG suggestive of MI. Poor R wave progression was present in 2(2.8%), 3(4.2%), 1(1.4%), 1(1.4%) cases according to BMI grades respectively. Left axis deviation was present in 2(2.8%) patients with BMI 25-29.9 and in 3(4.2%) patients with BMI 30-34.9. T wave inversion in lead II, III, and aVF was present in 3(4.2%), 2(2.8%), and 2(2.8%) patients according to BMI grades.

Conclusions

All obese patients with DM type 2 should offer baseline ECG recording because of autonomic neuropathy typical presentation of MI is uncommon in this population. As grade of BMI increases percentage of cases with poor progression of R wave also increases. In our study 40% male cases showed ECG changes suggestive of MI. There was no significant correlation between ECG findings and different grade of BMI or WHR.

Keywords: Body mass index, Diabetes mellitus, Obesity, Waist hip ratio

INTRODUCTION

India is experiencing an epidemic of Type-2 Diabetes mellitus and related disorders. With an estimated 50.8 million diabetic people, India has the world's largest diabetes population. Individual with Type 2 DM are at particular risk of the adverse consequences of obesity. The interaction of both disorders with other components of the metabolic syndrome culminates in an increase in cardiovascular complications and associated reduction in quality of life.

Obesity has major adverse effect on health. obesity is associated with an increase in mortality, with a 50-100% increased risk of death from all causes compared to normal weight individual, mostly due to cardiovascular causes. Mortality rates rise as grade of obesity increases, particularly when obesity is associated with increased intra-abdominal fat. Life expectancy of a moderately obese individual could be shortened by 2-5 years.

BMI and WHR are commonly used clinical parameters to measure obesity increase in BMI and WHR is associated with increase in risk of several cardiovascular diseases. ECG is the non-invasive and easy method to assess functional status of the heart and variations in electrophysiology of heart due to acute or chronic vascular events.

MATERIALS AND METHODS

Present work was conducted in Department of Medicine, MGM Medical College, Indore, MP, India, from October 2012 to September 2013. 100 cases with type 2 diabetes mellitus having associated obesity were taken for present work. Patients were taken randomly from various medical wards and OPDs.

Inclusion Criteria

1. Age 25 years to 60 years
2. Both male and female cases.
3. Cases who met the criteria for Diabetes mellitus type 2.
4. Cases with BMI>25.
5. Old as well as newly detected diabetic cases with various risk factors.

Exclusion Criteria

1. Age <25 year and case with age>60 years not included because cases with <25 year of age may have often diabetes mellitus type 1 and severe other age related diseases may see in senior citizens.
2. Cases with the normal and subnormal BMI.
3. Seriously ill cases with multisystem disease.
4. Cases were excluded who had clinical hypo or hyperthyroidism.
5. COPD cases.
6. Cases with deranged renal function.
7. Cases not giving consent.

Informed consent was taken prior to talking cases for present work.

In all selected cases detailed clinical workup was done. Various anthropometric measurements were taken and relevant investigations done.

The anthropometric measurements of cases were recorded by observer and his colleagues, using standard protocol. Cases were instructed to empty their bladder prior to anthropomorphic measurements. Cases stood in light clothing without shoes/chapels.

Height was measured to the nearest 0.1 cm using by inches centimeter tape pasted to wall. Cases were asked to stand erect while their occiput shoulder hips and heel touched the wall. A firm cardboard was put over the vertex to get the height in centimeters.

Weight was measured by using conventional weight machine.

Body mass index (BMI) was calculated from weight (kg) divided by square of height in meter square. A plastic coated inch/ centimeter tape was used for the waist circumference and hip circumference measures.

Waist circumference was measured at the smallest circumference between the costal margin and the iliac crest to the nearest 0.1 cm while the case was standing with the abdomen relaxed, at the end of normal expiration. Where there was no natural waistline, the measurement was taken at the level of umbilicus.

Hip circumference was measured at the maximum circumference between the iliac crest and the crotch, whiles the participant in standing and recorded to the nearest 0.1 cm.

A 12 lead electrocardiogram (ECG) was recorded with patient in supine position. Patient was asked to relax.

Statistical analysis

The discrete data were assessed in number and percent. Chi-square test was used for determining the correlation between carotid artery disease and various atherosclerotic risk factors. P value (2 sided) <0.05 represents statistical significance. Statistical significance was assessed by Statistical Package for Social Science (SPSS) version 10.

RESULTS

This study included 100 patients of obesity with type 2 diabetes mellitus. We studied the clinical profile and electrocardiogram findings in obese type 2 diabetes mellitus patients in central part of India.

As shown in table 1, out of 70 cases with abnormal ECG: 24% cases had ECG suggestive of low voltage QRS complex, 34% cases had ECG changes suggestive of ischemic heart disease. Poor

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progression of R wave was seen in 7% of cases. One case had sinus tachycardia.

Table 1: Distribution of 70 cases with abnormal ECG findings

ECG changes	No. of cases	ECG changes	No. of cases
Low voltage QRS complex	24	Left ventricular hypertrophy	4
QS complex	14	T inversion in I, aVL, V5-V6	4
ST elevation	3	BBB	10
ST depression in precordial lesds	6	VPCs	3
		Sinus tachycardia	1
T inversion in lead II, III, aVF	7	Early repolarisation	3
Poor progression of R wave	7	QT prolongation	1
Left Atrial overload	7	Nonspecific changes	4
Right Atrial overload	2	1* heart block	2

ECG was normal in 30 patients

As shown in table 2, 13(20%),8(33%), 2(25%), and 1(25%) cases with BMI 25-29.99 (N=64),30-34.99 (N=24), 35-39.99 (N=8), and >or=40 (N=4) respevtively showed low voltage complex. 10(10%) cases in our study (n=100) showed bundle branch block including right and left.

Table 2: Correlation between BMI and various ECG changes (n=100)

BMI	QS Complex	Low voltage complex	Bundle branch block	Left atrial overload
25-29.9	7	13	8	3
30-34.9	4	8	1	3
35-39.9	2	2	0	1
>40	1	1	1	0
Total	14	24	10	7

As shown in table 3, most of cases in our study with normal resting ECG, belonged to BMI 25-29.9(35%) and as BMI increases number of normal ECG decreases.

Table 3: Correlation between BMI and no. of cases with normal ECG(n=30)

BMI	Normal ECG	%
25-29.9	23	23
30-34.9	4	4
35-39.9	2	2
>40	1	1

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Total	30	30

As shown in table 4, poor R wave progression was present in 2(2.8%), 3(4.2%), 1(1.4%), 1(1.4%) cases according to BMI grades respectively. Left axis deviation was present in 2(2.8%) patients with BMI 25-29.9 and in 3(4.2%) patients with BMI 30-34.9. T wave inversion in lead II, III, and aVF was present in 3(4.2%), 2(2.8%), and 2(2.8%) patients according to BMI grades.

Table 4: Correlation between BMI and various ECG changes (n=70)

BMI	Poor progression of R waves	LAD	T inversion in II, III, aVF	T inversion in I, aVL,V3-V6
25-29.9	2	2	3	3
30-34.9	3	3	2	1
35-39.9	1	0	2	0
>40	1	0	0	0
Total	7	5	7	4

As shown in table 5, ventricular premature complexes were present in 1 patient with BMI 25-29.9, 1 patient with BMI 30-34.9, and 1 patient with BMI more than 40. ST elevation was present only in 3 patients in BMI group 25-29.9. ST depression was present in 3 patients with each BMI range 25-29.9 and 30-34.9. There was none specific ECG changes in 4 patients in BMI range 25-29.9.

Table 5: Correlation between BMI with no. of obese DM type 2 cases with various ECG changes (n=70)

BMI	VPCs	ST elevation	ST depression	LVH	Non specific changes
25-29.9	1	3	3	2	4
30-34.9	1	0	3	1	0
35-39.9	0	0	0	1	0
>40	1	0	0	0	0
Total	3	3	6	4	4

DISCUSSION

Present study was conducted in 100 obese type 2 diabetes consecutive patients from MGM Medical College and MY hospital Indore. This study was aimed to evaluate any electrogardiogram changes in obese type 2 DM patients from the study population of central India. The results observed in these patients during October 2012- September 2013 in Medicine Department MGM Medical College and M.Y.H. Indore, MP, India, presented for discussion.

Our study shows (table 1) that among various ECG findings; 24% cases had low voltage QRS complex, 34% cases had ECG changes suggestive of CAD. Poor progression of R wave was seen in 7% cases and 10% cases showed bundle branch block (either LBBB or RBBB). Isolated minor nonspecific ST-segment and T-wave abnormalities, indicating increased risk for coronary heart disease mortality and primary arrhythmic death can be present in the resting ECG in elderly (≥70 years) patients with diabetes[1].

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Tables 2, 3, and 4 shows correlation between BMI and various ECG changes in 70 cases with abnormal ECG findings. In a study done by Luigi Brollo et al[2] in 1,042 participants, 35.3% had DM (38.6% of the Issei and 34.5% of the Nissei); 51.8% had metabolic syndrome (59.4% of the Issei and 50.0% of the Nissei). There was a statistically significant correlation between metabolic syndrome and left ventricular hypertrophy in the Issei and Nissei groups. Exercise microvolt T-wave alternans identify sudden cardiac death risk and have been identified in the ECGs of postmyocardial infarction patients with diabetes[3].

Table 5 shows correlation between BMI and number of cases with normal ECG findings. Out of 30 cases with normal ECG, 23 cases had BMI 25-29.9. In a study by the de Santiago et al[2] analyze the prognostic value of ECG in a group of 221 patients with DM2 with no known cardiovascular disease, followed up for 5.9 years. They conclude that ECG abnormalities can predict the onset of cardiovascular events in patients with DM2 more precisely than traditional risk factors (hypertension, smoking, hypercholesterolemia, age, sex)[4].

In various study, it is found that overall rates of ECG abnormalities were significantly higher in subjects with metabolic syndrome than in those without metabolic syndrome ($p<0.01$). Metabolic syndrome was strongly associated with ECG abnormalities, especially ischemic ECG findings. The association between ischemic ECG findings and central obesity was weaker in women than in men.

Computerized ECG measures of repolarization abnormality and complexity, that is, ST-segment depression $\geq 50\,\mu V$, QT interval corrected for heart rate (QTc) >460 ms, and increased principal component analysis (PCA) of the ratio of the second to first eigenvalues of the T-wave vector can predict silent myocardial ischemia and all-cause mortality in patients with type 2 diabetes[5].

This study was conducted in 100 consecutive patients with type 2 DM with obesity, we tried to find the correlation with early ECG changes in these study population. However the number of included patients was limitation in our study.

CONCLUSIONS

All obese patients with DM type 2 should offer baseline ECG recording because of autonomic neuropathy typical presentation of MI is uncommon in this population. As grade of BMI increases percentage of cases with poor progression of R wave also increases. In our study 40% male cases showed ECG changes suggestive of MI. There was no significant correlation between ECG findings and different grade of BMI or WHR.

DISCLOSURES

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Conflict of interest: Nil

Ethical Approval: Study was approved by institutional review board.

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