Journal of Pharmaceutical Research International

32(14): 1-5, 2020; Article no.JPRI.54223
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Echocardiographic Changes in Controlled Type 2 Diabetes Mellitus with Reference to Body Mass Index and Waist Hip Ratio

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2020/v32i1430598
Editor(s):
(1) Dr. Arun Singh, Rohilkhand Medical College & Hospital, India.
Reviewers:
(1) Ramachandran Muthiah, Thoothukudi Medical College Hospital, India.
(2) Maria Cristina Gonzalez-Torres, Universidad Autonoma Metropolitana-Iztapalapa, Mexico.
(3) Izreen Supa'at, Universiti Selangor, Malaysia.
Complete Peer review History: http://www.sdiarticle4.com/review-history/54223

Original Research Article

Received 20 May 2020
Accepted 26 July 2020
Published 06 August 2020

ABSTRACT

Type2 diabetes mellitus is associated with central obesity. Studies shows that central obesity, leads to insulin resistance is an important determinant for insulin resistance and cardiovascular morbidity. In the present study clinical profile of type2 diabetics with special reference to cardiac changes were studied and their relationship were established. This is a prospective cross-sectional study conducted in Sree Balaji Medical College and Hospital. 50 obese patients with controlled diabetes less than 5 years of duration were compared with obese non diabetics. There is significant statistical correlation with obese diabetic subjects particularly females, alterations in LV geometry. Obese female subjects had predominantly higher left ventricular mass. From the data of the present study high BMI, WHR have increased incidence of cardiovascular disease.

Keywords: Obese; type2 diabetes; BMI; WHR; cardiovascular disease.

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1. INTRODUCTION

Diabetes mellitus, over two thousand years is featured prominently in the history of modern medicine. Diabetes mellitus is now recognized as a group of common metabolic disorders that share the phenotype of hyperglycemia. Though type 2 diabetes mellitus is a multifactorial disease, obesity is the most common and important factor associated with its pathogenesis. Obesity is associated with insulin resistance, compensatory hyperglycemia and glucose intolerance all of which are metabolic alterations contributing to substantial increase in the risk of type 2 diabetes mellitus. It has also been shown that obesity; particularly the visceral type is associated with increased incidence of cardiovascular disease risk [1]. Recent evidence suggests that both hyperglycemia and insulin resistance may contribute to adverse myocardial metabolism, resulting in abnormal systolic and diastolic function. Myocardial metabolism alterations are associated with myocardial dystrophy and lead to the heart chambers dilatation, decreased contractility, organs perfusion and depended on symptoms. Nowadays heart failure treatment in veterinary medicine includes neurohormonal, circulatory and contractile aspects of this pathological. state. Unfortunately, energy supplying component not presented in modern recommendations [2].

2. MATERIALS AND METHODS

2.1 Study Deign

The present study was carried out in the General Medicine ward and Diabetology Department of the Sree Balaji Medical College and Hospital. A cross- section of both male and female diabetic patients attending the above departments were taken into the study. A total of 50 patients were studied. 25 male and 25 female diabetic patients were selected. The study was done between March 2017 and February 2018 in our institution. Relevant history, physical examination, measurements of anthrometric indices was also done. Echo and 2d Doppler study were also done. Other routine investigations were done. Routine investigations - complete blood count, renal function test, electrolytes, liver function tests, urine routine, chest radiograph and imaging studies were done to rule out other co-morbid conditions [3].

2.2 Statistical Analysis

Excel (Microsoft Office 2007) and SPSS (SPSS inc, Chicago) software packages were used for data entry and analysis. The student 't' test was used to determine whether there was a statistical difference between improved and expired

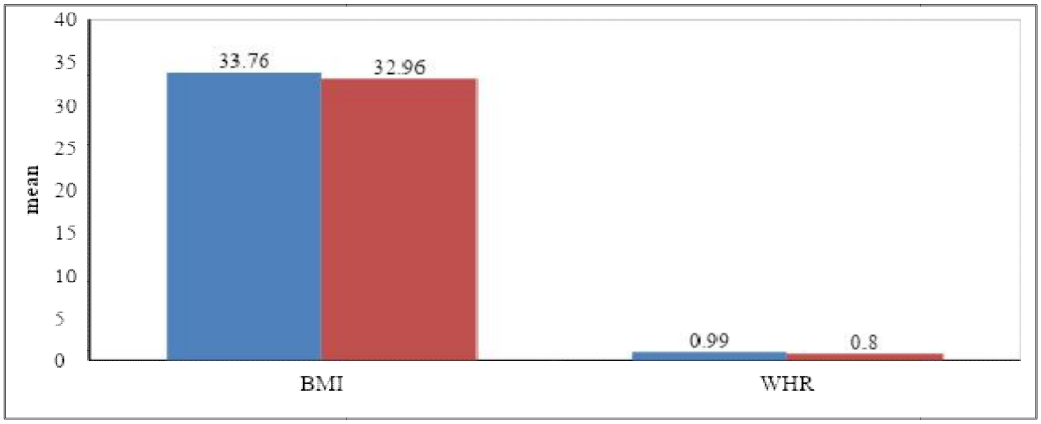

Fig. 1. Mean BMI and WHR in each group

Table 1. Mean LVIDD, IVST and LVPWT in each group

Variable	Case	Control	P value
LVIDD (cm)	5.01±0.42	4.53±0.36	0.000*
IVST (cm)	1.04±0.18	0.89±0.09	0.000*
LVPWT (cm)	1.01±0.12	0.81±0.05	0.000*

**Significant*

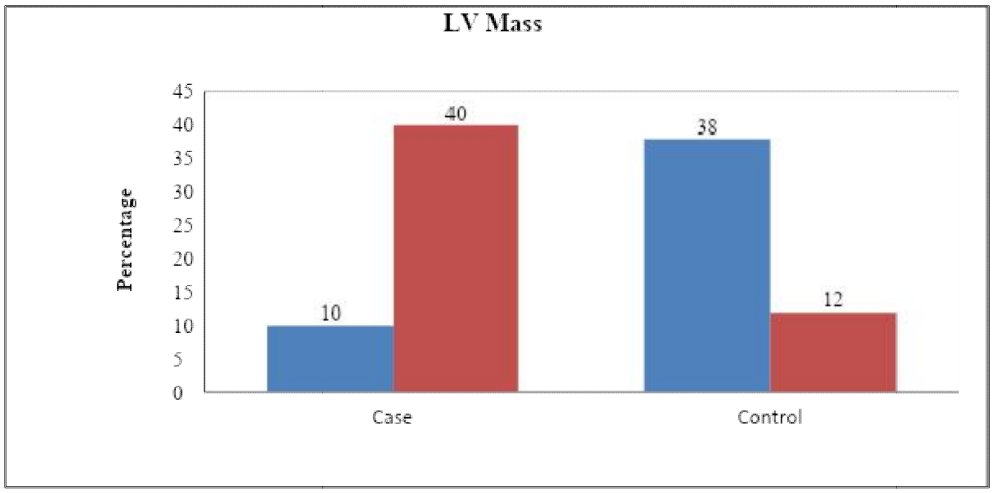

Fig. 2. Proportion of cases with respect to LV Mass in each group

subjects in the parameters measured. The Proportions were compared using Chi-square test of significance. One way analysis of variance was used to test the difference between the groups [4]. In all the above test "p" value of less than 0.05 was accepted as indicating statistical significance.

3. RESULTS

The mean Body Mass Index (BMI) among the cases was 33.76 with SD of 1.93, among the control group the mean BMI was 32.96 with SD of 1.95. The difference in BMI among cases and controls were found to be statistically significant with p value<0.05. Regarding Waist Hip Ratio (WHR) among cases the mean was 0.99 with SD 0.55 and among the controls the mean WHR was found to be 0.80 with SD 0.56 and the difference was highly statistically significant (p value 0.000) [5].

In this current study, the difference in Left ventricular internal dimension was found to be statistically significant. (p value= 0.000). Likewise the difference in IVST and LVPWT between cases and controls were found to be statistically significant (p value =0.000). Left ventricular mass was found to be increased in 40% of the cases and 12% of the controls in this study whereas left ventricular mass was normal in 10% cases and 38% controls.

4. DISCUSSION

All of the 50 cases selected had altered waist hip ratio, > 0.85 for females and >0.95 for males reflecting large proportion of abdominal fat distribution. Average BMI was 33.76 among cases compared to 32.96 in controls. In view of waist hip ratio, the mean was 0.99 when compared to 0.8 among controls. Even in presence of obesity in both the groups, abnormalities were detected by echocardiography [6]. Only 2% of the cases had neuropathy. None of the patients had evidence of microscopic albuminuria or retinopathy.

None of the patients had any history of angina stable or unstable. None of the patients had any history suggestive of ischemic heart disease. Electrocardiographic evidence of benign conduction disorders were observed in a small proportion (20%) of the cases. 15% had incomplete RBBB and another 5% had incomplete LBBB and 5% of the controls had incomplete RBBB.

In the present study abnormalities in left ventricular geometry were detected in the form of increased interventricular septal wall thickness, increased left ventricular posterior wall thickness and increased left ventricular mass. The mean left ventricular mass of the cases in the present study was 190.7 grams, which was significantly higher than that of controls, 115.88 grams. 46% of the cases in the present study had a high left ventricular mass. Among the cases incidence of higher left ventricular mass in females was 68% as compared to 24% in males. Thus in the present study type 2 diabetic subjects with a high waist hip ratio and a high BMI had a higher interventricular septal wall thickness, left ventricular posterior wall thickness and LV mass than those obese without diabetes and normal waist hip ratio [7,8]. In the present study, females

had higher incidence of abnormalities in left ventricular geometry as compared to males.

It was found that, a significantly higher left ventricular mass, interventricular septal wall thickness and left ventricular posterior wall thickness in female type 2 diabetes mellitus patients [9,10]. The mean left ventricular mass in their study was 169 grams [11]. The results of this study are similar to the present study. However, the mean left ventricular mass calculated in the present study was higher i.e. 190.7 grams. This difference could be due to the higher waist hip ratio and BMI of the type 2 diabetic subjects in the present study.

The present study also demonstrated a very high incidence of diastolic dysfunction in the type 2 diabetes mellitus patients with high waist hip ratio and BMI. The incidence of LV diastolic dysfunction was also much higher than the other studies [12,13]. This higher incidence of abnormalities in the left ventricular geometry and function could be due to the study group, which consisted of obese or centrally obese diabetics. This association between obesity, type 2 diabetes mellitus and left ventricular abnormalities could be responsible for higher incidence of cardiovascular events in such patients. However, a much larger population based study is required before a definite causal association can be established between obesity type 2 diabetes mellitus and abnormalities of left ventricular geometry and function.

5. CONCLUSION

From the data of the present study it can be concluded that type 2 diabetics with obesity, particularly central type, have an increased predisposition to the development of left ventricular structural or geometrical abnormality. They have significantly higher left ventricular Mass. Obese type 2 diabetics also have higher incidence of diastolic dysfunction. All these abnormalities occur with greater frequency in females.

CONSENT

As per university standard guideline patients' consent has been collected and preserved by the authors.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/54223