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PREVALENCE OF DIASTOLIC DYSFUNCTION WITH NORMAL SYSTOLIC FUNCTION IN ASYMPTOMATIC TYPE 2 DM

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Conflicts of Interest: Nil
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Abstract:
Background: In the last thirty years, diabetic heart diseases have increased at a significant rate. It is being considered as a clinical anomaly by different researchers and experts on the topic. According to various studies even if there is no indication of coronary artery disease and hypertension, then as well, there are high chances of heart failure in diabetic patients. People with diabetes mellitus (DM) tend to have high pre-clinical diastolic dysfunction.
Aim: Aim of the current study was to evaluate the relationship between diastolic dysfunction and Type 2 DM. In this research, the scholar also considered the asymptomatic subjects. To achieve the aim of the study, the researcher assessed the occurrences of diastolic dysfunction along with normal systolic functions in asymptomatic Type 2 DM. The study also evaluated its relationship with duration of DM, age, obesity, Glycosylated haemoglobin (HbA1c) and microangiopathies.
Materials and Methods: Thirty normotensive people with Type 2 DM for more than 3 years were selected for the current study, but it did not involve people with cardiac diseases. Further, a sample of 30 healthy subjects as the control group was also selected for this study. The researcher was carried out for over one year at Sri Siddhartha Medical college and hospital, Tumkur, Karnataka from March 2017 to February 2018.
Results: During the study, it was observed that the mean for waist circumference (WC) was computed to be much higher for the case group in comparison to participants from the control group. The mean for waist to hip ratio (WHR) was also higher for case group than that of the control group. Similarly, mean for total serum cholesterol (TC) and serum triglyceride levels (TG) was higher in the case group as opposed to the control group. Low density lipoprotein (LDL) cholesterol's mean was also higher, while the mean for High-density lipoprotein (HDL) cholesterol was found to be lower in the case group than in the control group. Mean of blood sugar level (BSL) for the case group was much higher while the mean for E/A {early diastolic rapid filling (E-wave) and atrial contraction late filling (A-wave) velocities} was computed to be very low as compared to the control group. E/e's {mitral peak velocity of early filling (E) to early diastolic mitral annular velocity (e)} ratio's and diastolic dysfunction's mean for the case group was higher in comparison to the control group. During the study, diastolic dysfunction was found to be more prevalent in the participants than HbA1c > 7.5% and HbA1c < 7.5%. Serum HDL's correlation was positive with E/A ratio and negative correlation with E/e' ratio. A statistically significant association was observed during the regression analysis between diastolic dysfunction and factors of WC, WHR, serum TG level, HbA1c, DM, autonomic neuropathy and retinopathy.
Conclusion: It can be concluded that the prevalence of diastolic dysfunction is statistically significant and high in people with asymptomatic Type 2 DM in comparison to the control group. Duration of diabetes, advanced ageing, high obesity, retinopathy, postural hypotension, dyslipidemia and HbA1c are associated with LV diastolic abnormalities.
Keywords: *Diastolic dysfunction, diabetes mellitus, echocardiography and heart failure*

Introduction:

In recent some years, there has been a significant increase in the cases of diabetes mellitus (DM) around the world. In fact, it has reached epidemic proportions. Specifically, during the last three decades, the instances of people suffering from heart diseases, as a result of diabetes are now considered as a very distinct clinical aspect by various experts and researchers around the world[6]. Researchers defined heart failure or HR as a medical condition that comes with the functions of left ventricular systolic. Studies have even found high chances of heart failure for people with diabetes, even if they do not have any coronary artery disease and cases of hypertension[2]. According to several studies, people with DM tend to have higher pre-clinical diastolic dysfunction. In diabetic subjects, the diastolic functions are affected even before the systolic function starts to put its influence through the myocardial damage[6]. Even though so many studies have been carried out on the subject matter, they have failed to understand and explain the pathogenesis of the left ventricular (LV) dysfunction in diabetic subjects. Various

studies have shown that diabetic cardiomyopathy is an independent type of cardiovascular disease. The main reason for such a disease can be attributed to factors like interstitial fibrosis, metabolic disorders, autonomic dysfunction and microvascular diseases and many more[3]. However, so far, the specific etiopathogenesis of the diabetic cardiomyopathy has not been found.

Even with so many studies available on the topic of diabetes, there is a serious lack of Indian population-based studies that describe the prevalence of the diastolic dysfunction among diabetic people[9]. The current study shows and describes the relationship between diastolic dysfunction and Type 2 DM. Asymptomatic subjects also have been considered in this research. This study was carried out with normal systolic function in asymptomatic type 2 DM and its relations with the duration of DM age, obesity, HbA1c and microangiopathies.

MATERIALS AND METHODS

Introduction

This study hypothesised worsening of diastolic dysfunction with the duration of DM, age, obesity, and HbA1c. In this regard, the ratio of mitral peak velocity of the early filling (E) to early diastolic mitral annular velocity (e') (E/e') was followed. Further, the researcher took a sample size of 30 normotensive subjects who were diagnosed with Type 2 DM for a period of more than 3 years. In this study, no cardiac diseases were selected for the current research. For the control group, a sample of 30 healthy subjects was used. This research was carried out at Sri Siddhartha Medical college and hospital, Tumkur, Karnataka for one year – from March 2017 to February 2018.

Inclusion Criteria

Normotensive subjects (LVEF ≥ 50%) diagnosed with Type 2 DN for a period of more than 3 years, but with no history of cardiac diseases were included in the current research work.

Exclusion Criteria

Following were the exclusion criteria used in this study:

- People who have valvular disease
- Subjects who had coronary artery disease
- People with bad transthoracic echo window
- People with agents of hypertension and/or angiotensin-converting enzyme (ACE) inhibitors that showed evidence of hypertrophy in left ventricular on echocardiography.

Echocardiography

Each of the participants went through the Doppler Imaging and resting transthoracic 2-dimensional echocardiography to evaluate their left ventricular diastolic function. For accurate measurements, transthoracic 2-dimentionsional echocardiogram (TTE) with pulse-Doppler and Tissue Doppler Imaging (TDI) and 2D echocardiography (ECG) were carried. Furthermore, a modified version of the Simpson's model was used to compute the left ventricular overall ejection fraction (systolic function).

Statistical Analysis

To analyse the data, SPSS-20 was used, and tests such as descriptive analysis, correlation, regression, chi-square tests were carried out.

RESULTS

Table 1:

Gender	Case Group
Male with Type 2 DM	18 (60%)
Female with Type 2 DM	12 (40%)

From the above table, it can be observed that 60% of participants were male who had Type 2 DM, and 40% were female. While on the other hand, the control group consisted of 33% male and 66% female participants.

Table 2:

Gender	Case Group
Male	10 (33.33%)
Female	20 (66.66%)

From the t-test, the mean of BMI for the case group was found to be higher than that of the control group. Further, the mean for WC was computed to be much higher for the case group in comparison to participants from the control group. The mean for WHR was also higher for case group than that of the control group. Similarly, mean for TC and TG was higher in the case group as opposed to the control group. LDL-cholesterol's mean was also higher, while the mean for HDL cholesterol was found to be lower in the case group than in the control group. Mean of BSL for the case group was much higher while the mean for E/A was computed to be very

low as compared to the control group. E/e's ratio's and diastolic dysfunction's mean for the case group was higher in comparison to the control group. During the study, diastolic dysfunction was found to be more prevalent in the participants than HbA1c > 7.5% and HbA1c < 7.5%. Participants with age greater than 45 years had higher diastolic dysfunction than those with age less than 45 years. Diastolic dysfunction was found to be directly proportional to the duration of diabetes. Participants that had higher WHR and WC had statistically significant diastolic dysfunction. From correlation analysis, it was found that age, WC, WHR, duration of diabetes, HbA1c, fasting BSL and serum TG level had a negative correlation with E/A ratio; while on the other hand positive correlation with E/e' ration was also observed. Serum HDL's correlation was positive with E/A ratio and negative correlation with E/e' ratio. A statistically significant association was observed during the regression analysis between diastolic dysfunction and factors of WC, WHR, serum TG level, HbA1c, DM, autonomic neuropathy and retinopathy.

DISCUSSION

From the findings of the study, it can be observed that patients with DM had a pre-clinical diastolic dysfunction. Results of the current study concur with the findings of Romano and Penco (2010)[7] who conducted their study on people with Type 2 DM with a sample of 55 individuals. Majority of the participants in this research were diagnosed with diastolic dysfunction. In addition, the results are also similar to the findings of Romano and Penco[7]. They found an association between the LV and global cardiac autonomic neuropathy (CAN). Roos and Delgado (2013)[8] found that the cardiac diastolic dysfunction without LV systolic dysfunction among people with well-controlled Type 2 DM can be associated with the duration of Type 2 DM and age, but it cannot be linked with LY hypertrophy and hypertension. The current research relates to the findings of Roos and Delgado (2013)[8]. During the study, it was also revealed that the participants for the case group without CAD and hypertension had a normal LV systolic function. Furthermore, a negative association between E/A ratio and duration of diabetes was observed. This result correlates with the results of Faden and Cioffi (2013)[4]. Chaudhary, Shukla and Razi (2015)[1] conducted a study of 70 people and concluded that diastolic diabetes and LV systolic are related to diabetes microangiopathies and duration of diabetes. Results of the current study are similar to the findings of Chaudhary, Shukla and Razi (2015)[1].

CONCLUSION

On the basis of the study, it can be concluded that the prevalence of diastolic dysfunction is statistically significant and high in people with asymptomatic Type 2 DM in comparison to the control group. Duration of diabetes, advanced ageing, high obesity, retinopathy, postural hypotension, dyslipidemia and HbA1c are associated with LV diastolic abnormalities. If the diastolic dysfunction can be identified early on and then with the help of institutional treatments, the outcomes can be improved of diastolic HF and thus reduce the morbidity. Thus, it is recommended that it is necessary to optimise the treatment of diastolic HF to improve the poor prognosis in subjects with DM. For such patients, echocardiography should be used for subclinical diastolic dysfunction.

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