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ORIGINAL ARTICLE

A Comparative Change in Left Ventricular Mass Index on Echocardiography in Hypertensive Diabetic and Non-Diabetic Patients Taking Candesartan

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ABSTRACT

Background: To assess the evolution of the left ventricular mass index on echocardiography in candesartan-treated hypertension individuals with and without diabetes.

Study Design: This is a cross-sectional comparative study.

Place and Duration: The present study was conducted from June 2022 to February 2023.

Methodology: A total of 120 male and female patients of 35-55 years of age, fulfilling inclusion and exclusion criteria were selected for this study and divided into two groups i.e. Group-A and Group B. In Group-A 60 diabetic type-2 hypertensive patients were considered while in Group B 60 non-diabetic hypertensive patients were included. Patients of both groups were treated with candesartan. Raw data was operated through SPSS version 2022 with the Mean standard deviation regression (Mean ± SD).

Results: Significant changes (P≤0.05) in both groups were seen, the hypertensive diabetic patients showed Mean standard Deviation value (35.65 ± 5.93) whereas hypertensive non-diabetic patients showed Mean standard Deviation value (21.95 ± .48) respectively.

Practical Implications: In the current study there was an echocardiographic comparison of left ventricular mass index changes in both diabetic and non-diabetic hypertensive patients was concluded with candesartan cilexetil. The findings of this clinical trial are so beneficial for hypertensive patients to manage their self.

Practical implication This study compared the effect of candesartan on left ventricular mass index in hypertensive diabetic and non-diabetic patients. The results showed that candesartan was more effective in reducing left ventricular mass index in hypertensive diabetic patients. This study provides useful information for the management of hypertension in diabetic patients of the community.

Conclusion: Candesartan reduced left ventricular mass index more in hypertensive diabetic as compared to non-diabetic hypertensive patients**.** Both diabetic and non-diabetic hypertensive patients had a reduction in blood pressure with candesartan. With the considerable BP drop, candesartan is a viable treatment for hypertensive diabetic patients.

Keywords: Hypertensive, Diabetics, Candesartan and Left ventricular index, posterior wall thickness.

INTRODUCTION

In hypertension individuals, left ventricular hypertrophy (LVH) is the most common type of target organ damage. An increased risk of congestive heart failure, sudden cardiac death, angina pectoris, or acute myocardial infarction is linked to the existence of left ventricular hypertrophy in hypertension[1]. Antihypertensive therapy-induced left ventricular hypertrophy regression is linked to a significant decrease in cardiovascular risk.[2] Those with type 1 or type 2 diabetes mellitus are more likely to develop cardiovascular disease (DM). Peripheral arterial disease (PAD), congestive heart failure (CHF), coronary artery disease (CAD), myocardial infarction (MI), and sudden death (risk rise from one- to fivefold) were all significantly more common in DM, according to the Framingham Heart Study[3]. In diabetics, dyslipidemia, hypertension, obesity, decreased physical activity, and cigarette smoking are risk factors for macrovascular disease. Microalbuminuria, macro-albuminuria, an increase in serum creatinine, and impaired platelet function are additional risk factors that are more common in the diabetic population. [4]

The leading causes of death in diabetic individuals are cardiovascular problems, particularly coronary artery disease, and congestive heart failure. [5] Hypertension, dyslipidemia, and microalbuminuria are all known independent cardiovascular risk factors that are highly prevalent in people with diabetes. Diabetes is linked to a higher incidence of cardiovascular death, even in people with low cardiovascular risk.[6] Patients with type 2 diabetes mellitus frequently have left ventricular hypertrophy, an alarming prognostic marker and a standalone risk factor for cardiac events[7]. There have been few studies that have looked at the risk factors for left ventricular mass in type 2 diabetes mellitus patients without hypertension, despite the possibility that hyperinsulinemia and hyperglycemia may contribute to left ventricular mass in normotensive and hypertensive subjects without diabetes.[6]

By subtracting the volume of the left ventricular cavity from the volume encircled by the equivalent epicardium to obtain myocardial volume, and then multiplying by myocardial density, the left ventricular mass is quantified by echocardiography.[8] Although having severe limitations due to the requirement for prolate ellipsoid-based cardiac geometry assumptions, the linear approach for evaluating LV mass has historically been the reference standard.[9] Thus, using machine learning (ML) or Artificial intelligence (AI) in 3D has the huge potential to completely transform how we identify and measure left ventricular mass.[2] Nevertheless, as the current European Association of Cardiovascular Imaging (EACVI) and American Society of Echocardiography (ASE) (ASE/EACVI) approved cut-off values based on the 2D-derived linear dimension approach may not apply to the 3D automated, ML-based generation and data produced from automated ML-based software must be put into actual practice.[10] Both diabetic and non-diabetic hypertensive patients saw good blood pressure reduction results with candesartan cilexetil. The considerable BP drop shows that candesartan cilexetil is a viable treatment for managing hypertensive diabetic individuals.[11]

The Rationale of Study: This is a cross-sectional comparative study in which an echocardiographic comparison of left ventricular mass index changes in both diabetic and non-diabetic hypertensive patients was concluded with candesartan cilexetil.

The findings of this clinical trial are so beneficial for hypertensive patients to manage their self.

MATERIALS AND METHODS

Study Design: This is a cross-sectional comparative study.

Inclusion Criteria: Just the 3D echocardiograms were used for intra-analysis in the current investigation. This decision was made precisely to prevent adding more bias to our first results using the 3D automatic LV mass quantification.

Exclusion Criteria: In this investigation, the end-diastolic default position 40/40 of the boundary detection sliders, which are intended to globally increase or reduce the size of the endocardial 3D surface, has been randomly chosen since it produces images that are more similar to those obtained with 2D. Our goal was to further reduce any prejudice that might exist in head-to-head 2D-3D comparison.

Methodology: A total of 120 male and female patients of 35-55 years of age, fulfilling inclusion and exclusion criteria were selected for this study and divided into two groups i.e. Group-A and Group B. In Group-A 60 diabetic type-2 hypertensive patients were considered while in Group B 60 non-diabetic hypertensive patients were included. Patients of both groups were treated with candesartan.

Parameters: Blood pressure, Fasting, Random Glucose levels, Left Ventricular Mass, and Posterior wall thickness.

Biochemical Analysis &Sample Collection: 120 hypertensive individuals were examined. The individual was asked to sit for at least 10 minutes while having their clinic BP checked with a traditional mercury sphygmomanometer. Standard laboratory practices were followed in the cross-sectional M-mode echocardiographic evaluation of the LV using commercially available equipment. Fasting and Random glucose levels were measured with a glucometer.

Bio-Statistic: Data that is metric is presented as (Mean ±SD) standard statistical comparison and descriptor analyses. The ISSP version 2020 in which a significant level (P≤0.05) was considered.

RESULTS

In the present study, a total of 120 hypertensive male and female individuals of age (47.34±0.04) years with echocardiographic LVH were considered. The systolic and diastolic blood pressure of diabetic and non-diabetic males and females were (140.1± 0.01, 90.1± 0.02) (120.1± 0.01, 82.1± 0.03), (145.1± 0.02, 92.1± 0.01) (120.1± 0.01, 80.1± 0.01)

Table-1: Comparative variables of male diabetic and non-diabetic Individuals are treated with candesartan.

Variables	Units	Mean ±SD %	P- value (p≤0.05)
Age	Years	47.34±0.04	0.04
Gender	Male	99.04±0.01	0.01
BMI	kg/m^2	25.61±0.01	0.01
Diabetics (n)	number	30.01±0.01	0.01
Non-diabetics(n)	number	30.01±0.01	0.01

Table-2: Comparative variables of female diabetic and non-diabetic Individuals are treated with candesartan.

Variables	Units	Mean ±SD %	P- value (p≤0.05)
Age	Years	46.14±0.02	0.02
Gender	Female	99.04±0.01	0.01
BMI	kg/m^2	27.11±0.01	0.01
Diabetics (n)	number	30.01±0.01	0.01
Non-diabetics(n)	number	30.01±0.01	0.01

Table-3: Comparative variables of male diabetic Individuals treated with candesartan.

Parameters	Units	Mean ±SD	P- value (p≤0.05)
Blood pressure systolic	mm. Hg	140.1± 0.01	0.01
Blood pressure diastolic	mm. Hg	90.1± 0.02	0.02
Fasting Glucose levels	mg/dl	100.1± 0.01	0.01
Random Glucose levels	mg/dl	170.1± 0.01	0.01
Left Ventricular index	g/m^2	140.3± 0.03	0.03
Posterior wall thickness	Cm	1.2± 0.04	0.04

Table-4: Comparative variables of male non-diabetic Individuals treated with candesartan.

Parameters	Units	Mean ±SD	P- value (p≤0.05)
Blood pressure	mm. Hg	120.1± 0.01	0.01
Blood pressure diastolic	mm. Hg	82.1± 0.03	0.03
Fasting Glucose levels	mg/dl	80.1± 0.01	0.01
Random Glucose levels	mg/dl	142.1± 0.01	0.01
Left Ventricular index	gm	120.1± 0.02	0.02
Posterior wall thickness	Cm	1.1± 0.01	0.01

Table-5: Comparative variables of female diabetic Individuals treated with candesartan.

Parameters	Units	Mean ±SD	P- value (p≤0.05)
Blood pressure	mm. Hg	145.1± 0.02	0.02
Blood pressure diastolic	mm. Hg	92.1± 0.01	0.01
Fasting Glucose levels	mg/dl	105.1± 0.01	0.01
Random Glucose levels	mg/dl	180.1± 0.01	0.01
Left Ventricular index	gm	120.1± 0.02	0.02
Posterior wall thickness	Cm	1.2± 0.01	0.02

Table-6: Comparative variables of female non-diabetic Individuals treated with candesartan.

Parameters	Units	Mean ±SD	P- value (p≤0.05)
Blood pressure	mm. Hg	120.1± 0.01	0.01
Blood pressure diastolic	mm. Hg	80.1± 0.01	0.01
Fasting Glucose levels	mg/dl	80.1± 0.01	0.01
Random Glucose levels	mg/dl	144.1± 0.02	0.02
Left Ventricular index	gm	117.1± 0.01	0.01
Posterior wall thickness	Cm	0.9± 0.01	0.01

Fig-1: Left ventricle analysis in echocardiographic diabetic Individuals treated with candesartan

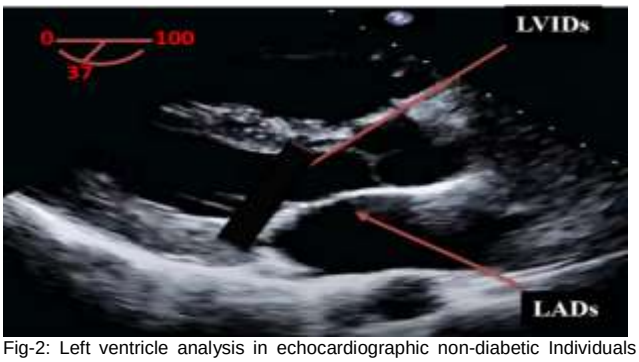

Fig-2: Left ventricle analysis in echocardiographic non-diabetic Individuals treated with candesartan

The fasting and random glucose levels of diabetic and non-diabetic males and females were (100.1± 0.01, 170.1± 0.01) (80.1± 0.01, 142.1± 0.01), (105.1± 0.01, 180.1± 0.01) (80.1± 0.01, 144.1± 0.02) and Left Ventricular index in both male and female regarding diabetic and non-diabetic indications were (140.3± 0.03, 120.1± 0.02) (120.1± 0.02, 117.1± 0.01) noted showed in table-1, table-2, table-3, and table-4 respectively.

Posterior wall thickness in both males and females regarding diabetic and non-diabetic indications were (1.2± 0.04, 1.1± 0.01, 1.2± 0.01, and 0.9± 0.01) found. The most important and indicated

cardiovascular risk factor was obesity i.e. 25.61±0.01 and 27.11±0.01 in males and females showed in table-1 and table-2. The present research has demonstrated that antihypertensive therapy's ability to reduce ECG-LVH is linked to a lower risk of cardiovascular morbidity and mortality, regardless of other risk factors. Left ventricle analysis in echocardiographic of diabetic and non-diabetic Individuals treated with candesartan was represented in fig-1 and fig-2.

DISCUSSION

Previous research has demonstrated that antihypertensive medications can affect glycemic control in a variety of ways. Regarding glycemic control, ACE inhibitors, ARAs, and calcium channel blockers generally appear to have favorable or neutral effects, but -blockers and thiazide diuretics frequently increase insulin resistance[12]. In another study, researchers claimed in their studies that Diabetes mellitus is linked to higher cardiovascular mortality and morbidity rates as well as higher levels of ECG-LVH[2]. The life study showed that patients with diabetes responded to antihypertensive medication less rapidly than people without diabetes in terms of ECG-LVH regression. 38 Results from our study were comparable.[13]

These results could help to explain why diabetic people with hypertension have increased cardiovascular morbidity and mortality[14]. The most significant finding of another study was that a serial decrease in LV mass in uncomplicated individuals with critical hypertension has a good prognostic value by foretelling a lower probability of developing cardiovascular disease in the future[15].[8, 16] The leading cause of overall diabetes morbidity and mortality remains to be heart disease, which develops eventually in the majority of individuals with DM.[17] Because LVH is a warning sign and a separate risk factor for sudden death, ventricular dysrhythmia, myocardial ischemia, coronary heart disease, and heart failure, increased LVM may be a factor in the increased cardiovascular risk. [18, 19]

The leading cause of overall diabetes morbidity and mortality remains to be heart disease, which develops eventually in the majority of individuals with DM.[20, 21] Because LVH is a warning sign and a separate risk factor for sudden death, ventricular dysrhythmia, myocardial ischemia, coronary heart disease, and heart failure, increased LVM may be a factor in the increased cardiovascular risk.[22, 23] Inhibitors of angiotensin-converting enzymes are efficient for reversing LVH and regulating blood pressure. Up to 50% of diabetics develop hypertension, which is nearly twice as common in people with diabetes as it is in the general population.[24] According to a study, the prevalence of LVH was reported to be 16% in men and 21% in women in the Framingham Heart Study's 95 percent nondiabetic sample. In that study, 42 women with diabetes had a 22% higher LVM and thicker left ventricular walls than their non-diabetic counterparts.[25]

Prior research has demonstrated that antihypertensive medications can affect glycemic control in a variety of ways.[26] About glycemic control, ACE inhibitors, ARAs, and calcium channel blockers generally appear to have favorable or neutral effects, but -blockers and thiazide diuretics frequently increase insulin resistance.[11] The findings of the present study have a close resemblance with the previous findings by different researchers.[2, 27] Posterior wall thickness in both male and female regarding diabetic and non-diabetic indications were (1.2± 0.04, 1.1± 0.01, 1.2± 0.01, and 0.9± 0.01) found.[7, 28, 29] The most important and indicated cardiovascular risk factor was obesity i.e. 25.61±0.01 and 27.11±0.01 in males and females shown in table-1 and table-2.[30, 31, 32] Comparatively a significant (P≤0.05) change were seen in non-diabetics male and female as compared with diabetic individuals.

CONCLUSION

Candesartan reduced left ventricular mass index more in hypertensive diabetic as compared to non-diabetic hypertensive patients**.** Both diabetic and non-diabetic hypertensive patients had a reduction in blood pressure with candesartan. With the considerable blood pressure drop, candesartan is a viable treatment for hypertensive diabetic patients.

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