Original Article

Left Ventricle Dilatation: Early Marker of Structural Remodelling of the Heart in Obese People

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ABSTRACT

Objective: Transthoracic echocardiography is used to examine whether or not left ventricular dilatation is an early and independent indicator of cardiac remodeling in obese people.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Al-Batool Hospital (bariatric surgery consultation), from January to October, 2024.

Methods: This cross-sectional study was consisted of 200 adults between the ages of 30 and 60 were split into two groups: non-obese (body mass index 22.4, n=80) and obese (body mass index ≥30, n=120). Left ventricular end-diastolic diameter left ventricular end-systolic diameter (LVESD), left ventricular mass index, and ejection fraction were assessed using standard 2D transthoracic echocardiography. Multivariate regression and Student's t-check were used for statistical comparisons.

Results: Compared to non-obesity controls, obese people had significantly higher mean left ventricular end-diastolic diameter (5.9±0.3 cm vs 5±0.4 cm, $p<0.001$) and left ventricular mass index (128±14 g/m² vs. 97±13 g/m², $p<0.001$). Left ventricular dilatation linked to body mass index ($r=0.6$, $p<0.001$). After indexing for age, sex, and hypertension, left ventricular dilatation still showed a correlation with body mass index ($r=0.622$, $p<0.001$).

Conclusion: Even in the absence of obvious clinical symptoms, LV dilatation is a unique and early echocardiographic indicator of structural heart transformation in obese people.

Key Words: Left ventricular dilatation, Obesity, Cardiac remodelling, Echocardiography, Body mass index, Heart failure, Structural changes, Cardiomyopathy

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INTRODUCTION

With its incidence nearly tripling globally over the past forty years, obesity has become a significant global health issue of the twenty-first century. In 2022, over 1.9 billion persons were overweight, with over 650 million of them classified as obese, according to the World Health Organization.[1] Because of its detrimental hazard on heart obesity is linked to increased cardiovascular morbidity and death.[2,3]

Cardiac remodeling is a complicated process that involves alterations in the heart's length, shape, and characteristics in response to long-term stressors such as obesity, metabolic syndrome, and hypertension.[4,5] These changes may initially be advantageous as well, but they frequently lead to maladaptive consequences, such as heart failure.[6,7] Increased LV mass, chamber dilatation, and left ventricular (LV) hypertrophy are characteristics of structural remodeling in obese people.[3,8]

Numerous investigations have reported concentric hypertrophy and elevated left ventricular mass in obese patients, frequently without any corresponding symptoms.[8,9] The early diagnosis of LV dilatation, that may occur before clinical symptoms and serve as an important indicator of early cardiac remodeling, has received less attention, though.[10,11] A reliable and non-invasive method for identifying such alterations before they progress to systolic dysfunction is echocardiography.[12]

In obese people without established cardiovascular disease, this study attempts to determine whether left ventricular dilatation, as measured by transthoracic echocardiography, can function as an early marker of structural cardiac remodelling.[13,14] Finding these early indicators may help prevent the development of heart failure and allow for prompt intervention.[11,15]

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METHODS

This observational, cross-sectional study was conducted at Al-Batool Hospital (bariatric surgery consultation), from January to October 2024. Two hundred adult contributors between the ages of thirty and sixty have been enlisted and divided into the following groups: 120 individuals with a BMI of 30 kg/m² are in the obese organization. The non-obese manipulate group consisted of 80 people with a BMI of 22.4±18 kg/m². Participants with significant valve disease, kidney disease, cardiac dysfunction, coronary artery disease, or pregnancy were not allowed to participate. Body weight and height were obtained for each person to determine their BMI. Lipid profile, fasting glucose, and blood pressure had also been noted. The presence of hypertension and diabetes mellitus was noted.

Vivid e9 system was used to perform two-dimensional transthoracic echocardiography. As stated by the recommendations of the American Society of Echocardiography, the parameters were measured.[12] Left Ventricular End-Diastolic Diameter (LVEDD), Left Ventricular End-Systolic Diameter (LVESD), Left Ventricular Mass Index (LVMI)Left Ventricular Ejection Fraction (LVEF) and LVEDD >5.6 cm in adult males and >5.2 cm in adult females are the criteria used to characterize LV dilatation

SPSS version 26 has been used to perform statistical analysis. T-test was utilized to analyze study groups. The relationship between echocardiographic indices and BMI was examined using Pearson's correlation. To identify the predictors of LVEDD, a multivariable linear regression was used. A p-value <0.05 was considered significant.

RESULTS

The mean age was 45.3±8 years in the control group and 46.6±8.4 years in the obese persons (p=0.3). 53% of the obese group and 47% of the control group were men (p=0.6). Participants who were obese had significantly higher rates of type 2 diabetes and systemic hypertension (Table 1).

Those who were obese had significantly larger LV dimensions and a higher LV mass index. LVEDD in the obese group measured 5.9±0.3 cm, while the controls measured 5±0.4 cm (p<0.001). 38.3% of obese participants had LV dilatation, compared to 5.0% in the control group (Table 2).

Regression charts showing the strong relationships between SBP and LVEDD (right) and BMI and LVEDD (left). Accounting for gender and age, multivariable regression analysis identified BMI (β=0.48, p<0.001) and SBP (β=0.25, p=0.002) as independent predictors of LVEDD (Fig. 1). There was a strong positive correlation between BMI and LVEDD (r=0.62, p<0.001). Multivariable linear regression revealed BMI (β=0.48, p<0.001) and systolic blood pressure (β=0.25, p=0.002) as independent predictors of LVEDD after accounting for gender and age.

Table No.1: Baseline characteristics of the patients (n=200)

Variable	Obese (n=120)	Control (n=80)	*P*-value
Age (years)	46.6±8.4	45.3±8	0.3
Male sex	53%	47%	0.6
BMI (Kg/m^2)	34.9±3.1	22.4±1.8	0.001
Hypertension	40%	10%	0.001
Type 2 diabetes	27%	7%	0.001

Table No.2: Echocardiographic findings

Variable	Obese (n=120)	Control (n=80)	*P*-value
LVEDD (cm)	5.9±0.3	5±0.4	0.001
LVESD (cm)	4.1±0.2	3.2±0.3	0.001
LV mass index (g/m^2)	128±14	97±13	0.001
LVEF (%)	58±7	62±4	0.08

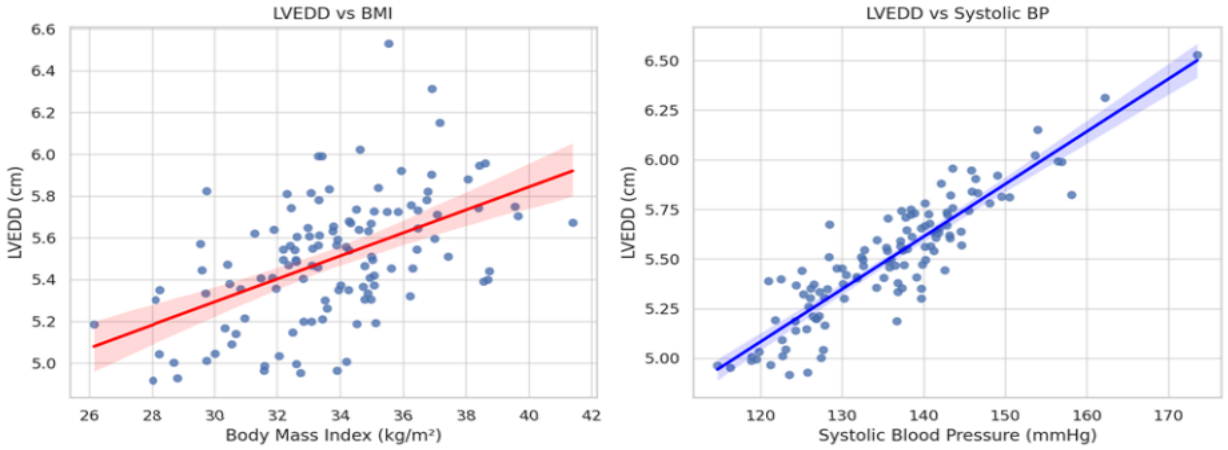

Figure No. 1: Predictors of LVEDD from multivariable regression

DISCUSSION

This study shows that in obese people, left ventricular dilatation is a significant early indicator of heart structural remodeling. Our results are consistent with previous autopsy and echocardiography-based research that suggest obesity lead to myocardial remodeling and volume overload even when there is no obvious cardiac condition.[3,8,16]

Obese people have a considerably higher mean LVEDD than non-obese controls. Additionally, more than one - third of obese individuals had echocardiography features of LV dilatation. These findings support the idea that obesity per se independent of diabetes or hypertension, may also contribute to early chamber remodeling, most likely as a result of adipose-mediated inflammation and prolonged preload.[4,5,11]

It's interesting to note that although LVEF was somewhat lower in the obese group, it was still within the normal range, supporting the idea that structural changes occur before functional damage. Because of this, LVEDD is a valuable early diagnostic sign that can be detected using non-invasive imaging.[6,10,12]

These findings have been supported by earlier reports by Alpert et al[2] and Cheng et al[3], which highlight how early identification of LV structural alterations might direct physicians in aggressive cardiovascular risk management. It has been demonstrated that weight loss and lifestyle changes reduce left ventricular mass and improve heart geometry, highlighting the need of early reputation.[11,15]

Our study is hindered by its cross-sectional design, which restricts the ability to infer causality. Furthermore, although adjustments were made for confounders, unmeasured variables such as physical activity and subclinical metabolic inflammation may also influence cardiac geometry.[14,17]

CONCLUSION

One common and quantifiable early sign of cardiac structural remodeling in obese people is left ventricular dilatation. To enable early intervention and stop the development of heart failure, echocardiographic examination of LVEDD should be considered in routine cardiovascular assessments of obese patients, including those who do not exhibit obvious symptoms.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Asaad Hasan Noaman, Falah Mahdi Dananah
Drafting or Revising Critically:	Amina Abdul Baqi Khuthur, Shaymaa AH Jasim
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. WHO. Obesity and overweight factsheet, Available: https://www.who.int/news-room/fact-sheets/detail/ obesity-and-overweight. 2024
2. Alpert R. Obesity and cardiac structure: is early remodeling reversible?" Curr Cardiol Rep 2020; 22(5): 45-52.
3. Cheng S. Obesity-induced changes in cardiac morphology. Circulation 2021;143:901-12.
4. Peterson SM. Cardiac impact of metabolic syndrome. Heart Fail Rev 2022;27(3):555-64.
5. Gagliardi AS. Structural cardiac adaptation in obesity. J Hypertens 2020;38(8):1640-48.
6. Brown M. Echocardiographic prediction of heart failure in obese adults. Am J Cardiol 2024;134: 103-9.
7. Vasan S. Early remodeling as predictor of diastolic dysfunction. Hypertension 2021;77(1):45-51.
8. Greenland JB, Bouchard M. LV mass index in obese patients: Clinical utility. J Am Coll Cardiol 2020;76(6):689-97.
9. Thomas G, Eckel R. Obesity and cardiovascular disease risk. Endocr Rev 2019;40(4):132-40.
10. James E, Khatib P. Echocardiographic norms for BMI-stratified populations. Int J Card Imaging 2020;36:765-74.
11. Packer MF. Cardiometabolic remodeling in obesity. Lancet Diabetes Endocrinol 2022;10(3):203-12.
12. Badran E. Echocardiographic assessment of asymptomatic obese patients. Am Heart J 2023; 144(3): 423-31.
13. Liu H. Longitudinal follow-up of cardiac remodeling. BMC Cardiovasc Disord 2023;23:89.
14. Tanaka J, Inoue H. Progression of LV dilatation in high-risk patients. J Card Fail 2022;28(1):66-74.
15. Tran LK. Regression of cardiac hypertrophy with weight loss. Obesity 2020;28(4):743-50.
16. Devereux C. Anatomic evidence of remodeling in obesity. Ann Intern Med 2020;168(10):735-42.
17. Singh N. Left ventricular chamber size as a function of obesity. Heart Int 2019;15(2):119-24