

# Comparison of Left Ventricular Mass and Mass Index in Males with Untreated Blood Pressure in Rural Set-Up

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| Received: 14.01.2019 | Accepted: 25.01.2019 | Published: 30.01.2019

DOI: [10.21276/sijap.2019.2.1.8](https://doi.org/10.21276/sijap.2019.2.1.8)

## Abstract

**Introduction:** A blood pressure has caused a lot adverse effect to the body and as a whole society if it remains untreated. Hypertensive state causes increase in left ventricular diameter as well as mass. These two conditions can be also called as LV hypertrophy. **Method:** 60 male individuals aged from 35 to 45 years enrolled in the study from Dhiraj general hospital after getting ethical approval. Their general examination and history was taken after that blood pressure was recorded. Participants were divided in 4 groups based on JNC guideline. 2 D echocardiography was performed and Left ventricular mass (LVM) recorded. Left ventricular mass index (LVMI) was calculated after getting body surface area (BSA). **Result:** Blood pressure changes show marked variation in Left ventricular mass as well as Left ventricular mass index. Pre hypertensive and hypertensive stage 1 and stage 2 shows marked rise in LVM in comparison with normotensive individuals. Blood pressure is positively correlated with left ventricular mass and also with ventricular mass index. Out of all 4 groups Prehypertensive stage shows more risk for LVM and LVMI. **Conclusion:** There is multifold rise in LVM and LVMI when blood pressure increased from normal range. The left ventricular hypertrophy has one independent factor above other confounding factors.

**Keywords:** Blood pressure, 2D echocardiography, Left ventricular mass.

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## INTRODUCTION

Cardiovascular morbidity and mortality are known conditions results due to left ventricular hypertrophy (LVH). If the LVH is associated with increased blood pressure then the individual would be at triple risk of cardiac problems [1, 2]. Electrocardiography and echocardiography are the most useful routine methods for accessing LVH. Blood pressure is considered as one of the most important factors which affects the development and extent of LVH. Similarly non-hemodynamic factors like age, gender, race, socioeconomic status etc also change the left ventricle geometry [3].

Hypertension becomes major factor of mortality in urban population but now a day's its ill effects spanning in rural areas also. In country like India there are no reference values according to the different states and so Asian guidelines are considered as a standard.

Few studies examined associations between left ventricular mass and blood pressure as reported in

literature and that too in small number of subjects. Correlation between blood pressure and left ventricular mass in a heterogeneously treated population (both in duration and type of treatment) may be different from those in untreated patients.

## MATERIALS AND METHODS

60 male individuals aged from 35 to 45 years enrolled in the study from Dhiraj general hospital after getting ethical approval. Their general examination and history was recorded followed by measurement of blood pressure. Height was measured in meter by using stadiometer. All patients underwent echocardiography on the same day as the blood pressure measurement. 2 D echocardiography was performed and Left ventricular mass (LVM) recorded. Left ventricular mass index (LVMI) was calculated after getting Body surface area (BSA).

Participants included in the study after obtaining Written Informed Consent Form. All males were asymptomatic with regards to hypertension or should not be on medication or any type of treatment

linked with blood pressure variation. Participants were excluded in the presence of any sort of cardiac problems or history of the same.

### Blood pressure

Diastolic and systolic blood pressure were expressed as the mean value of three consecutive readings separated by 2-min intervals and measured using a mercury sphygmomanometer (appearance and disappearance of Korotkoff sounds) with the participant resting comfortably in a sitting position for 5 minutes. Mean arterial pressure and pulse pressure calculated and expressed in mm Hg.

### Echocardiography

The American Society of Echocardiography guidelines were followed for two-dimensionally guided M-mode evaluation of the left ventricle. For these End-diastolic M-mode measurements of septum (SD), posterior wall (PWD) and left ventricle diameter

(LVD), LVM was calculated using the Devereux formula:

$$\text{LVM (in grams)} = 0.84 (\text{SD} + \text{LVD} + \text{PWD})^3 - \text{LVD}^3.$$

Ratio of LVM and body surface area was calculated as Left ventricular mass index (LVMI)

### Statistical analysis

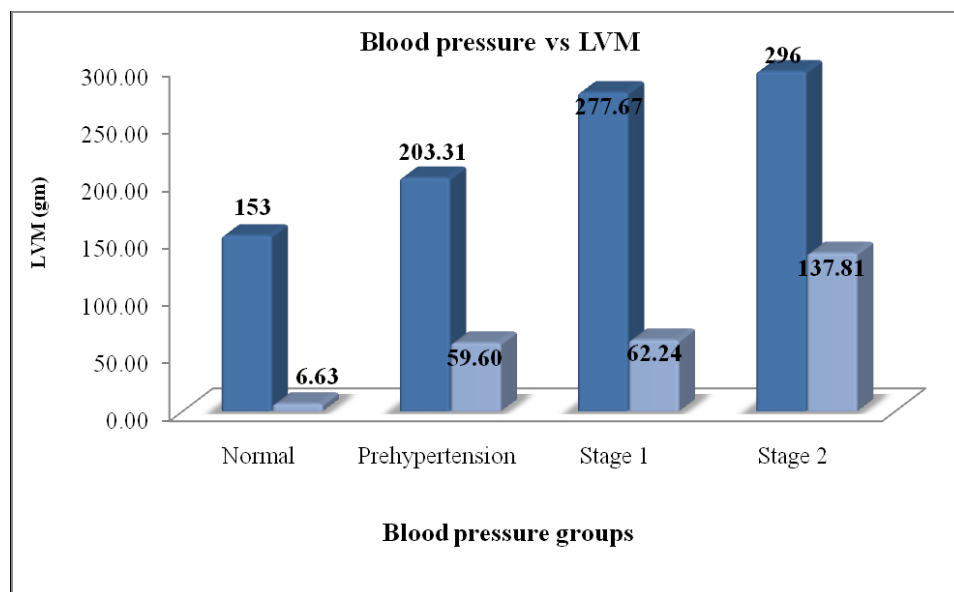
Descriptive statistics of measured and calculated parameters are expressed as mean  $\pm$  standard deviation. Analysis of variance is applied to find out changes in LVM & LVMI with 4 different groups. Bonferroni post hoc analysis is performed for inter group comparison.

## RESULTS

Out of total 60 subjects, 4 individuals with normal blood pressure (6.67%), for prehypertensive, stage 1 & 2 has participants 45, 6, and 5 respectively.

**Table-1: Classification of Blood pressure**

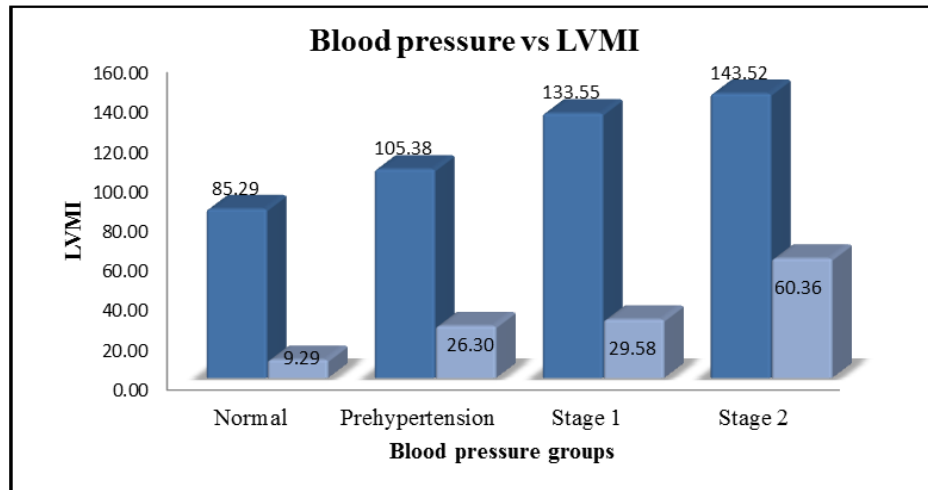
Hypertension	N	%
Normal	4	6.67%
Pre-hypertension	45	75.00%
Stage 1	6	0.10%
Stage 2	5	8.33%
Total	60	100.00%



**Graph-1: Bar diagram for comparison between LVM and Blood pressure**

**Table-2: Comparison between LVM and LVMI with Blood pressure**

Hypertension	Mean LVM	p value	Mean LVMI	p value
Normal	153.00 $\pm$ 6.633	<b>0.002</b>	85.29 $\pm$ 9.29	<b>0.006</b>
Pre-hypertension	203.31 $\pm$ 59.609		105.38 $\pm$ 26.30	
Stage 1	277.67 $\pm$ 62.244		133.55 $\pm$ 29.58	
Stage 2	296.00 $\pm$ 137.817		143.52 $\pm$ 60.36	
Total	215.12 $\pm$ 74.755		110.03 $\pm$ 32.41	



**Graph-2: Bar diagram of comparison between LVMI and Blood pressure**

## DISCUSSION

Present study analyzed the data of 60 subjects with subclinical high blood pressure reveals the relationship between blood pressure and left ventricular mass and mass indexes. Study found highly significant relation between BP and LVM (Table-2). Similar studies reported by Rowlands *et al.*, studied 45 subjects found the positive correlation ( $r=0.45$ ;  $p<0.01$ ) and Deveureux *et al.*, studied 100 subjects ( $r=0.24$ ;  $p<0.001$ ).

The positive relationship between blood pressure and LV mass reported here for patients without cardiac hypertrophy agrees with data published previously [1-3] which probably indicates that BP is one of the important factors in the development of LV hypertrophy in hypertensive patients. Once cardiac hypertrophy has developed, however, factors other than blood pressure must be involved in the regulation of cardiac muscle mass. Other studies found that patients with marked hypertrophy are not hypertensive explained that decreases in cardiac function associated with marked increases in LV mass may be responsible for this phenomenon.

Present study found relatively insignificant relationship between blood pressure and LV mass. Table-2 showed the Comparison between LVMI with Blood pressure show high level of significance. We have applied bonferroni post hoc analysis and found that both LV Mass and LV Mass Index are significantly higher in pre hypertensive and hypertensive patients as compared to normotensive subjects.

A number of previous studies have related BP values with LVH and organ damage [4-6]. Study reported by "STRONG" [4] on a heterogeneous cohort of 2585 participants found 32% participants hypertensive and BP was closely related to LVMI and the correlation ( $r=0.396$ ) of the BP values was higher than that of the PP. Similar data was found in a study conducted in Taiwan with 1272 subjects, found 34%

untreated hypertensive individuals and BP was also more closely related to LVMI ( $r=0.410$ ) [5].

Present study observed that the patients with the high SBP (in the highest tertile in any of the measures) had a 7 times greater risk of LVH. (odds of the risk) Author suggested the inclusion of autonomic function testing with echocardiography for better prediction of LVH & LVMI as the response of BP to activated sympathetic outflow is one of the primary determinants of left ventricular hypertrophy in hypertension.

## CONCLUSION

As blood pressure ranges for higher marker it affects the heart. Left ventricular mass increase significantly in prehypertensive stage only and this stage remains undiagnosed for a longer period as the symptoms of increased BP are so vague. In Stage 1 the rise is continued and finally ending up with severe cardiac morbidity.

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