



## LEFT VENTRICULAR HYPERTROPHY IN PREHYPERTENSIVE POPULATION.

## Physiology

**Dr Smriti Pathak  
Dutta**

Associate Professor of Physiology, Assam Medical College, Dibrugarh

**Dr Dibyajyoti  
Dutta**

Professor of Cardiology, Assam Medical College, Dibrugarh

**Dr Rwitusmita  
Bharali**

Demonstrator of Physiology, Assam Medical College, Dibrugarh

## ABSTRACT

Left Ventricular Hypertrophy is considered as a marker of cardiovascular end-organ damage in hypertension. As such, LV hypertrophy is often thought to be a long-standing consequence of hypertension. However, some evidence suggests that increased LV mass precedes the onset of hypertension. Prospective studies have demonstrated a relation of higher levels of LV mass, assessed by echocardiography, with subsequent increases in blood pressure level. Hence this study was undertaken in 200 individuals to study the correlation between left ventricular wall thickness and level of blood pressure. The study showed a positive correlation between left ventricular wall thickness and blood pressure level.

## KEYWORDS:

Blood pressure, left ventricular wall thickness

## INTRODUCTION:

LEFT ventricular hypertrophy (LVH) plays a dual role in patients with systemic hypertension – being both a necessary adaptation to pump a normal amount of blood against the increased pressure load and a pathologic manifestation of hypertensive cardiovascular disease.<sup>1</sup> LV hypertrophy is often thought to be a long-standing consequence of hypertension. However, some evidence suggests that increased LV mass precedes the onset of hypertension.<sup>(2-6)</sup> Prospective studies have demonstrated a relation of higher levels of LV mass, assessed by echocardiography, with subsequent increases in blood pressure level<sup>(1,2)</sup> or a greater risk of incident hypertension<sup>(5-7)</sup> in individuals without hypertension. Thus, alterations in LV mass may contribute to a sustained increase in blood pressure. Therefore this study was undertaken to find the association of left ventricular wall thickness in normotensives with that of prehypertensive population.

## MATERIALS AND METHODS:

In this cross sectional study 200 young adults in the age group of 18-22 years were selected randomly from the general population of Dibrugarh. The ethical committee clearance and an informed consent of the subjects were taken. Subjects less than 18 years and more than 22 years and individuals with overt cardiovascular disease established hypertension, renal failure, diabetes mellitus and with other serious co-morbid conditions, obese individual or trained athletes or on medication which can affect blood pressure were excluded from the study. Blood pressure was recorded in the right upper arm after the subject had rested for at least 5 minutes with standard mercury sphygmomanometer to the nearest 2 mm Hg as per the guidelines of sixth report of the joint national committee for the detection, evaluation and treatment of high blood pressure.<sup>7</sup> Blood pressure level of 120 to 139 mmhg (systolic) and/or diastolic pressure of 80 to 89 mmhg was taken as prehypertensive.<sup>8</sup> M mode Echocardiography was performed in each subject. All the measurements were made at the end of diastole using the American society of Echocardiography standard criteria<sup>9</sup> as well as Penn convention.<sup>10</sup> Left ventricular mass was calculated using the formula as proposed by devereux.<sup>10</sup>

$$LV \text{ mass (g)} = 1.04 [(IVSd + LVId + LVPWTd)^3 - (LVId)^3] - 13.6$$

Where:-

IVSd - interventricular septum-diastolic dimension  
LVId - Left Ventricular internal diameter

LVPWTd - Left Ventricular Posterior wall dimension

Statistical analysis of data was carried out using SPSS Version 16. Data were presented in the forms of mean  $\pm$  standard deviation and also in the forms of diagrams. Statistical significance was ascertained by t-test. p value more than 0.05 was considered as significant.

## RESULT AND OBSERVATION:

The Blood pressure of the subjects were classified as shown in table 1. The percentage of subject in each group is shown in table 2. The mean  $\pm$  SD of the value of left ventricular mass in the study population is shown in table 3. Comparison of Left ventricular mass in both the groups has been shown in Table 4. Results shows a increase in left ventricular thickness with increase in blood pressure level. On comparison between normal and prehypertensive, an increase in left ventricular wall thickness was observed, which was statistically highly significant (p<0.000).

**Table 1: Classification of Blood Pressure level.**

Classification	Systolic BP (mmHg)	Diastolic BP (mmHg)
Normal	<120	And <80
Prehypertension	120-139	or 80-89

**Table 2: Showing the number and percentage of subject in each group of blood pressure**

Groups ( n = 200 )	Number	Percentage (%)
Normal	74	37%
Prehypertension	126	63%

**Table 3: Showing the value of left ventricular mass in both the groups of blood pressure level.**

Groups ( n =200)	Left Ventricular Mass (Mean $\pm$ SD) (gm)
Normal	109.12 $\pm$ 15.17
Prehypertension	119.65 $\pm$ 15.10

**Table 4: Showing the comparison between both the groups of blood pressure**

Groups(n=200)	LV Mass (mean $\pm$ SD )	Level of Significance (p Value)
Normal ( n = 74 )	109.12 $\pm$ 15.17	0.000 (HS)
Prehypertensive ( n = 126)	119.65 $\pm$ 15.10	

{p value >0.05 was non-significant (NS); p value < 0.05 was as significant(S); p value < 0.01 was highly significant (HS);p value < 0.001 was very highly significant(VHS)}

#### DISCUSSION:

The results of the present study shows a positive correlation between left ventricular wall thickness and level of systemic arterial blood pressure. Increased LV mass has been proposed to be a compensatory response to elevated blood pressure.<sup>11</sup> Left ventricular hypertrophy occurs as a response of the left ventricle to the stresses of pressure or volume overload.<sup>12</sup> However, evidence is increasing that increase in LV mass is associated with development of hypertension.<sup>2-7</sup> The underlying mechanisms responsible for increased LV mass in the absence of hypertension i.e. in normal individuals, and for prehypertensive, are complex and probably multitietologic. Genetic factors could play a role in promoting myocardial hypertrophy and hypertension onset.<sup>13,14</sup> Extracardiac factors such as an exaggerated sympathetic drive and a dysregulated renin-angiotensin-aldosterone system,<sup>15</sup> in addition to vascular structural changes such as arterial stiffness,<sup>16</sup> may also have influenced both LV mass and later hypertension incidence.

#### CONCLUSION:

Left ventricular hypertrophy is both a major maladaptive response to chronic pressure overload and an important risk factor in patients with hypertension. Present study indicates that even in prehypertensive persons left ventricular mass is significantly increased in comparison to the normotensives. Since complications of left ventricular hypertrophy include coronary artery disease, atrial fibrillation, diastolic heart failure, systolic heart failure, and sudden death, both earlier recognition and improved understanding of cardiac hypertrophy may lead to more effective therapeutic strategies for this cardiovascular risk factor.

#### REFERENCES:

1. Richard b. Devereux R B, Thomas g. Pickering, Michael h. Aderman, Su chien,Jffrey s. Brer, and Jhn h. Lragh: Left Ventricular Hypertrophy in Hypertension Prevalence and Relationship to Pathophysiologic Variables: SUPPL II HYPERTENSION, VOL. 9, No 2, FEBRUARY 1987
2. Iso H, Kiyama M, Doi M, et al. Left ventricular mass and subsequent blood pressure changes among middle-aged men in rural and urban Japanese populations. *Circulation*. 1994;89(4):1717-1724. [PubMed]
3. Mahoney LT, Schieken RM, Clarke WR, et al. Left ventricular mass and exercise responses predict future blood pressure. The Muscatine Study. *Hypertension*. 1988;12(2):206-213. [PubMed]
4. Post WS, Larson MG, Levy D. Impact of left ventricular structure on the incidence of hypertension. The Framingham Heart Study. *Circulation*. 1994;90(1):179-185. [PubMed]
5. de Simone G, Devereux RB, Chinali M, et al. Left ventricular mass and incident hypertension in individuals with initial optimal blood pressure: the Strong Heart Study. *J Hypertens*. 2008;26(9):1868-1874. [PMC free article] [PubMed]
6. De Marco M, de Simone G, Roman MJ, et al. Cardiovascular and metabolic predictors of progression of prehypertension into hypertension: the Strong Heart Study. *Hypertension*. 2009;54(5):974-980. [PMC free article] [PubMed]
7. Joint national committee on detection, evaluation and treatment of high blood pressure. 6th report, 1997.
8. Joint national committee on detection, evaluation and treatment of high blood pressure. 7th report, 2002.
9. Sahn DJ, De Maria, Kisslo J, Weyman A. 1978. Recommendations regarding quantitation in M-mode echocardiography. Results of survey of Echocardiographic measurement. *Circulation*, 58:1072-1082
10. Devereux RB and Reichek N. 1977. Echocardiographic determination of Left ventricular mass in man: anatomic validation of the method. *Circulation*, 55:613-618
11. Schmierer RE, Messerli FH. Hypertension and the heart. *J Hum Hypertens*. 2000;14(10-11):597-604. [PubMed]
12. Lannigan R Cardiac Pathology, London: Butterworths. 1966:32- 3.43.
13. Arnett DK, Devereux RB, Rao DC, et al. Novel genetic variants contributing to left ventricular hypertrophy: the HyperGEN study. *J Hypertens*. 2009;27(8):1585-1593. [PMC free article] [PubMed]
14. Mayosi BM, Avery PJ, Farrall M, et al. Genome-wide linkage analysis of electrocardiographic and echocardiographic left ventricular hypertrophy in families with hypertension. *Eur Heart J*. 2008;29(4):525-530. [PubMed]
15. Olsen MH, Wachtell K, Hermann KL, et al. Is cardiovascular remodeling in patients with essential hypertension related to more than high blood pressure? A LIFE substudy. Losartan Intervention For Endpoint-Reduction in Hypertension. *Am Heart J*. 2002;144(3):530-537. [PubMed]
16. Bella JN, Wachtell K, Palmieri V, et al. Relation of left ventricular geometry and function to systemic hemodynamics in hypertension: the LIFE Study. Losartan Intervention For Endpoint Reduction in Hypertension Study. *J Hypertens*. 2001;19(1):127-134. [PubMed]