



# FREQUENCY OF HYPERTROPHY OF LEFT VENTRICULAR IN ISCHEMIC STROKE PATIENTS PRESENTING IN TERTIARY CARE HOSPITAL

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## Author's Contribution

NG: Conducted study, audit and wrote the article. QAS: Helped in conduction of study, wrote, audit and reviewed the article as a whole and consultants incharge of the audit and gave frequent advice, corrections and did the proof reading. MMS: Tables, Helped in Re-arranged data and figures and also Helped in analysis of data corrected article. AM: consultants incharge of the audit and gave frequent advice, corrections and did the proof reading also.

## All authors declare no conflict of interest.

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## ABSTRACT

**OBJECTIVE:** To calculate the frequency of hypertrophy of left ventricular in patients with ischemic stroke

**SUBJECTS & METHODS:** It was a cross-sectional observational survey which was carried out in Cardiology Department of Shaikh Zayed Hospital, Lahore over a period of 6 months from June 9, 2018 to December 9, 2018. 61 patients fulfilling the inclusion criteria were enrolled. Hypertrophy of left ventricle (LVH) was calculated in left lateral decubitus position, mass of left ventricular, mass index of left ventricular and body surface area were calculated. Data were stratified for age, gender, diabetes (random sugar >200mg/dl, hypertension (>160/90, smoking (>5 pack years) and BMI. Chi-square test was used after stratification of variables taking p-value less than 0.05 as significant.

**RESULTS:** The patients were having mean age of  $57.43 \pm 15.10$  years. There were 44 (72.13%) males and 17 (27.87%) females. In this study, 19 (31.15%) patients had LVH while 42 (68.85%) did not have LVH.

**CONCLUSION:** The frequency of LVH was high in ischemic stroke patients. Now in future we will implement the screening of stroke patients for cardiovascular changes.

**KEY WORDS:** Left ventricular hypertrophy, ischemic stroke, echocardiography, ventricular mass index, left ventricular mass, body mass index

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## INTRODUCTION

The fourth common cause of mortality in the world is stroke due to thromboembolic phenomenon which is responsible for residual disability. The underlying mechanism of acute ischemic stroke is occlusion of cerebral arteries secondary to atherosclerosis plaque disruption or thromboembolism due to atrial fibrillation, valvular or congenital heart disease. Both primary and secondary prevention of underlying causes of stroke needs to be addressed. Out of major associations of stroke, hypertension is a silent killer.<sup>2,3</sup> Left ventricular hypertrophy (LVH) is a known potential risk factor of ischemic stroke.<sup>4</sup> Dasti et al. in 2016 conducted a study in Pakistan and found that the frequency of LVH in ischemic stroke patients was 25.7%.<sup>5</sup> Khan et al in 2009 reported that the frequency of LVH in ischemic stroke patient was 3.6%.<sup>6</sup> Rodrigo et al. conducted a similar study in 2012 and found that to be 76.3%.<sup>7</sup>

There is a conflict in the frequency of LVH in ischemic stroke patients not only in the local population of same province (25.7% Hyderabad 5 vs. 3.6% Karachi 6) but also with the internationally published figures (76.3% Sri Lanka).<sup>7</sup> Hypertrophy of left ventricle is one of the major association with stroke and indicates uncontrolled hypertension.<sup>7</sup> There is a difference in the frequency of LVH among local and international population (25.7%5, 3.6%6, 76.3%7). LVH may be unnoticed and be need to screen patients for the presence of LVH and subsequent stroke.

There is a need to conduct this study in local population. So that the frequency of LVH could be determined which can help us in determining the frequency of LVH in local population and help us set local protocols in evaluating the high risk patients for LVH so that it can help in reducing the frequency of ischemic cerebrovascular accident.

## MATERIAL AND METHODS:

It was a cross-sectional survey was carried out in cardiology department of Shaikh Zayed Hospital, Lahore over a period of six months from June 9, 2018 to December 9, 2018. A total of 61 patients fulfilling inclusion criteria (patients of both sex group with ages in the range of 25-80 years suffering ischemic stroke presenting within 12 hours of stroke and patients who consented) were included. Patients who have meningitis (cerebrospinal fluid proteins (CSF)  $\leq 0.5$ g/dl, glucose  $< 2.4$  m mole/l, and WBC count  $> 500$  in past 1 week as per clinical record, patients with hyperdense mass on computed tomography scan without

contrast, patients with valvular heart disease and patients with hypertrophic cardiomyopathy were excluded.

Ischemic stroke was defined as patients with sudden weakness of one half of the body, with deviation of angle of mouth and up going planter having (any one of the features) hypoattenuating brain tissue, obscuration of the lentiform nucleus or hypodensity and swelling of the insular cortex on computed tomography of brain. Left ventricular Hypertrophy was labeled upon ECG on the basis of Sokolow criteria and echocardiography in decubitus position having mass index of left ventricle  $> 115$  g/m<sup>2</sup> in males and in female  $> 95$  g/m<sup>2</sup>.

LVH was calculated in left lateral decubitus position, thickness of interventricular septum (IVSd), posterior wall in the end diastole (PWd) and the internal diameter of left ventricular at end diastole (LVIDd) were measured. Mass of left ventricular was calculated by the formula:

$$LVM=0.8 [1.04x \{(LVIDd + IVSd + PWd)^3 - LVIDd^3\}] + 0.6g.$$

Mass index of left ventricle was estimated by the ratio of left ventricular mass to body surface area. Body surface area was calculated by formula of Dubois: body surface area =  $0.007184x W^{0.425}xH^{0.725}$  (where W is weight in kg and H is height in cm). Hypertrophy of LV was labeled as per operational definition. All the data was noted and recorded along with demographic details of the patient. All the echocardiographic examinations were performed on the same machine by the same operator of the cardiology department to eliminate bias and confounding variables were controlled by exclusion.

Collected data was analyzed with SPSS version 21. Numerical variable i.e. age and BMI were shown as mean and standard deviation or ranges. Variables (categorical) i.e. gender, diabetes, hypertension, smoking and LVH were shown as frequencies and percentages. Stratification of data like age, gender, diabetes (random sugar  $> 200$ mg/dl), hypertension ( $> 160/90$ ), smoking ( $> 5$  pack years) and BMI was done. Chi-square test was used after stratification and  $< 0.05$  p-value was significant.

## RESULTS:

There were 44(72.13%) males and 17(27.87%) females. The patients were having mean age of  $57.43 \pm 15.10$  years. The mean BMI of patients was  $27.62 \pm 3.64$ kg/m<sup>2</sup>. In this study, 33 (54.1%) were diabetics while 28 (45.9%) were non-diabetics, 39 (63.93%) were hypertensive while 22 (36.07%)

were non-hypertensive, 29 (47.54%) smokers and 32 (52.46%) non-smokers, 19 (31.15%) patients had LVH while 42 (68.85%) did not have LVH.

Data was stratified for age, of patients. In patients aged 30-50years, 4 (17.4%) patients had LVH while 19 (82.6%) did not have LVH. In patients aged 51-80years, 15 (39.5%) patients had LVH while 23 (60.5%) did not have LVH. The difference was insignificant ( $p > 0.05$ ). Data was stratified for gender and BMI and there was no significance of

**Table-1: Stratification of Left Ventricular Hypertrophy (LVH) with respect to age**

Left Ventricular Hypertrophy (LVH)	Age groups		Total	p-value
	30-50 years	51-80 years		
Yes	4	15	19	0.071
	17.40%	39.50%	31.10%	
No	19	23	42	
	82.60%	60.50%	68.90%	
Total	23	38	61	
	100%	100%	100%	

**Table-2: Stratification of Left Ventricular Hypertrophy (LVH) with respect to gender**

Left Ventricular Hypertrophy (LVH)	Gender		Total	p-value
	Male	Female		
Yes	14	5	19	0.856
	31.8%	29.4%	31.1%	
No	30	12	42	
	68.2%	70.6%	68.9%	
Total	44	17	61	
	100%	100%	100%	

**Table-3: Stratification of Left Ventricular Hypertrophy (LVH) with respect to diabetes**

Left Ventricular Hypertrophy (LVH)	Diabetes		Total	p-value
	Yes	No		
Yes	18	1	19	0.000001
	54.5%	3.6%	31.1%	
No	15	27	42	
	45.5%	96.4%	68.9%	
Total	33	28	61	
	100%	100%	100%	

**Table-4: Stratification of Left Ventricular Hypertrophy (LVH) with respect to Hypertension**

Left Ventricular Hypertrophy (LVH)	Hypertension		Total	p-value
	Yes	No		
Yes	16	3	19	0.027
	41.0%	13.6%	31.1%	
No	23	19	42	
	59.0%	86.4%	68.9%	
Total	39	22	61	
	100%	100%	100%	

**Table-5: Stratification of Left Ventricular Hypertrophy (LVH) with respect to Smoking**

Left Ventricular Hypertrophy (LVH)	Smoking		Total	p-value
	Yes	No		
Yes	13	6	19	0.024
	44.8%	18.8%	31.1%	
No	16	26	42	
	55.2%	81.3%	68.9%	
Total	29	32	61	
	100%	100%	100%	

**Table-6: Stratification of Left Ventricular Hypertrophy (LVH) with respect to BMI**

Left Ventricular Hypertrophy (LVH)	BMI			Total	p-value
	Normal	Overweight	Obese		
Yes	6	11	2	19	0.195
	42.90%	34.40%	13.30%	31.10%	
No	8	21	13	42	
	57.10%	65.60%	86.70%	68.90%	
Total	14	32	15	61	
	100%	100%	100%	100%	

the data with p-value ( $> 0.05$ ). Data stratification for hypertension, diabetes and smoking showed a difference which was significant ( $< 0.05$ ).

**DISCUSSION:**

Echocardiographically determined hypertrophy of LV may be an indication of cardiovascular disease which may be related to bad prognosis.<sup>8</sup> In this study, 19 (31.15%) patients had LVH while 42 (68.85%) did not have LVH. Dasti et al., in 2016 conducted a study in Pakistan and found that the frequency of LVH in ischemic stroke patients was 25.7%.<sup>5</sup> Khan et al., in 2009 conducted a similar study and found that the frequency of LVH in ischemic stroke patient was 3.6%.<sup>6</sup> Rodrigo et al., conducted a similar study in 2012 and found that to be 76.3%.<sup>7</sup>

There is a conflict in the frequency of LVH in ischemic stroke patients not only in the local population of same province (25.7% Hyderabad<sup>5</sup> vs. 3.6% Karachi<sup>6</sup>) but also with the internationally published figures (76.3% Sri Lanka).<sup>7</sup>

The current study reported that patients were having a mean age of  $57.43 \pm 15.10$  years. Data was stratified for age of patients. In patients aged 30-50years, 4 (17.4%) patients had LVH while 19 (82.6%) did not have LVH. In patients aged 51-80years, 15 (39.5%) patients had LVH while 23 (60.5%) did not have LVH. The difference was insignificant ( $p > 0.05$ ). Data was stratified for gender and BMI and there was no significance of the data with p-value ( $> 0.05$ ). Data stratification for hypertension, diabetes and smoking showed a difference which was significant ( $< 0.05$ ).

In this study, there were 44 (72.13%) males and 17 (27.87%) females. Data was stratified for gender of patients. In male patients, 14 (31.8%) patients had LVH while 30 (68.2%) did not have LVH. In female patients, 5 (29.4%) patients had LVH while 12 (70.6%) did not have LVH. The difference was insignificant ( $p > 0.05$ ).

Bruno et al., reported a prevalence of 46% of LVH. It was reported that there is poor compliance to treatment of hypertension which leads to development of LVH. In logistic analysis there was



significant association of un-control hypertension with LVH  $p < 0.05$ . In patients who present with stroke usually have poor compliance to treatment of hypertension and consequent LVH.<sup>4</sup>

Hypertrophy of LV is associated with an increased of cardiovascular morbidity which is reported to be two folds as compared to normal individuals. LVH may be a risk factor for fatal and non-fatal stroke. This increased risk of LVH and stroke may be due to smoking, systolic blood pressure and body mass index. EUROSTROKE data report should that LVH detected on electrocardiogram may be an important predictor of thrombo-embolic stroke.

The association was stronger with fatal stroke as compared to non-fatal stroke.<sup>9</sup> These facts may play a role in understanding the LV remodeling and its subsequent implications.<sup>8,10</sup>

The limitation of study were that it was only single centered study with small volume enrolled population and long term follow up of these patients was not carried out. So future study should address these limitations.

### CONCLUSION:

The frequency of LVH was high in ischemic stroke patients. Now in future we will implement the screening of stroke patients for cardiovascular changes.

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