

ORIGINAL ARTICLE

A Clinical Study of Prevalence of Microalbuminuria in Patients of Primary Hypertension and its Correlation with Left Ventricular Mass Index

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Abstract

Introduction: Hypertension is one of the most challenging health problems in the world. Hypertension is closely related to kidney diseases. Microalbuminuria is a reflection of early kidney dysfunction and a marker of asymptomatic preclinical disease which precedes and predicts the occurrence of major morbid events.

Aims and objectives: To investigate the relationship between microalbuminuria and LVH in patients with primary hypertension. To establish microalbuminuria as an independent risk factor for increased Left Ventricular Mass Index in patients with Primary Hypertension.

Methods: This was a cross-sectional prevalence, analytical study conducted for a period of two years in a tertiary care teaching hospital in Western India. 126 patients diagnosed as primary hypertension, according to JNC 7 criteria were included in the study. Left ventricular Mass Index was measured using 2 D Echo Machine using the formula of Left ventricular mass. Multiple logistic regression was conducted to find out independent correlation of Left Ventricular Hypertrophy.

Results: Mean age was 64.32 years in patients without LVH while it was 63.85 years in patients with LVH. Serum creatinine, albumin-creatinine ration and Microalbuminuria were independently correlated with the Left Ventricular hypertrophy. Multiple logistic regression concluded that presence of microalbuminuria increases risk of LVH 2.04 times more as compared to absence of microalbuminuria. Serum creatinine level was higher in patients with LVH compare to patients without LVH. patients with Microalbuminuria were higher in LVH group compare to non LVH group and this difference was statistically significant.

Conclusion: This study demonstrates that microalbuminuria has an independent correlation with Left Ventricular Mass Index and hence an independent risk factor for increased cardiovascular morbidity and mortality.

threshold that is used currently for the definition of microalbuminuria is arbitrary and was chosen more than 25 years ago based on data of diabetic patients.⁵ Microalbuminuria is defined as 24-hour urinary albumin in the range of 30-299mcg is often found in primary hypertension and represents a sign of renal and cardiovascular damage.⁶ It has been proposed that microalbuminuria is a reflection of early kidney dysfunction and a marker of asymptomatic preclinical disease which precedes and predicts the occurrence of major morbid events.⁷ Although several studies have attempted to define the prevalence of microalbuminuria in primary hypertension, the exact figure is still unclear. The published prevalence of microalbuminuria in hypertensive subjects ranges from 4.7% to 58.4% .⁸ The present study aimed to investigate the relationship between microalbuminuria and LVH in patients with primary hypertension. The aim of this study was to establish Microalbuminuria as an independent risk factor for increased Left Ventricular Mass Index in patients with Primary Hypertension.

Materials and Methods

This was a cross-sectional prevalence, analytical study conducted for a period of two years in a tertiary care teaching hospital in Western India. Institutional ethics committee approval was obtained before the start of study. Informed consent was taken from each patient. 126 patients diagnosed as primary hypertension according to JNC 7 criteria, admitted to medicine ward were included in the

Introduction

Hypertension is one of the most challenging health problems in the world. It has been estimated that, globally, almost one billion individuals have hypertension.¹ Latest WHO statistics show that hypertension is the leading cause of mortality worldwide (responsible for 13% of global deaths).²

Hypertension is closely related to kidney diseases.³ Primary hypertension is considered to be strongly associated with end-stage renal disease (ESRD). Using longitudinal data from the

Glasgow Blood Pressure Clinic (GBPC), it has been found that progression to ESRD in subjects attending this tertiary/secondary clinic is uncommon (only 1% of the population).⁴

The relationship between albuminuria and cardiovascular outcomes seems to exhibit a continuous relationship with no clear threshold for such association. The conventional

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Received: 31.10.2017; Accepted: 06.06.2019

Table 1: Comparison between age and Left Ventricular Hypertrophy (LVH)

	Subjects	Age, years		P value
		Mean	Standard deviation	
No LVH	77	64.32	11.14	0.48
LVH Present	49	63.85	12.01	

Table 3: Comparison between left ventricular mass index, and Left Ventricular Hypertrophy (LVH)

	Subjects	Left ventricular mass index, g/m ²		P value
		Mean	Standard deviation	
No LVH	77	102.32	16.02	< .001
LVH present	49	188.78	40.34	

study. Secondary hypertension was ruled out by an elaborate questionnaire. Patients were asked the history of breathlessness, cough, expectoration, chest pain and palpitations, swelling over feet, syncope. A thorough physical examination was conducted and vital signs, pallor, edema, icterus, cyanosis and lymphadenopathy were recorded. All patients included in the study then underwent routine blood investigations such as hemogram, erythrocyte sedimentation rate, blood sugars, renal function tests, liver function tests, electrocardiogram and 2D echocardiography. Left ventricular Mass Index was measured using measurements taken from 2 D Echo Machine using the formula $\text{Left ventricular mass} = 0.80 \times 1.04 [(VSTd \times LVIDd \times PWTd) 3 - (LVIDd) 3] + 0.6$ where VST is ventricular septal thickness, LVID is left ventricular internal dimension, and PWT is posterior wall thickness. Prognostic value of LVH, defined as a binary variable, after correction for body surface area (a left ventricular mass 125 g/m² in men and 110 g/m² in women). Body surface area (in square meters) was estimated according to the Briaers equation. Multiple logistic regression was conducted to find out independent correlation of Left Ventricular Hypertrophy. All significant variables in bi-variate analysis like Smoking, Diastolic blood pressure, Serum creatinine, Albumin-creatinine ratio and Microalbuminuria were taken. Apart from this some non significant variables in bi-variate analysis like Systolic blood pressure, Serum cholesterol, High-density lipoprotein and Low-density lipoprotein were also taken to remove their probable

Table 2: Comparison between microalbuminuria and Left Ventricular Hypertrophy (LVH)

Microalbuminuria	No LVH (n=77) No. (%)	LVH Present (n=49) No. (%)	P value
Present	25 (32.5)	30 (61.2)	< .001
Absent	52 (67.5)	19 (38.8)	

confounding effect.

Results

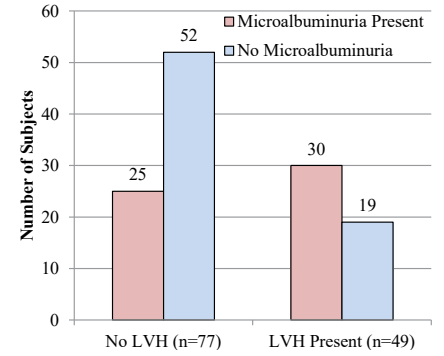
The present study was conducted among 126 patients of hypertension. Mean age of the patients were 64.41 years with standard deviation of 11.65 years. Females were 58 (46.03%) while males were 68 (53.97%). All patients were categorized based on presence of Left Ventricular Hypertrophy (LVH). LVH was present in 49 (38.89%). All other variables were compared with presence of LVH. Tables 1, 2 and 3 show comparison of these variables.

Mean age was 64.32 years in patients without LVH while it was 63.85 years in patients with LVH. This difference was statistically non significant (p value >0.05).

In LVH group proportion of patients with Microalbuminuria was 61.22% while in non LVH group proportion of patients with Microalbuminuria was 32.47%. Thus patients with Microalbuminuria were higher in LVH group compare to non LVH group and this difference was statistically significant p value (p <0.05) (Figure 1).

Mean Left ventricular mass index was 102.32 gms/m² in patients without LVH while it was 188.78gms/m² in patients with LVH. This difference was statistically significant (p-value <0.05) indicating that Left ventricular mass was higher in patients with LVH compare to patients without LVH.

Mean age was 64.32 years in patients without LVH while it was 63.85 years in patients with LVH. This difference was statistically non significant (p value >0.05). In LVH group proportion of females was 44.90% while in non LVH group proportion of females was 46.75%. Thus male-female ration was almost equal in both group and this was also depicted from non significant p value (p value >0.05). In LVH group proportion of smokers was 44.90% while in non LVH group proportion of smokers was 24.68%. Thus smoker were higher in LVH group compare to non LVH group and this difference

**Fig. 1: Comparison between microalbuminuria and Left Ventricular Hypertrophy (LVH)**

was statistically significant p value (p <0.05). Mean Systolic blood pressure was 182.23 mmHg in patients without LVH while it was 188.89 mmHg in patients with LVH. This difference was statistically non significant (p value >0.05). Mean Diastolic BP was 93.51 mmHg in patients without LVH while it was 106.47 mmHg in patients with LVH. This difference was statistically significant (p value <0.05) indicating that DBP is higher in LVH patients. Mean Serum Creatinine was 0.76 mg/dL in patients without LVH while it was 0.84 mg/dL in patients with LVH. This difference was statistically significant (p value <0.05). Mean Albumin-creatinine ratio was 34.65 µg/mg in patients without LVH while it was 53.56 µg/mg in patients with LVH. This difference was statistically significant (p value <0.05) indicating that Albumin-Creatinine ratio was higher in patients with LVH compared to patients without LVH.

Using backward LR method it was found that only Serum Creatinine, Albumin-Creatinine Ratio and Microalbuminuria were independently correlated with the Left Ventricular hypertrophy. Presence of microalbuminuria increases risk of LVH 2.04 times more compared to its absence.

Discussion

Primary hypertension (PH) is one of the most common medical problems in the general population and is one of the most important modifiable cardiovascular risk factors. Left ventricular hypertrophy (LVH) has also a prognostic value in patients with PH that strongly correlates with adverse cardiovascular outcome. It is identified that presence of LVH is

associated with an increased risk of sudden cardiac death, myocardial infarction, arrhythmia, progression of congestive heart failure, stroke, and abdominal aorta enlargement.^{9,10} Primary hypertension (PH) is one of the most common medical problems in the general population and is one of the most important modifiable cardiovascular risk factors. Left ventricular hypertrophy (LVH) has also a prognostic value in patients with PH that strongly correlates with adverse cardiovascular outcome. Microalbuminuria is often found in primary hypertension and represents a sign of renal and cardiovascular damage.⁶ In a study by Monfared et al¹¹ also demonstrated that microalbuminuria levels were higher in patients with LVH compared to patients without LVH. The study also documents that the microalbuminuria levels were increased in patients with hypertension and correlated with LVH.

The study also documents that the microalbuminuria levels were increased in patients with hypertension and correlated with LVH. In present study, it was found that only serum creatinine, albumin-creatinine ratio and Microalbuminuria were independently correlated with the Left Ventricular hypertrophy. Presence of microalbuminuria increases risk of LVH 2.04 times more compared to its absence. In present study mean Serum Creatinine was 0.76 mg/dL in patients without LVH while it was

0.84 mg/dL in patients with LVH. This difference was statistically significant (p value <0.05) indicating that serum creatinine level was higher in patients with LVH compare to patients without LVH. Monfared et al¹¹ found that patients with LVH compared with those without LVH had significantly higher serum creatinine levels ($P = .02$). Smilde and co-workers reported that kidney dysfunction was independently related to a 1.47-fold increased risk of LVH (95% CI, 1.15 to 1.88, $P = .009$). In addition, both creatinine clearance (OR, 1.56; 95% CI, 1.07 to 2.2; $P = .04$) and microalbuminuria (OR, 1.37, 95% CI, 1.04 to 1.80; $P = .02$) were independently associated with the presence of LVH.¹² Finally overall epidemiological and experimental data show that microalbuminuria is associated with an increased risk for all-cause and cardiovascular mortality, cardiac abnormalities, cerebrovascular disease, and, possibly, peripheral arterial disease.¹³ In hypertensive children and adolescents, microalbuminuria also is a predictor of LVH, and microalbuminuria lowering may stop the progression and even persuades the regression of LVH.¹⁴

Conclusion

This study demonstrates that microalbuminuria has an independent correlation with Left Ventricular Mass Index and hence an independent risk factor for increased cardiovascular morbidity and mortality.

Ethical approval

The study was approved by the Institutional Ethics Committee.

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