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A Study to Assess Microalbuminuria in Newly Diagnosed Patients of Essential Hypertension and Its Correlation with Left Ventricular Hypertrophy and Carotid Artery Intima-Media Thickness

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Abstract

Background: High blood pressure (BP) is ranked as the third most important risk factor for attributable burden of disease in south Asia (2010). The present study was conducted for determining the prevalence of microalbuminuria in hypertension and examination of its correlation with severity of hypertension, LVH and CCIMT. **Materials & methods:** The presents study was conducted for determining the prevalence of microalbuminuria in hypertension and examination of its correlation with severity of hypertension, LVH and CCIMT. Patients attending medical OPD and ward of our hospital were studied. Patients satisfying inclusion and exclusion criteria were subjected to detailed history and physical examination with special emphasis on the examination of cardiovascular system. Microalbuminuria was measured in all patients in a 24h urinary sample. Echocardiography was done in all patients. Left ventricular mass (LVM) was calculated. LVID was the left ventricular internal diameter, 1.04 specific gravity of the myocardium and 0.8 is the correction factor LVM index (LVMI) was calculated by dividing LVM by body surface area of the patients and represented as g/m2. LVH considered being present if LVMI was ≥131 g/m^2 in men and LVMI ≥100 g/m^2 in women. CCIMT was measured in all patients included in the study. All recorded were analysed. **Results:** Among patients with stage I hypertension, Microalbuminuria was present in 33.33 percent of the patients while LVH was present in 34.04 percent of the patients. Increased CCIMT was seen in 33.33 percent of the patients. Among patients with stage II hypertension, Microalbuminuria was present in 66.67 percent of the patients while LVH was present in 63.96 percent of the patients. Increased CCIMT was seen in 66.67 percent of the patients. Overall, Microalbuminuria was present in 48 percent of the patients while LVH was present in 47 percent of the patients. Increased CCIMT was seen in 48 percent of the patients. Mean LVM among patients with Microalbuminuria was 193.74 gram and was significantly higher in comparison to the patients without Microalbuminuria (132.99 gram). Mean LVMI among patients with Microalbuminuria was 116.33 g/m^2 and was significantly higher in comparison to the patients without Microalbuminuria (106.55 g/m^2). LVH was present in 68.75 percent of the patients with Microalbuminuria and 26.92 percent of the patients without Microalbuminuria. Significant results obtained while assessing the correlation of Microalbuminuria and LVH. Increased CCIMT was present in 83.33 percent of the patients with Microalbuminuria and 15.38 percent of the patients without Microalbuminuria. Significant results obtained while assessing the correlation of Microalbuminuria and CCIMT.**Conclusion:** The present study demonstrated the presence of Microalbuminuria in a significant number of newly detected and untreated patients of essential hypertension.

Key words: Microalbuminuria, Hypertension

INTRODUCTION

High blood pressure (BP) is ranked as the third most important risk factor for attributable burden of disease in south Asia (2010). Hypertension (HTN) exerts a substantial public health burden on cardiovascular health status and healthcare systems in India. HTN is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease (CHD) deaths in India. The WHO rates HTN as one of the most important causes of premature death worldwide. The Global and Regional Burden of Disease and Risk Factors study (2001), in a systematic analysis of population health data for attributable deaths and attributable disease burden, has ranked HTN in south Asia as second only to child underweight for age.[1- 3]Essential hypertension is defined as high blood pressure without any clearly defined etiology. From a practical perspective, it is best defined as that level of blood pressure at which treatment to lower blood pressure results in significant clinical benefit—a level which will vary from patient to patient depending on their absolute cardiovascular risk.[4- 6]

Several indices including arterial stiffness, vascular inflammatory markers, and carotid intima-media thickness (IMT) have been applied to estimate the macrovascular complication. Arterial stiffness plays an important role in the occurrence of atherosclerotic CVD. The measurement of pulse wave velocity (PWV) has been generally accepted as the gold standard for determining arterial stiffness. Moreover, this surrogate index of large artery compliance has been demonstrated to predict cardiovascular morbidity and mortality in a variety of populations. Additionally, increased IMT has also been reported as a risk factor for future cardiovascular events in patients with diabetes or hypertension.[7- 10]Meanwhile, microalbuminuria (MAU) is regarded as an early index of

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generalized microvascular impairment including endothelial dysfunction, which reflects subclinical vascular abnormalities of renal glomeruli. The detection of MAU is the main clue for the early recognition and treatment of clinically evident microvascular complications in diabetic or hypertensive patients. Furthermore, MAU is also highly associated with an increased risk of atherosclerotic CVD in patients with type 2 diabetes or essential hypertension.[6- 8]Microalbuminuria (MA), defined as urinary albumin excretion (UAE) in the range of 30–300 mg/24 h, is seen in patients with established essential hypertension and is a predictor of higher risk of cardiovascular and renal dysfunction. Hypertension affects the heart by increasing afterload causing the left ventricular hypertrophy (LVH) and stiffening of the left ventricle leading ultimately to increase in the left ventricular mass (LVM). LVH is the most common abnormality in patients with hypertension and significant marker of subclinical cardiovascular disease.[8- 11]Hence; under the light of above mentioned data, the present study was conducted for determining the prevalence of microalbuminuria in hypertension and examination of its correlation with severity of hypertension, LVH and CCIMT.

MATERIALS & METHODS

The presents study was conducted for determining the prevalence of microalbuminuria in hypertension and examination of its correlation with severity of hypertension, LVH and CCIMT. Patients attending medical OPD and ward of our hospital were studied. Patients satisfying inclusion and exclusion criteria were subjected to detailed history and physical examination with special emphasis on the examination of cardiovascular system. Microalbuminuria was measured in all patients in a 24h urinary sample. Echocardiography was done in all patients. Left ventricular mass (LVM) was calculated. LVID was the left ventricular internal diameter, 1.04 specific gravity of the myocardium and 0.8 is the correction factor LVM index (LVMI) was calculated by dividing LVM by body surface area of the patients and represented as g/m2. LVH considered being present if LVMI was $\geq$131 g/m^2 in men and LVMI $\geq$100 g/m^2 in women. CCIMT was measured in all patients included in the study. The common carotid artery was scanned and measurements were taken at one point15 mm proximal to the bifurcation (manual measurement). Urine analysis for microscopy and microalbuminuria, urine albumin by dipstick, plasma glucose – fasting and post prandial, blood urea and serum creatinine, serum electrolytes, lipid profile, echocardiography, Doppler examination of neck, USG abdomen (for kidney size), ECG, Chest X-ray.Chi-square test was used to analyze nonparametric or categorical data. For analysis of ordinal scale data, Students t-test was used. Karl–Pearson correlation coefficient was calculated to observe correlation between variables. $P < 0.05$ was taken as significant and <0.01 as highly significant. Appropriate stat tool was used for analysis.

RESULTS

Mean age of the patients overall was 46.8 years.65 percent of the patients were males while the remaining were females. Stage I hypertension was present in 43.08 percent of males and 34.28 percent of the females. Stage II hypertension was present in 56.92 percent of males and 65.72 percent of the females. Overall, Stage I hypertension was seen in 40 percent of the patients while Stage II hypertension was seen in 60 percent of the patients. Among patients with stage I hypertension, Microalbuminuria was present in 33.33 percent of the patients while LVH was present in 34.04 percent of the patients. Increased CCIMT was seen in 33.33 percent of the patients. Among patients with stage II hypertension, Microalbuminuria was present in 66.67 percent of the patients while LVH was present in 63.96 percent of the patients. Increased CCIMT was seen in 66.67 percent of the patients. Overall, Microalbuminuria was present in 48 percent of the patients while LVH was present in 47 percent of the patients. Increased CCIMT was seen in 48 percent of the patients. Mean LVM among patients with Microalbuminuria was 193.74 gram and was significantly higher in comparison to the patients without Microalbuminuria (132.99 gram). Mean LVMI among patients with Microalbuminuria was 116.33 g/m^2 and was significantly higher in comparison to the patients without Microalbuminuria (106.55 g/m^2). LVH was present in 68.75 percent of the patients with Microalbuminuria and 26.92 percent of the patients without Microalbuminuria. Significant results obtained while assessing the correlation of Microalbuminuria and LVH. Increased CCIMT was present in 83.33 percent of the patients with Microalbuminuria and 15.38 percent of the patients without Microalbuminuria. Significant results obtained while assessing the correlation of Microalbuminuria and CCIMT.

Table 1: Stage of hypertension

Stage of hypertension	Males		Females		Total	
	Number of patients	Percentage	Number of patients	Percentage	Number of patients	Percentage
Stage I	28	43.08	12	34.28	40	40
Stage II	37	56.92	23	65.72	60	60
Total	65	100	35	100	100	100

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Table 2: Descriptive results

Stage of hypertension	Microalbuminuria present		Microalbuminuria absent		LVH present		LVH absent		CCIMT Increased		CCIMT Normal	
	N	%	N	%	N	%	N	%	N	%	N	%
Stage I	16	33.33	24	46.15	16	34.04	24	45.28	16	33.33	24	46.15
Stage II	32	66.67	28	53.85	31	63.96	29	54.72	32	66.67	28	53.85
Overall	48	100	52	100	47	100	53	100	48	100	52	100

Table 3: Correlation of Microalbuminuria and LVM and LVMI

Parameter	Microalbuminuria present		Microalbuminuria absent		p- value
	Mean	SD	Mean	SD	
LVM (g)	193.74	17.58	132.99	11.97	0.001*
LVMI (g/m^2)	116.33	23.07	106.55	20.30	0.000*

*: Significant

Table 4: Correlation of Microalbuminuria and LVH

Parameter	Microalbuminuria present		Microalbuminuria absent		p- value
	Number of patients	Percentage	Number of patients	Percentage	
LVH	33	68.75	14	26.92	0.020*

*: Significant

Table 5: Correlation of Microalbuminuria and CCIMT

CCIMT	Microalbuminuria present		Microalbuminuria absent		p- value
	Number of patients	Percentage	Number of patients	Percentage	
Increased	40	83.33	8	15.38	0.000*
Normal	8	16.67	44	84.62	

*: Significant

DISCUSSION

During the past few years, microalbuminuria has become a prognostic marker for cardiovascular and/or renal risk in diabetic and nondiabetic subjects. Although determinants of subtle increases in urinary albumin excretion (UAE) and its progression remain poorly understood, microalbuminuria assessment is now recommended in a risk stratification strategy for hypertension management. Moreover, the potential of microalbuminuria as an intermediate end point during antihypertensive treatment is still unclear. A better understanding of what determines the development of microalbuminuria in hypertensives will help formulate a more rational application of microalbuminuria, both at the time of risk stratification and during treatment. CIMT is the area of tissue starting at the luminal edge of the artery and ending at the boundary between the media and the adventitia. CIMT is closely associated with many traditional cardiovascular risk factors (, some new risk factors, and target organ damages (such as left ventricular hypertrophy, microalbuminuria and decreased ankle–brachial index).[11-14] Hence; the present study was undertaken for assessing the microalbuminuria in newly diagnosed patients of essential hypertension and its correlation with Left Ventricular Hypertrophy and Common carotid artery intima media thickness. One hundred patients visiting in the department of general medicine with newly diagnosed cases of essential hypertension [according to the Indian guidelines on Hypertension (IGH) III-2013] were considered for the study.

Microalbuminuria was found to be present in 48 percent of the patients. Our results were in concordance with the results obtained by previous authors who also reported similar range of Microalbuminuria in essential hypertension patients. In a study conducted by Maggon RR et al, Microalbuminuria was present in 44 percent of the patients. Hitha B et al, in their study reported presence of Microalbuminuria in 23.7% of the newly detected hypertensive patients. In another study conducted by Poudel B et al, Microalbuminuria was present in 51.88% of the patients. The published prevalence of Microalbuminuria in hypertensive subjects ranges from 4.7% to 58.4% (Bohm M et al).[10- 14]

In the present study, LVH was present in 68.75 percent of the patients with Microalbuminuria and 26.92 percent of the patients without Microalbuminuria. Significant results obtained while assessing the correlation of Microalbuminuria and LVH. Increased CCIMT was present in 83.33 percent of the patients with Microalbuminuria and 15.38 percent of the patients without Microalbuminuria. Significant results obtained while assessing the correlation of Microalbuminuria and CCIMT. Khutan et al assessed the association of carotid intimal medial thickness with left ventricular hypertrophy (LVH) in hypertensive patients. Hundred hypertensives (JNC-7, Stage 1 and 2) between 30 and 55 years were enrolled in this prospective observational study conducted at a tertiary care teaching institute of Punjab, India. Electrocardiogram, Carotid Doppler, and Echocardiography were carried out in addition to routine biochemical investigations. Increased carotid intimal

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medial thickness (CIMT) had statistically significant association with age, duration of hypertension, high systolic and diastolic blood pressure (BP), left ventricular hypertrophy and left ventricular mass index but was not associated with body mass index, low-density lipoproteins, and total cholesterol. LVH and arterial wall changes occur concurrently, and therefore, management of hypertension should not be limited just to control of BP but should also include therapy for carotid plaques and increased CIMT.[15] Wang et al investigated the association of low-grade albuminuria with LVH and LV diastolic dysfunction in hypertensive patients. Of the 870 patients, 765 (87.9%) had normal albuminuria, 77 (8.9%) had microalbuminuria, and 28 (3.2%) had macroalbuminuria. Percentage of LVH and LV diastolic dysfunction was increased with ascending UACR. UACR was independently associated with LVH and LV diastolic dysfunction, even in patients with normal albuminuria. Multivariable logistic regression showed that the patients with the highest tertile within normal albuminuria had nearly 80% increase in LVH and nearly 60% increase in LV diastolic dysfunction. After further stratification analyses in patients with normal albuminuria, it was shown that this independent association persisted in female patients, those who were younger than 70 years old, and those with duration of hypertension <15 years. Low-grade albuminuria was associated with LVH and LV diastolic dysfunction in hypertensive patients, especially in patients younger than 70 years old, and those with duration of hypertension <15 years.[16]

CONCLUSION

The present study demonstrated the presence of Microalbuminuria in a significant number of newly detected and untreated patients of essential hypertension. Microalbuminuria had a statistically significant relationship with LVH and CCIMT. These findings imply an underlying vascular relationship between MA, LVH, and CCIMT.

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