

Microalbuminuria in Stage 2 Hypertensive Patients with Left Ventricular Hypertrophy

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Abstract

Objective: Microalbuminuria (MA, albuminuria: 20 – 200 $\mu\text{g min}^{-1}$) is associated with several cardiovascular risk factors including left ventricular hypertrophy (LVH). The relationship, usually assumed to reflect an increased blood pressure (BP) load on the heart and the kidney. To evaluate this relation between MA and LVH, left ventricular mass index (LVMI) was determined in stage 2 hypertensive patients with LVH.

Study Design: Descriptive Case series

Setting and Duration of Study: Department of Medicine, King Edward Medical University, Mayo Hospital Lahore, from 1st April 2009 to 31st March 2010.

Methodology: Hundred cases of non diabetic patients with stage 2 hypertension and left ventricular hyper-

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trophy visiting outdoor and indoor patients of East medical ward Mayo Hospital Lahore were registered. Microalbuminuria was detected using standardized dipstick technique (MICRAL, Roche, USA) and recorded in mg/dL. Left ventricular hypertrophy was determined by measuring LVMI in gram/m^2 using GE Logic pro 500 echocardiography with color Doppler. All this information was collected through a specially designed proforma.

Results: Microalbuminuria was present in 65% of the hypertensive individuals with LVH. When the occurrence of microalbuminuria was analyzed according to the different clinical parameters like age and gender and duration of hypertension, a significant correlation was found with age and duration of hypertension, but no significant relation was found with either gender.

Conclusion: There is high frequency of microalbuminuria in hypertensive individuals with left ventricular hypertrophy. This is associated with advanced age, duration of hypertension and degree of left ventricular hypertrophy. So microalbuminuria is an important predictor of cardiovascular morbidity and mortality in hypertensive patients with left ventricular hypertrophy and should be checked routinely in all hypertensive patients, regardless of the presence of diabetes.

Key words: Hypertension, Left Ventricular Hypertrophy, Microalbuminuria.

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Introduction

Microalbuminuria (MA), a slight elevation in urinary albumin excretion (UAE) above some preset threshold, characterizes a large proportion of essential hypertensive patients and predicted cardiovascular morbidity and mortality independent of several conventional cardiovascular risk factors in recent studies in nondiabetic populations.¹

Microalbuminuria has long been considered a marker of early nephropathy and increased cardiovascular risk in the specific setting of diabetes mellitus. However, numerous clinical studies found an association between microalbuminuria and other cardiovascular risk factors, target organ damage and risk of cardiovascular disease in clinical contexts different from diabetes.^{2,3}

Microalbuminuria which is albuminuria: 20 – 200 $\mu\text{g min}^{-1}$ characterizes a large proportion of hypertensive patients. This predictive effect is independent of age, sex, and other conventional atherosclerotic risk, factors and the patients with microalbuminuria have severe sub clinical atherosclerosis.

Microalbuminuria in non-diabetic individuals indicates that the endothelium is not functioning properly. The prevalence of microalbuminuria among hypertensive non-diabetic patients is up to 46% across different studies and microalbuminuria is strong, early and independent marker of increased cardiovascular risk in hypertension.

Microalbuminuria (MA) also correlates with left ventricular mass (LVM) index (LVMI), and is more frequent in the presence of left ventricular hypertrophy (LVH) which, starting as compensation to increased cardiac workload, can eventually contribute to generate cardiovascular events through its negative effects on ventricular function, coronary circulation and dysrhythmogenesis. For this reason, LVH is now considered as a marker of risk and an important surrogate endpoint in hypertension. Although the association between UAE and LVMI is frequently assumed to represent a mere consequence of an increased BP load on the heart and the kidney, it may represent more than a hemodynamic correlate.⁴⁻⁸

In this study this possibility was evaluated in well-screened group of non diabetic, Type 2 hypertensive patients.

Methodology

One hundred type 2 hypertensive patients (BP > 160 / 100) of age 35 – 75 years of both genders having LVH

on echocardiography were registered from outpatient department and indoor wards. Diabetic patients and those with known renal hepatic or cardiac disease and pregnant females were excluded. An informed consent was obtained for using their data in research. The sociodemographic information like name, age, sex, address etc was recorded. The history of present illness was obtained regarding symptoms like headache, palpitations and dyspnoea. Their severity and duration was noted. They were routinely investigated for complete blood count, urinalysis, Electrocardiogram, chest X-ray, renal function tests and liver function test and specifically investigated for microalbuminuria using standardized dipstick technique (MICRAL, Roche, USA) with a cutoff 20 mg/L. For left ventricular hypertrophy using GE Logic pro 500 echocardiography with color Doppler was used. All this information was collected through a specially designed Proforma and all the investigations were carried out at the same time.

The data was entered in SPSS version 11 and analyzed. The demographic variables like age were described as simple statistics giving mean and standard deviation. The presence of microalbuminuria and left ventricular hypertrophy (left ventricular mass index > 110 gram/meter² in females and > 125 gram/meter² in males) were presented as frequency, distribution and proportions.

Results

The group of stage 2 hypertensive, non diabetic patients with left ventricular hypertrophy comprised of 100 individuals. Microalbuminuria was found in 65% of stage 2 hypertensive, non diabetic patients with left ventricular hypertrophy (Table 1).

Table 1: Frequency of Microalbuminuria among Hypertensive Patients n = 100.

Microalbuminuria status	No. of Patients (Percentage)
Present	65 (65%)
Absent	35 (35%)
Total	100 (100%)

Mean age of the patients was 59.42 ± 8.05 years. It was also observed that majority of subjects (73%) were in the age range of 55-69 years and microalbumi-

nuria was present in relatively older patients and those having longer duration of hypertension (Table 2, 3).

Table 2: Distribution of Age in Hypertensive Patients with LVH n = 10.

Serial No.	Age Range	No. of patients (Percentage)
1.	35 – 39	2 (2.0)
2.	40 – 44	3 (3.0)
3.	45 – 49	6 (6.0)
4.	50 – 54	10 (10.0)
5.	55 – 59	23 (23.0)
6.	60 – 64	24 (24.0)
7.	65 – 69	26 (26.0)
8.	70 – 75	6 (6.0)

Mean ± SD = 59.42 ± 8.05 years

Table 3: Duration of Hypertension among Hypertensive Patients with LVH n = 100.

Serial No.	Duration (years)	No. of patients (Percentage)
1.	< 5	8 (8)
2.	5 – 9	22 (22)
3.	10 – 14	39 (39)
4.	15 – 20	31 (31)

Although majority of patients in this study were male (70%), the frequency of microalbuminuria, was comparable in both genders 63.3% and 65.7% in females and males respectively (Table 4). In patients with

Table 4: Sex Distribution of Patients with Their Status of Microalbuminuria.

		Microalbuminuria		Total
		Present	Absent	
Sex of Patient	Female			
	Count	19	11	30
	% of Total	63.3%	36.7%	30%
	Male			
Count	46	24	70	
% of Total	65.7%	34.3%	70%	

microalbuminuria majority had LVMI > 130 gm/m² in males and 116 gm/m² in females. Likewise majority of the patients without microalbuminuria had LVMI in the range of 125 – 130 gm/m² in males and 111 – 115 gm/m² in females (Table 5). This suggests a relationship between the degree of LVH and presence of microalbuminuria.

Discussion

Increased urinary albumin excretion is associated with signs of sub clinical organ damage, such as left ventricular hypertrophy. This increased ventricular mass is a predictor of cardiovascular morbidity and mortality but risk is not the same for all hypertensive patients. It is important to detect patients with high risk early.⁹ After being exposed to risk factors a large number of these patients first progresses through an asymptomatic phase which often precedes and predicts the occurrence of major events. So microalbuminuria, could prove to be a valuable tool in the screening and identification of hypertensive patients who are at higher cardiovascular risk.¹⁰⁻¹²

In the literature, frequency of microalbuminuria has been reported within from 4.7% to 40%. Frequency of microalbuminuria among nondiabetic hypertensive patients was reported as 38% by Bigazzi et al. and 32% by Grandi et al.^{11,13} In our study, we found the frequency of microalbuminuria (65%) to be higher than those reported in previous studies. This may be related with higher average age of the patients, poor compliance of medicines, late presentation and uncontrolled hypertension in this study population.

The presence of microalbuminuria was highly associated with increasing age. In the present study, we found that UAER was significantly higher in advanced age groups. This verifies the results from various

Total Count	65	35	100
% of Total	65%	35%	100%

Table 5: Comparison of Microalbuminuria and LVMI in patients with Stage 2 Hypertension.

LVMI gram/meter ²	Microalbuminuria			
	Positive no. of pt.		Negative no. of pt.	
	Male	Female	Male	Female
≤ 110	0	0	0	0
111 – 115	0	3	0	6
116 – 120	0	6	0	2
121 – 125	0	7	0	2
126 – 130	9	3	13	1
131 – 135	15	0	7	0
136 – 140	19	0	2	0
> 140	3	0	2	0

other studies, showing increased frequency of microalbuminuria in elderly. Since elderly people have hypertension for a longer duration of time and more chances of LVH on electrocardiogram and echocardiography and increased LVMI, therefore increased frequency of microalbuminuria in this age group shows that it could be an important marker for detection of cardiovascular risk.

We also detected an increase frequency of microalbuminuria with the duration of hypertension, but there was no significant specific gender association, as there was no significant difference in frequency of microalbuminuria among male and female patients. This is in contrast to the Gubbio cohort, where risk for microalbuminuria was found to be greater for men than for women, which according to them, could reflect an influence of sex hormones on glomerular function.¹⁴ This lack of significance could indicate a weak association between this variable to microalbuminuria, or could be due to some methodological limits.

Detection of the high frequency of microalbuminuria in non diabetic patients with stage 2 hypertension with left ventricular hypertrophy suggests that these patients are at high risk for cardiovascular diseases. Microalbuminuria may indicate endothelial damage, which results from cumulative effect of atherosclerotic risk factors. It is also proposed that microalbuminuria not only indicates early and possibly reversi-

ble glomerular damage but also correlates with severity of coronary atherosclerosis;¹⁵ therefore it can be possible to prevent or improve atherosclerotic cardiovascular diseases with the removal of risk factors and with the effective treatment of microalbuminuria.

Accurate cardiovascular risk evaluation is a prerequisite for devising cost – effective therapeutic strategies in patients with essential hypertension. In fact, the burden of risk may influence the identification of target BP and may be useful for establishing the need for specific drugs. The presence of target organ damage has an important impact on cardiovascular risk, but very much depends on the technique that is used to assess it. In light of these observations, it is not surprising that microalbuminuria was found to be an excellent predictor of cardiovascular morbidity and mortality in hypertensive patients.

Perhaps measuring microalbuminuria may also serve as a tool in heart rehabilitation clinics for secondary prophylaxis of cardiovascular events. Studies should be undertaken in order to test whether urinary albumin is reduced when intervention is made against conventional atherosclerosis risk factors. Intervention trials are clearly warranted to establish whether reduction of urinary albumin leads to a lower incidence of cardiovascular events.

Conclusions

We conclude that microalbuminuria is a common finding in subjects with Stage 2 hypertension having left ventricular hypertrophy and could be a strongest independent determinant of cardiovascular risk in type 2 hypertension. Therefore, it is recommended that in addition to strict control of blood pressure and control of other modifiable atherosclerotic risk factors, microalbuminuria should also be measured routinely in hypertensive patients, especially those having left ventricular hypertrophy with or without diabetes.

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