

Original Research Article

Study of microalbuminuria in essential hypertension patients with target organ damage

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ABSTRACT

Background: Urinary albumin excretion has been purported to be strongly linked to cardiovascular events in hypertensive patients. The prevalence of microalbuminuria in patients with essential hypertension and its relationship with target organ damage was evaluated with the present study, as the correlation of microalbuminuria and target organ damage except cardiovascular events has not been deliberated upon much in the past.

Methods: One hundred and twenty cases of essential hypertension were enrolled sequentially. Prevalence of urinary albumin excretion and its correlation with target organ damage (left ventricular hypertrophy, retinopathy and stroke) was analyzed. Urinary albumin excretion was assessed by turbidimetry method, while microalbuminuria was calculated by urine albumin to creatinine ratio.

Results: Microalbuminuria was observed in 57.7% cases of essential hypertension. Target organ damage was observed in 62.5% (75) patients, out of which 78.66% patients had associated microalbuminuria ($p < 0.05$). Higher prevalence was observed in patients with longer duration and greater severity of hypertension, increased body mass index and dyslipidemia.

Conclusions: The assessment of microalbuminuria in hypertensive patients is a great value addition for the evaluation of target organ damage. Prompt control of hypertension and lipid levels along with weight management may lead to decreased risk of microalbuminuria.

Keywords: Essential hypertension, Microalbuminuria, Target organ damage, Urinary albumin

INTRODUCTION

Hypertension has long been recognized as a major health burden and particularly as a major risk factor for stroke, cardiovascular disease, end-stage renal disease, and overall mortality that affects all segments of the population.¹ Hypertension (HTN) particularly and significantly impacts healthcare systems in India.^{2,3}

Hypertension, even in asymptomatic state, is related to different types of Target Organ Damage (TOD) and their

clinical sequelae. Subtle TOD, such as Left Ventricular Hypertrophy (LVH), retinopathy, microalbuminuria and cognitive dysfunction occur early in the natural course of hypertensive disease; while catastrophic events such as stroke, heart attack, renal failure etc. are usually a result of long-standing uncontrolled hypertension. Majority of these patients have essential hypertension, defined as rise in blood pressure of unknown etiology.

Previously available robust data does indicate occurrence of proteinuria and Microalbuminuria (MA) (i.e. urinary

albumin excretion rate of 20-200 mg/min or 30-300 mg/24 hr. or urinary albumin to creatinine ratio in the first voided sample in the morning greater than 30-300 mg/gm or early morning urinary albumin concentration of 20-200 mg/L) in hypertensive adults to be independent predictors of Cardiovascular (CV) morbidity and mortality.⁴⁻⁶ In fact, MA is the earliest marker of hypertensive (and diabetic) nephropathy. Further, MA has been shown to be reversible with optimal blood pressure and blood sugar control, at least in early stages.^{7,8}

The prevalence of MA and its association with TOD among patients with essential hypertension has not been deliberated upon much by the researchers from this part of the world. The present study was hence planned with the objective of estimation of prevalence of microalbuminuria, assessment of probable risk factors for its development and the relationship of microalbuminuria to target organ damage amongst essential hypertension cases.

METHODS

In this hospital-based prevalence study, carried out between September 2017 and August 2019 (2 years) at a tertiary care centre in central India, a total of 120 participants were recruited based on following selection criteria:

Inclusion criteria

- All the patients with diagnosis of hypertension
- Newly detected cases of hypertension during routine check-up or examination for some other reason

Exclusion criteria

- All the cases of secondary hypertension (irrespective of cause of hypertension)
- Patients with diabetes, acute coronary syndrome, renal disease, urinary tract infection, raised serum creatinine, macroproteinuria
- Pregnant ladies
- Smokers
- Refusal to provide consent

Detailed history was elicited from all the participants with emphasis on duration of hypertension and its treatment, cardiac symptoms (angina, palpitations, dyspnea and intermittent claudication), neurological symptoms (headache, seizures, transient ischemic attacks and previous stroke) and visual symptoms (blurring and/or diminution of vision, weakness in limbs) etc. Past history of diabetes, hypertension in first and second degree relative, coronary heart disease and history of major illness was also noted, along with personal history w.r.t. smoking, tobacco chewing, alcohol intake and diet etc. Physical examination focused on the assessment of neurological and cardiovascular systems along with fundus examination. Routine investigations (fasting lipid

profile, ECG, x-ray chest, CT head (wherever indicated), 2D Echo and albumin creatinine ratio) were indicated for all the patients, along with work up for secondary hypertension on the basis of clinical indication.

Assessment of microalbuminuria was done on the basis of recommendations of the National Kidney Foundation and American Diabetic Association by urine Albumin Creatinine Ratio (ACR).^{9,10} Urine albumin was assessed by turbidimetry. Five ml of first voided early morning sample of urine was used, with patients having avoided exercise prior to urine collection. Urine examinations were done during the non-menstrual phase in women. Microalbuminuria (MA) for the study purpose was defined as ACR values between 30-300 mg/gm of creatinine.¹¹

The Institutional Ethics Committee approval was obtained before start of the study and pretested and validated proforma was used for data collection. Informed written consent was obtained from the all participants before enrollment. Data analysis was conducted using SAS statistical software and chi-square test and regression analysis were employed for interpretation.

RESULTS

Most of the patients belonged to 40-49 years (31.66%) and 60-69 years (27.5%) age groups (mean- 53.53±12.56 years). Males (65, 54.16%) outnumbered females (55, 45.83%) (M:F ratio- 1:0.84). Assessment of symptomatology revealed most of the participants having no symptoms (59.16%), with headache (13.33%) being the commonest presenting feature. Majority of cases (64, 53.33%) were newly diagnosed patients of hypertension.

Sixty-nine participants out of a total of 120(57.5%) were detected to have Microalbuminuria (MA). Higher age, female gender, obesity, higher blood pressure level and deranged lipid profile were the factors significantly increasing the risk of MA (Table 1).

Occurrence of MA was observed to be directly affected by duration of hypertension (except for <5 years duration category) and the difference across various duration categories was significant. Compliance to the antihypertensive therapy was also observed to be instrumental w.r.t. prevalence of MA (Table 2).

Target Organ Damage (TOD) was observed to be present in 75(62.5%) patients, out of which 59(78.66%) had microalbuminuria. There was no (TOD) in remaining 45(37.5%) patients, out of which only 10(22.22%) had microalbuminuria. Microalbuminuria was observed to be significantly correlated to Target Organ Damage (TOD) in the form of Stroke, retinopathy and LVH ($p=0.0072$, 0.0041 , <0.001 respectively). Retinopathy, LVH, stroke and dyslipidemia remained independently associated with of MA even after multivariate analysis (Table 3).

Table 1: Factors associated with microalbuminuria (MA).

Risk factor	No. of patients (n=120)	With MA	Without MA	p-value
Age	<60 years	75	36	p<0.05
	>60 years	45	12	
Gender	Male	65	27	p<0.05
	Female	55	13	
Obesity	Present	81	40	p<0.05
	Absent	39	10	
Blood pressure (mmHg)	<140/90	21	0	p<0.05
	Syst: 140-160, Dias: 90-100	66	45	
	>160/100	33	9	
Dyslipidemia	Present	100	53	p<0.05
	Absent	20	4	

Table 2: Correlation of microalbuminuria with duration of hypertension and compliance to antihypertensive therapy.

	Number of patients (n=120)	Microalbuminuria present	p- value
Duration of hypertension	Unknown duration	04(3.33%)	p=0.0023
	Newly diagnosed	64(53.33%)	
	<5 years	34(28.33%)	
	5-10 years	16(13.33%)	
	>10 years	02(1.66%)	
Compliance to anti-hypertensive therapy	Regular treatment	46(38.33%)	p=0.006
	No treatment	44(36.66%)	
	Irregular treatment	30(25%)	

Table 3: Target Organ Damage (TOD) with respect to Microalbuminuria (MA).

TOD	Number of Patients (n=120)	MA	p-value
Stroke	13(10.83%)	12(92.3%)	0.072
Retinopathy	51(42.5%)	37(72.54%)	0.0041
Left ventricular hypertrophy (LVH)	35(29.16%)	33(94.28%)	<0.001

DISCUSSION

Microalbuminuria is frequently seen in patients with essential hypertension and is relatively well established as a predictor of a higher risk for cardiovascular and probably renal dysfunction and subsequent mortality. Due to lack of credible locally relevant evidence, the present study was undertaken to assess prevalence of Microalbuminuria (MA), probable risk factors for its development and the relationship of Microalbuminuria (MA) to Target Organ Damage (TOD) amongst patients of essential hypertension. MA was observed to be present in 69(57.5%) participants, which is higher than that reported in previous similar studies (6.7%-

40.0%).^{5,12-15} This could partly be explained by the comparatively higher levels of BP amongst participants in the present study, and that most of the patients were not compliant to treatment.

Microalbuminuria has gradually been confirmed to be a marker of CV risk in diabetic individuals.^{16,17} Significance of its presence in essential hypertension cases is also getting obvious one study at a time. MA was reported to be associated with increasing age, increased duration and severity of hypertension, obesity and dyslipidemia; findings observed in this study are corroborating available evidence.¹⁸⁻²⁰ Left ventricular hypertrophy (94.28%) and stroke (92.3%) were observed significantly more commonly in those with MA and so were progressive retinopathy changes (72.54%). Retinopathy, LVH, stroke and dyslipidemia remained independently associated with of MA even after multivariate analysis. This implies significantly higher chances of development of macro- as well as microvascular complications amongst hypertensives with microalbuminuria than without it. Significant correlations between MA and TOD in the form of major ECG abnormalities and vascular retinal changes were also reported by Pontremoli et al, Hitha et al, observed similar correlation between presence of MA and higher incidence of stroke as well as retinopathy, further substantiating

authors observations.^{12,13} The presence of MA is thought of as the renal manifestation of generalized increased endothelial dysfunction occurring as part of the disease process; which leads to the hypothesis that certain degree of correlation continuum exists between CV risk factors and the process from early to final renal damage.^{15,20,21}

CONCLUSION

It can be said that microalbuminuria in hypertensive patients may prove to be a reasonable predictor in the evaluation of target organ damage and management of preventable risk factors (regular treatment of hypertension, weight control, and normal lipid levels) may help in decreasing the occurrence of microalbuminuria. Prompt screening for microalbuminuria in known hypertensives and subsequent adequate treatment may help reduce the burden of chronic kidney disease and cardiovascular disease.

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