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Original Research Article

Study of correlation of presence of microalbuminuria to target organ damage in essential hypertension cases

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ABSTRACT

Background: Critical amount of urinary albumin excretion has long been reported to be one strong predictor of cardiovascular events in hypertensive patients. Very few studies have been conducted till now depicting correlation of microalbuminuria and target organ damage in patients with essential hypertension, except cardiovascular events. We evaluated the prevalence of microalbuminuria in patients with essential hypertension and its relationship with target organ damage.
Methods: Total 120 patients of essential hypertension were studied. Prevalence of urinary albumin excretion and its correlation to target organ damage (left ventricular hypertrophy, retinopathy and stroke) was analysed. Urinary albumin excretion was assessed by turbidimetry method and microalbuminuria was assessed by urine albumin to creatinine ratio.
Results: Microalbuminuria was found to be present in 57.7% patients. Target organ damage was observed in 62.5% (75) patients, out of which 78.66% patients had associated microalbuminuria ($p < 0.05$). Amongst them, higher prevalence was observed in patients with longer duration and greater severity of hypertension, increased body mass index and dyslipidemia.
Conclusions: Microalbuminuria assessment in hypertensive patients is an important test for the evaluation of target organ damage. Optimal management of hypertension, weight control, and maintenance of normal lipid levels leads to decreased risk of microalbuminuria.

Keywords: Essential hypertension, Microalbuminuria, Target organ damage

INTRODUCTION

High blood pressure is ranked as the third most important risk factor for attributable burden of disease in south Asia.[1] Hypertension (HTN) exerts a substantial public health burden on cardiovascular health status and healthcare systems in India.[2,3]

Although hypertension is often asymptomatic as an entity, it is related to different types of target organ damage (TOD) and associated clinical conditions. 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.

There is substantial and credible evidence suggesting occurrence of proteinuria and microalbuminuria (MA) (defined as urinary albumin excretion rate of 20-200mg/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 20-200mg/L) in hypertensive adults to be independent predictors of cardiovascular (CV) morbidity and mortality.[4-6] MA is the earliest marker of hypertensive (and diabetic) nephropathy. Equally important is the observation that MA is reversible to interventions aimed at tight control of blood pressure and blood sugars.[7,8]

There is paucity of data from this part of world w.r.t. prevalence of MA and its association with TOD among patients with essential hypertension. The present study aimed at bridging the gap with assessment of prevalence of MA, probable risk factors for its development and the relationship of MA to TOD amongst patients of essential hypertension.

METHODS

The study was a Hospital based observational study conducted at Department of medicine, Tertiary care government hospital between November 2009 to November 2011 (2 years). Total 120 participants were included in the study.

Inclusion criteria

- Diagnosed cases of hypertension (on regular/irregular/no treatment)
- Newly detected hypertensives.

Exclusion criteria

- Proven cases of secondary hypertension
- Pregnancy
- Patients with diabetes, acute coronary syndrome, renal disease, urinary tract infection, raised serum creatinine, macroproteinuria
- Smokers.

Approval from Institutional Ethics Committee was obtained before start of the study.

Data was collected in a pretested and validated proforma only after due informed written consent was obtained from the participants. All the participants were subjected to detailed history taking with emphasis on duration of hypertension and its treatment, history of smoking, cardiovascular symptoms like angina, palpitations, dyspnea and intermittent claudication, neurological symptoms like headache, seizures, transient ischemic attacks and previous stroke and visual symptoms like blurring and/or diminution of vision, weakness in limbs (hemiparesis/hemiplegia) etc. Past history of diabetes, hypertension in first and second degree relative, coronary heart disease along with history of any major illness was duly noted. Personal history regarding smoking, tobacco chewing, alcohol intake and diet (veg/non-veg/mixed) was also recorded. Thorough physical examination was performed on each patient focusing on the assessment of the neurological and cardiovascular status along with optic fundus examination. In addition to routine investigations (fasting lipid profile, ECG, x-ray chest, CT head (wherever indicated), 2D Echo and albumin creatinine ratio), work up for secondary hypertension was performed wherever indicated.

Microalbuminuria (MA) was assessed by urine albumin creatinine ratio (ACR) based on recommendations of the National Kidney Foundation and American Diabetic Association.[9,10] Urine albumin was assessed by turbidimetry. Five ml of first voided early morning sample of urine was used. Patients were asked to avoid exercise prior to urine collection. In women urine examinations were done during the non-menstrual phase of their cycle. ACR values between 30-300mg/gm of creatinine constituted Microalbuminuria (MA) for the study purpose.[11]

SPSS (Version 16) was used for data analysis and chi-square test and regression analysis were performed, as indicated.

RESULTS

In the present study, a total of 120 patients of essential hypertension were studied over the period of two years. Maximum patients were in the age groups of 40-49years (31.66%) and 60-69years (27.5%), with the mean age of 53.53±12.56 years. 65 (54.16%) participants were males and 55 (45.83%) were females (M:F ratio- 1:0.84).

An overwhelming majority of the participants had no symptoms (59.16%), while headache (13.33%) was the most common presenting complaint. Maximum number of cases were newly diagnosed hypertensives (64, 53.33%) and having hypertension for <5years (28.33%).

Among 120 patients of essential hypertension, 69 (57.5%) had microalbuminuria (MA). Increasing age, severity of hypertension, presence of dyslipidemia, obesity and female gender were other factors significantly increasing the prevalence of MA (Table 1).

Duration of hypertension was found directly proportional to prevalence of MA (except for <5 years duration category) and the difference across categories was significant. Also, high prevalence was higher in patients taking on irregular or no treatment in comparison with patients on regular treatment (Table 2).

Out of 120 patients of essential hypertension, target organ damage (TOD) was 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) (Table 3).

Table 1: Correlation of microalbuminuria (MA) with established risk factors.

Risk factor		Number of patients (n= 120)	With MA	Without MA	P-value
Age	<60 years	75	36	39	P<0.05
	>60 years	45	33	12	
Gender	Male	65	27	38	P<0.05
	Female	5	42	13	
Blood pressure (mmHg)	<140/90	21	0	21	P<0.05
	Syst: 140-160 Dias: 90-100	66	45	21	
	>160/100	33	24	9	
Dyslipidemia	Present	100	53	47	P<0.05
	Absent	20	16	4	
Obesity	Present	81	40	41	P<0.05
	Absent	39	29	10	

Table 2: Prevalence of microalbuminuria with respect to 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%)	02 (50%)	χ^2 for linear trend= 9.233, P= 0.0023
Newly diagnosed	64 (53.33%)	44 (68.75%)	
<5 years	34 (28.33%)	10 (29.41%)	
5-10 years	16 (13.33%)	11 (68.75%)	
>10 years	02 (1.66%)	02 (100%)	
Compliance to anti-hypertensive therapy			
Regular treatment	46 (38.33%)	18 (39.13%)	χ^2 for linear trend= 10.41, P= 0.006
No treatment	44 (36.66%)	31 (70.45%)	
Irregular treatment	30 (25%)	20 (66.66%)	

Table 3: Correlation of microalbuminuria with target organ damage (TOD).

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

Retinopathy, LVH, stroke and dyslipidemia remained independently associated with of MA even after multivariate analysis (Table 3).

DISCUSSION

In the present study, a total of 120 patients of essential hypertension were enrolled for studying 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.

Authors observed MA to be present in 69 (57.5%), which is higher than observed by researchers in similar studies previously (6.7%-40.0%).[5,12-15] The probable reasons could be comparatively higher levels of BP amongst participants in our study as well the fact that most of the patients were on irregular or no treatment.

Over the years, MA has slowly been confirmed to be a predictor 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 present study and 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, in the MAGIC study.[12] Hitha et al, observed similar correlation between presence of MA and higher incidence of stroke as well as retinopathy, further substantiating our observations.[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

Authors conclude by saying that MA in hypertensive subjects may prove to be a valuable marker in the evaluation of target organ damage and control of risk factors amenable to prevention (regular treatment of HT, weight control, normal lipid levels) may have a favorable effect in preventing, delaying and lessening prevalence of MA. Early screening of hypertensive patients for MA and prompt treatment of positive cases may help reduce the burden of chronic kidney disease and cardiovascular disease in the community.

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