Original Article

Prevalence of Microalbuminuria and its Correlation to Target Organ Damage in Patients with Essential Hypertension

A. Aher*, P. Bhole**

ABSTRACT

The aim of the study was to determine the prevalence and relation between urinary albumin excretion (UAE) and target organ damage (Left ventricular hypertrophy (LVH), retinopathy and stroke) in patients with essential Hypertension. We evaluated 120 patients of essential hypertension (HT), prevalence of UAE, and its correlation to target organ damage (TOD) were determined. UAE was assessed according to albumin creatinine ratio (ACR) and microalbuminuria (MA) was defined as albumin excretion between 30 300 mg/g. The overall prevalence of MA in our study was found to be 57.7 %. Target organ damage in the form of LVH, retinopathy and stroke was present in 75 (62.5 %) patients, out of which 59 (78.66%) patients had MA. This difference was found to be highly significant. MA was found to be more prevalent in patients with longer duration and greater severity of HT, increased body mass index (BMI) and dyslipidaemia.

Key Words : microalbuminuria, essential hypertension

Introduction -

High blood pressure is a major public health problem in India and its prevalence is rapidly increasing among both urban and rural populations.[1,2] The prevalence of HT ranges from 20-40% in urban adults and 12-17% among rural adults. The number of people with HT is projected to increase from 118 million in 2000 to 214 million in 2005, with nearly equal numbers of men and women.[3] Because of the heightened risk, the recommended targets are lower for all Indians i.e. <130/85 and <120/80 for those with diabetes or heart failure.[4,5]

HT produces proteinuria and a significant reduction in renal function in 5-15% patients. Several epidemiological studies have shown that protienuria as well as MA are independent predictors of cardiovascular (CV) morbidity and mortality[6]. MA is 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 20-200 mg/L.[7,8]

Many patients of HT present with subclinical or overt TOD.[9] Increased UAE has been reported to be a strong predictor of cardiovascular events in hypertensive patients. Increased UAE in these patients has been interpreted to be a marker of early intrarenal vascular endothelial dysfunction.[10] Several factors can affect the prevalence of microalbuminuria in hypertension including age, sex, race, severity of disease and concomitant risk factors.[11,12]

Although several studies have been published regarding correlation of MA and CV risk factors, very few studies have been conducted till now depicting correlation of MA and TOD in patients with essential hypertension.

In this background this study was performed. The purpose of this study was to evaluate the prevalence of MA in patients with essential HT and its relation with target organ damage.

Materials and Methods -

This cross sectional cohort study was conducted between Nov. 2009 to Nov. 2011. Known hypertensive patients (taking regular, irregular or no treatment) as well as newly detected patients of HT

*Assistant Professor, ** Resident,
Department of Medicine, GMC, Nagpur

Address for Correspondence -
Dr. Archana Aher
E-mail : drarchana_aher@rediffmail.com

were included in the study. Patients with diabetes, kidney disease, pregnant females, and patients with urinary tract infection were excluded from the study. Total 120 patients (65 males, 55 females) were included in the study. Detail history regarding duration of HT, cardiovascular symptoms (angina, palpitation, dyspnoea, and claudication), neurological symptoms (TIA, seizures, previous stroke) & visual symptoms (blurring or dimness) were recorded. Physical examination with special emphasis on neurological status, CV status and optic fundus were recorded in all patients. In addition to routine investigations, work up for secondary HT was performed wherever indicated and if patients were found to have secondary HT, they were excluded from the study. Fasting lipid profile, ECG, X-ray chest, CT head (wherever indicated), 2D Echo and albumin creatinine ratio were performed in every patient.

MA was assessed by urine albumin creatinine ratio (ACR) based on recommendations of the National Kidney Foundation and American Diabetic Association. Urine albumin was assessed by turbidimetry. 5 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 value between 30-300 mg/g was taken as MA.

Patient's consent of participation in the study was obtained & clearance was also taken from institutional ethic committee.

Statistical Analysis -

Relationship between MA and other variables was determined according to the chi square test. Multiple logistic regression analysis was performed to identify the independent predictors of microalbuminuria.

Observations -

In our study total prevalence of MA in the included 120 patients was found to be 57.5%. Mean age of cases was 53.52 ± 12.56. MA was found more prevalent in patients > 60 yrs of age than < 60 yrs of age (73.33% vs 48%, p value = 0.03). Out of 120 patients 65 were males (out of which 41.53% had MA) and 55 were females (out of which 76.36% had MA). This difference in the risk for MA between 2 sex groups was found to be statistically significant. Advancing age and increasing duration of HT were found to be associated with increased prevalence of MA.

Increased severity of HT (with stage 2 patients having high prevalence of MA), presence of dyslipidaemia and obesity was found to be significantly associated with increased prevalence of MA. ***(See Table 1)***

TABLE 1 : Correlation of cardiovascular risk factors and MA

Risk factor		Total no. of patients	With MA	Without MA	P value
Age	<60	75	36	39	p = 0.03
	>60	45	33	12	
Gender	Male	65	27	38	p =0.0000
	Female	55	42	13	
Blood Pressure (mm hg)	Normal	21	0	21	p =0.0000
	Stage 1	66	45	21	
	Stage 2	33	24	9	
Lipid Profile	No dyslipidaemia	100	53	47	p = 0.0258
	Dyslipidaemia	20	16	4	
BMI	Normal BMI	81	40	41	p = 0.0264
	Obese	39	29	10	

The prevalence of MA among hypertensives was found to be more with the increasing duration of HT ***(See Table 2).***

High prevalence of microalbuminuria was observed in patients taking either irregular or no treatment as compared to patients on regular treatment, which was statistically significant. ***(See Table 3)***

Statistically significant correlation was observed between MA & Target organ damage in the form of Stroke, retinopathy & LVH) P=0.0072, 0.0041, 0.0000 ***(See Table 4)***

TABLE 2 : Microalbuminuria in relation to the duration of hypertension

Duration of Hypertension	No of Cases [n=120] [%]	MA Present [n= 69] [%]	
Unknown Duration	04 [3.33%]	02 [50%]	$\chi^2 = 16.6902$
Newly Detected	64 [53.33%]	44 [68.75%]	p = 0.0 0,HS
<5 years	34 [28.33%]	10 [29.41%]	Chi square for linear trend
5-10 years	16 [13.33%]	11 [68.75%]	$\chi^2 = 9.233$,
>10 years	02 [1.66%]	02 [100%]	p = 0.0023 HS

TABLE 3 : Microalbuminuria in HTN among different treatment groups

Treatment Details	No. of Cases [n=120] [%]	MA Present [n=69] [%]	
Regular Treatment	46 [38.33%]	18 [39.13%]	÷²=10.4050,
No Treatment	44 [36.66%]	31 [70.45%]	P=0.006,HS
Irregular Treatment	30 [25%]	20 [66.66%]	

TABLE 4 : Microalbuminuria in relation to various target organ damage [TOD]

TOD	No of cases n = 120 [%]	MA n = 69 [%]	p value
STROKE	13 [10.83%]	12 [92.30%]	0.0072[HS]
RETINOPATHY	51 [42.5%]	37 [72.54%]	0.0041[HS]
LVH	35 [29.16%]	33 [94.28%]	0.0000[HS]

When multiple logistic regression analysis was applied, retinopathy, LVH, stroke and dyslipidaemia were found to be independent predictors of MA.

Discussion -

MA has been considered to be a marker of CV risk in diabetic individuals as well as nondiabetic individuals.[13,14] The importance of increased UAE levels in essential HT was unclear[15] till now, however several studies pointed out the importance of MA as a risk factor for renal and CV diseases as well as other TOD (retinopathy, stroke) in patients of HT. It was proved that MA was related not only to BP levels and LVH but also to several risk factors such as hyperinsulinemia, dyslipidaemia and obesity which comprises a cluster of metabolic abnormalities.[16,17,18]

The overall prevalence of MA was found to be 57.7% in our study as compared to other studies[9]. MA was found to be associated with increasing age, increased duration and severity of HT, obesity and dyslipidaemia. These findings are consistent with the data reported by other studies also[18,19,20,21]. MA had been reported to be three times more prevalent in patients with recent stroke and the risk for future stroke had been found to be higher among patients with MA [22,23]. MA was found to be more prevalent among patients with stroke in the present study as well. Significant association between retinopathy (with higher grades of retinopathy having high

prevalence of MA) and LVH was observed in our study as observed in the study done by Hitha et al[9]. The prevalence of LVH in our cohorts was 29.16%, out of which 94.28% had MA, which implies higher risk of CV events in the hypertensive patients. This suggests that the early effect of blood pressure on target organ damage such as kidneys and heart occur in parallel[24]. The presence of MA has been understood to be a renal manifestation of generalized increased endothelial dysfunction[15]. Our study showed increased association between high levels of blood pressure and MA, which is comparable to Gubbio Population Study[25] in contrast to some other studies,[15] however other risk factors for development of MA are found to be same in these studies as well like increased BMI and hypercholesterolemia. On the basis of this the hypothesis is reasonable that a continuity of relationship exists between CV risk factors and the process from early to ultimate renal damage[15(11)]. The main finding of the study is that CV risk factors amenable to prevention and control (regular treatment of hypertension, dyslipidaemia and obesity) are independent correlates of MA in hypertensive patients. Higher prevalence of MA was seen in hypertensive patients with stroke, retinopathy and LVH. This means that patients with essential HT and MA have high odds for the development of TOD. In our study longer duration of HT, increased levels of BP, advanced age, increased BMI, and dyslipidaemia were found to be associated with increased prevalence of MA.

On the basis of this it can be inferred that control of risk factors amenable to prevention (regular treatment of HT, weight control, normal lipid levels) may have a favourable effect in preventing, delaying and lessening MA.

It can also be concluded that MA in hypertensive subjects seems to be a very important test to be considered in the evaluation of target organ damage.

References :

1. Gupta R, Guptha S. Strategies for initial management of hypertension. Indian J Med Res. Nov 2010; 132 (5) : 531-542.
2. Gupta R, al-Odat NA, Gupta VP. Hypertension epidemiology in India : meta-analysis of 50 year prevalence rates and blood pressure trends. J Hum Hypertens. Jul 1996; 10 (7) : 465-472.
3. Reddy KS. Regional case studies India. Nestle Nutr Workshop Ser Pediatr Program. 2009; 63 : 15-24; discussion 41-16, 259-268.
4. Enas EA, Singh V, Gupta R, Patel R, et al. Recommendations of the Second Indo-US Health Summit for the prevention and control of cardiovascular disease among Asian Indians. Indian heart journal. 2009; 61 : 265-74.
5. Enas EA, Singh V, Munjal YP, Bhandari S, Yadave RD, Manchanda SC. Reducing the burden of coronary artery disease in India : challenges and opportunities. Indian Heart J. Mar-Apr 2008; 60 (2) : 161-175.
6. Bigazzi R, Bianchi S, Campese VM, Baldari G. Prevalence of microalbuminuria in a large population of patients with mild to moderate hypertention. Nephron1992; 61 : 94-97
7. Redrigo Tagle, Monica Acevedo, Donald G. Vidt, Microalbuminuria : Is it a valid predictor of cardiovascular risk? Cleveland Clinic Journal of medicine 2003; 70 : 255-262
8. Bhuwnesh Agrawal, Alexandra Berger, Klaus Wolf & Friedrick c. Luft, Microalbuminuria screening by reagent strip predicts cardiovascular risk in hypertension. J Hypertens 1996 ; 14 : 223-228
9. B Hitha, JM Pappachan et al, Microalbuminuria in patients with essential hypertension and its relationship to target organ damage : An Indian experience; The Saudi Journal of Kidney Diseases and Transplantation, 2008/vol: 19/ Issue: 3/ 411:419.
10. Cerasola G, Cottone S, Mule G, Nardi E, Mangano MT, Andronico G, Contorno A, Li Vecchi M, Galione P, Renda F, Piazza G, Volpe V, Lisi A, Ferrara L, Panepinto N & Riccobene R (1996). Microalbuminuria, renal dysfunction and cardiovascular complication in essential hypertension. Journal of Hypertension, 14 : 915-920.
11. Microalbuminuria in hypertension : Palatini P. Curr Hypertens Resp. 2003 Jun; 5 (3) : 208-14
12. Mogensen CE. Systemic blood pressure and glomerular leakage with particular reference to diabetes and hypertension. Journal of Internal Medicine, 1994, 235: 297-316.
13. Mogensen CE. Microalbuminuria predicts clinical proteinuria and early mortality in maturity onset diabetes. New England Journal of Medicine, 1984, 310 : 356-360.

14. Deckert T, Koford-Enevoldsen A, Norgaard K, Borch-Johnsen K, Feldt-Rassmussen B & Jensen T. Microalbuminuria. Implications for micro- and macrovascular disease. Diabetes Care, 1992, 15 : 1181-1191
15. F. L. Plavnik, M.A.M.R.T. Silva, N.E.B. Kohlmann, O. Kohlmann Jr., A. B. Ribeiro and M. T. Zanellats Relationship between microalbuminuria and cardiac structural changes in mild hypertensive 1992; 61 : 94-97
16. Redon J, Liao Y, Lozano JV, Miralles A, Pascual JM & Cooper RS. Ambulatory blood pressure and microalbuminuria in essential hypertension : role of circadian variability. Journal of Hypertension, 1994, 12 : 947-953.
17. Redon J, Miralles A, Pascual JM, Baldo E, Robles RG & Carmena R). Hyperinsulinemia as a determinant of microalbuminuria in essential hypertension. Journal of Hypertension, 1997, 15 : 79-86.
18. Palatini P, Graniero GR, Canali C, Santonastaso M, Mos L, Piccolo D, D'Este D, Berton G, Zanata G & De Venuto G). Relationship between albumin excretion rate, ambulatory blood pressure and left ventricular hypertrophy in mild hypertension. Journal of Hypertension, 1995 13 : 1796-1800.
19. Rayner B. Importance of modulating the renin-angiotensin system in preventing renal complications of hypertension. Saudi J Kidney Dis Transpl 2006; 17 : 469-80.
20. Hebert LA, Spetie DN, Keane WF. The urgent call of albuminuria/proteinuria. Heeding its significance in early detection of kidney disease. Postgrad Med 2001; 110 : 79-82, 87-8, 93-6.
21. Cirillo M, Senigalliesi L, Laurenzi M, et al. Microalbuminuria in nondiabetic adults : relation of blood pressure, body mass index, plasma cholesterol levels, and smoking : The Gubbio Population Study. Arch Intern Med 1998; 158 : 1933-9.
22. Beamer NB, Coull BM, Clark WM, Wynn M. Microalbuminuria in ischemic stroke. Arch Neurol 1999; 56 : 699-702.
23. Wachtell K, Ibsen H, Olsen MH, et al. Albuminuria and cardiovascular risk in hypertensive patients with left ventricular hypertrophy : the LIFE study. Ann Intern Med 2003; 139 : 901-06.
24. Bulatov VA, Stenehjem A & Os I. Left ventricular mass assessed by electrocardiography and albumin excretion rate as a continuum in untreated essential hypertension. Journal of Hypertension, 2001, 19 : 1473-1478.
25. Cirillo M, Senigalliesi L, Laurenzi M, et al Microalbuminuria in nondiabetic adults : relation of blood pressure, body mass index, plasma cholesterol levels, and smoking : The Gubbio Population Study. Arch Intern Med 1998; 158 : 1933-9.