

ASSESSMENT OF MICROALBUMINURIA IN ESSENTIAL HYPERTENSIVES AND ITS RESPONSE TO ANGIOTENSIN-CONVERTING ENZYME INHIBITOR THERAPYPREETI SHARMA^{1*}, PRADEEP KUMAR¹, RACHNA SHARMA², TRIPATHI GK³, GAURAV GUPTA¹¹Department of Biochemistry, Santosh Medical College & Hospital, Ghaziabad, Uttar Pradesh, India. ²Department of Biochemistry, TSM Medical College and Hospital, Lucknow, Uttar Pradesh, India. ³Department of Medicine, Hind medical College and Hospital, Ghaziabad, Uttar Pradesh, India. Email: prcdri2003@yahoo.co.in

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ABSTRACT

Objective: Objective is to study the prevalence of microalbuminuria among patients suffering from essential hypertension and also to evaluate the response of microalbuminuria to angiotensin-converting enzyme (ACE) inhibitors therapy.

Methods: The study conducted at Santosh Medical College and Hospital, Ghaziabad, on 300 patients with essential hypertension. After attaining baseline parameters in all patients, those newly diagnosed essential hypertensives with microalbuminuria not on any treatment were started on an ACE inhibitor (ramipril), for 8 weeks, after which all parameters were reassessed and comparison and statistical analysis were done to establish the prevalence of microalbuminuria and its response to therapy.

Results: In our study, mean microalbuminuria excretion was 101.79 mcg/mg creatinine at the beginning of the study and 80.20 mcg/mg creatinine after 8 weeks of ACE inhibitor therapy, with 21.2% fall rate.

Conclusion: Microalbuminuria is an independent risk factor for the development or worsening of hypertensive nephropathy and endothelial dysfunction, thereby increasing the risk of micro- and macro-vascular complications.

Keywords: Microalbuminuria, Essential hypertension, Angiotensin-converting enzyme inhibitor therapy.

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INTRODUCTION

Microalbuminuria is very well-known marker of cardiovascular disorders [1] while its prognostic significance as marker is still controversial. The prevalence rate of microalbuminuria among hypertensives is reported from 4.7% to 46% [2]. According to national kidney foundation, microalbuminuria is defined as urine albumin excretion rate of approximately 30-300 mg/day in at least three consecutive samples of nonketotic sterile urine [3]. It is now clearly demonstrated that microalbuminuria is a risk factor for the development of clinical proteinuria and decline of renal functions in hypertension [4]. Based on pooling results from clinical trials, efficacy of different classes of antihypertensive agents suggests essentially equivalent blood pressure (BP)-lowering effect [5]. However, angiotensin-converting enzyme (ACE) inhibitors have a particularly useful role in treating patients with chronic kidney diseases because they diminish proteinuria and stabilize renal functions [6]. There is recent evidence that ACE inhibitors reduce the incidence of diabetes in patients with high cardiovascular risk [7]. ACEs decrease intraglomerular pressure and proteinuria and may retard the rate of progression of renal insufficiency among both diabetics and nondiabetics [8]. There is evidence that a significant reduction in urinary albumin excretion (UAE) rate after 4-8 weeks of treatment with ACE inhibitors, in comparison to other treatment groups [5]. Hence, it becomes necessary to quantitatively study the renoprotective effect of ACE inhibitors among hypertensives. With this background, our objective is to study the prevalence of microalbuminuria among patients suffering from essential hypertension and also to evaluate the response of microalbuminuria to ACE inhibitors therapy.

METHODS

The study conducted at Santosh Medical College and Hospital, Ghaziabad, on patients who attended the medical outpatient department/inpatient

department of Santosh Hospital. A total of 300 patients with essential hypertension were chosen for the study. The study was conducted in a time span of 1 year in 2014-15.

Inclusion criteria

Newly diagnosed hypertensives/not on any drug treatment having diastolic BP consistently over 90 mmHg on two or more successive visits to the outpatient clinic and/or systolic BP over 140 mm Hg on two or more successive visits to the outpatient clinic. Patients having UAE at the commencement of ACE inhibitor therapy between 30 and 300 mcg/mg creatinine and patients on no any hypertensive therapy in the past were included in the study.

Exclusion criteria

Patients suffering from secondary hypertension or having frank proteinuria or patients with clinical or laboratory evidence of hepatic, renal, thyroid, or any other major illness such as diabetes mellitus were not included in the study. Patients receiving nephrotoxic drugs (nonsteroidal anti-inflammatory drug, aminoglycosides), patients with deranged serum creatinine value or females on oral contraceptive pills were excluded from the study.

All patients were subjected to general medical and physical examination, fasting blood sugar, blood urea, serum creatinine, and creatinine clearance estimation. Haemoglobin, total leukocyte count, differential leukocyte count, erythrocytes sedimentation rate, serum Na⁺ and K⁺, and Urine analysis including urine sugar, urine protein, microalbuminuria, urine microscopic examination for pus cells, red blood cells, casts, etc., were also investigated of all the participants.

After attaining baseline parameters in all patients, those newly diagnosed essential hypertensives with microalbuminuria not on any

treatment were started on an ACE inhibitor (ramipril), beginning from 2.5 mg OD to 10 mg OD (dosage individualized to maintain target BP of <140 mmHg) for 8 weeks, after which all parameters were reassessed, and comparison and statistical analysis were done to establish the prevalence of microalbuminuria and its response to therapy.

Following methods were used for measuring aforesaid parameters:

- Microalbumin - Immunoturbidimetric method [9]
- Urinary creatinine estimation - Jaffe's method [10]
- Fasting blood sugar - Glucose oxidase-peroxidase method [11]
- Urine sugar - Dipstick method [12]
- Blood urea - Glutamate dehydrogenase-urease method [13]
- Na⁺/K⁺ - Ion selective electrode method with help of electrolyte analyzer [14]

OBSERVATION AND RESULTS

The study was conducted on 300 newly diagnosed patients of essential hypertension including 130 females and 170 males. Patients were in the age group of 41-60 years. 165 patients were having microalbuminuria <30 mcg/mg creatinine, 83 patients had microalbumin 30-300 mcg/mg creatinine, >300 mcg/mg creatinine level was observed in 52 patients.

Hence, the prevalence of microalbuminuria among essential hypertensives was found to be 27.7% in our study. Out of these, 43 (30.8%) were males and remaining 40 (30.8%) patients were females. These patients were given ramipril and reevaluated after 8 weeks (Table 1).

Our study showed a significant reduction in BP (p<0.001) and microalbuminuria (p<0.001) as a consequence of ACE inhibitor therapy (Table 2).

DISCUSSION

Microalbuminuria is one of the leading causes of mortality and morbidity all through the globe. In India, its prevalence lies between 17% and 21%. The study was conducted to assess the prevalence of microalbuminuria among the patients suffering from essential hypertension and to study the role and renoprotective action of ACE inhibitors in reducing microalbuminuria over 8 weeks of therapy. In our finding, the prevalence of microalbuminuria was 27.7% out of 300%. Palatini reported the prevalence of only 6% in 2005 [15] while Sabharwal *et al.* in 2008 reported the 33.3% prevalence among 174 patients [16]. Pontremoli *et al.* reported 8% prevalence in their study [17]. Maharjan *et al.* in 2012 reported the prevalence of 17.7% [18]. The study done

by Kim *et al.* in 2013 found the microalbuminuria prevalence of 14.1% among 40,473 patients in the Republic of Korea [19]. In our study, 25.3% of male hypertensive patients and 30.8% of female patients were albuminuric with maximum age group between 41 and 50 years. In the study done by Hunse *et al.*, 10 out of 24 (41.7%) patients in the age group 50-59 years had microalbuminuria [20]. In our study, mean microalbuminuria excretion was 101.79 mcg/mg creatinine at the beginning of the study and 80.20 mcg/mg creatinine after 8 weeks of ACE inhibitor therapy, with 21.2% fall rate. The study conducted by Jalal *et al.* in 2001, microalbumin level was 79.30 mcg/mg creatinine at the beginning and 73.96 mcg/mg creatinine after 8 weeks showing a fall of 6.7% [21]. Abate *et al.* in 1995 noted the disappearance of microalbuminuria in 65% patients, reduction in 17.5%, and no change in 17.5% with a 6 months follow-up period [22].

Thus, results from our study are in conjunction with those from other studies, using similar or different drugs and prolonged treatment duration.

CONCLUSION

From the outcome of our and several other studies, it can be concluded that microalbuminuria is an independent risk factor for the development or worsening of hypertensive nephropathy and endothelial dysfunction, thereby increasing the risk of micro- and macro-vascular complications. Drug acting on renin-angiotensin-aldosterone helps in reduction of UAE apart from their BP-lowering action.

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Table 1: Frequency of microalbumin among essential hypertensive patients

Microalbumin (mcg/mg creatinine)	Frequency (%)
<30	165 (55)
30-300	83 (27.7)
>300(up to frank proteinuria)	52 (17.3)

Table 2: Microalbumin and BP levels among microalbuminuric patients after ACE inhibitor therapy

Parameters	Mean±SD	SD mean error	p value
SBP (0 weeks)	162.18±18.11	2.07	<0.001
SBP (8 weeks)	136.89±10.46	1.10	
DBP (0 weeks)	97.47±9.74	1.11	<0.001
DBP (8 weeks)	84.89±5.8	0.66	
Microalbumin (0 weeks)	101.79±67.82	7.78	<0.001
Microalbumin (8 weeks)	80.20±54.47	6.26	

DBP: Diastolic blood pressure, SBP: Systolic blood pressure, SD: Standard deviation, ACE: Angiotensin-converting enzyme

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