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MICROALBUMINURIA – PREVALENCE & CORRELATION WITH TARGET ORGAN DAMAGE IN NON-DIABETIC HYPERTENSIVE POPULATION

KEY WORDS: Microalbuminuria, Target organ damage, Non-diabetic hypertensive population.

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ABSTRACT

Background: The detection of microalbuminuria by Spot Urinary Albumin: Creatinine Ratio (ACR) is an easy and cost-effective test. Though microalbuminuria is an approved marker of endothelial dysfunction in diabetes, its role has been poorly studied in non-diabetic population. The present study aims to establish the predictive role of microalbuminuria in the detection of target organ damage and hence its role in risk stratification in a non-diabetic hypertensive population.

Material and Methods: 288 patients fulfilling inclusion and exclusion criteria were enrolled in the study over a period of 2 years. Details of socio-demographic data, clinical variables and biochemical parameters were collected using a semi-structured proforma specifically designed for this study. Relevant clinical tests were done and data thus collected was tabulated and analysed using SPSS.

Conclusion: There is a significant prevalence of microalbuminuria in a non-diabetic hypertensive population. It has a strong positive predictive value to detect target organ damage.

Introduction:

Hypertension is an important health problem in the developed countries and is showing an upward trend in developing countries also. [1] It is a common, often asymptomatic but readily detectable condition. When left untreated it leads to accelerated atherosclerosis and target organ damage involving the heart, brain, eyes, kidneys and the peripheral blood vessels.

Routine measurements of blood pressure at out patient department is mandatory as majority of the patients are asymptomatic at presentation. The right arm blood pressure in reclining position using a sphygmomanometer is considered standard for screening purposes. [2]

As mentioned above, untreated hypertension can lead to numerous long term and lethal complications. Target organ damage can occur in form of cardiomegaly (left ventricular hypertrophy), Coronary heart disease, cerebrovascular accident, retinopathy, nephropathy and peripheral vascular disease. Hence, screening, early detection and prompt treatment is vital to ensure prevention of target organ damage. [3] Large screening programs and information regarding hypertension may be the most important factor in reduction of mortality over the past 2 decades.

Extensive studies in Hypertension – HOPE study being the largest and the most well known have revolutionized our knowledge of hypertension. MICRO-HOPE study the renal implications of hypertension. More and more studies are being undertaken to study early markers or predictors of disease severity in hypertension.

The traditional belief that all adult onset hypertension is idiopathic [4] i.e. essential in nature is fast fading with advanced imaging modalities and more sensitive endocrine immunoassays. Moreover, the relation between target organ damage and hypertension is stronger with secondary causes of hypertension and maybe refractory to conventional therapy. Hence the need to risk stratify the newly diagnosed cases of hypertension cannot be over-emphasised.

Microalbuminuria is defined as a urinary albumin excretion greater than 30mg/day but less than 300mg/day. Microalbuminuria was originally defined as presence of albumin in the urine which is undetectable on conventional dipstick method. With the availability of "Micro Stix", the definition is now based on quantity of albumin excreted in the urine per day.

The spot urinary albumin: creatinine ratio (ACR) is an easy, cost-effective method to detect microalbuminuria. The spot nature of the test makes it socially acceptable as compared to the cumbersome 24hour urinary albumin estimation which is more reliable. Hence, for screening purposes, the spot test is recommended and approved worldwide. Microalbuminuria has been an approved marker of endothelial dysfunction and also an independent prognostic predictor of cardiovascular mortality among the diabetic population. [5-8] In diabetes, microalbuminuria is a sensitive test for early detection of nephropathy and facilitates early treatment of the same. Many studies have also reported positive correlations between microalbuminuria and severity of cardiovascular, [8] cerebrovascular disease in diabetic patient. However, studies related to role of microalbuminuria in non-diabetic population are sparse.

Hence, we propose to do a study to determine the prevalence of microalbuminuria in non-diabetic hypertensive patients to see if it correlates with the target organ damage such as cardiomegaly, ischemic heart disease, cerebrovascular disease and biochemical parameters like lipid profile.

Materials and Methods
Study type:

It is a Cross-sectional study. The study sample comprised 288 non-diabetic hypertensive patients enrolled over a period of 2 years.

Selection criteria:
1. hypertensive patients without diabetes irrespective of duration
2. no proteinuria on conventional dipsticks
3. normal urine examination
4. after excluding other causes of proteinuria i.e. congestive cardiac failure, renal diseases, etc.

Ethical consent:

Ethics committee approval was obtained before proceeding with this study. The study was carried out as per the tenets of the 1964 declaration of Helsinki. Participation was voluntary and no incentives were provided. Informed consent was taken from the patients before their inclusion in the study and they were assured of the confidentiality of their answers.

Methods:

Details of socio-demographic data, clinical variables and biochemical parameters were collected using a semi-structured proforma specifically designed for this study. Relevant clinical tests

to detect target organ damage viz. Electrocardiogram, echocardiogram, fundoscopy, urine ACR were done and data thus collected was tabulated and analysed using SPSS.

Statistical analysis:

The final data was analysed using Chi-Square test and Regression analysis methods. Value of 'p' less than 0.05 by chi-square test and value of "R' more than 0.4 by regression analysis was considered significant.

Results

The prevalence of microalbuminuria in 102 out of the 288 patients studied with similar trends noted in both genders.

Table 1. Population and Gender distribution of microalbuminuria

|	Total patients		Male		Female	
	No	%	No	%	No	%
Microalbuminuria	102	35.42%	68	36.17%	34	33.33%
Normoalbuminuric	186	64.52	120	63.83%	66	35.48
Total	288	100	188	100	100	100

Table 2 reveals presence of microalbuminuria in 42 patients of obesity.

Table 2. Correlation between Microalbuminuria and BMI (Body Mass Index)

BMI				
	<25	25-30	>30	Total
Microalbuminuria	30	42	30	102
Normoalbuminuric	97	74	15	186

There is increased incidence of microalbuminuria among hypertensive population suffering from Target organ damage. The distribution with different target organ damage is summarised in Chart 1.

Chart 1 : Correlation of Microalbuminuria with Target organ damage
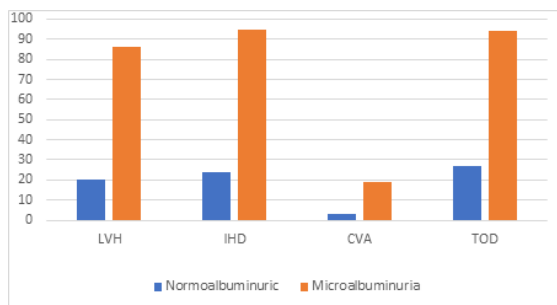
There is a strong correlation between Cholesterol levels and microalbuminuria as tabulated in Table 3.

Table 3. Correlation between Microalbuminuria and Lipid Profile

Lipid Profile (Mean Values)	Microalbuminuria	Normoalbuminuric	'R' value	Regression analysis 'R' value > 0.4
a. Cholesterol	208.25	157.92	0.430	Significant
b. Triglycerides	155	113.58	0.269	Non-significant
c. HDL	40.21	42.98	0.216	Non-significant
d. LDL	118	84.81	0.435	Significant

Discussion

Before we start the discussion, few aspects of this study need to be clarified. This study is a cross sectional study, hence the severity or control of hypertension over a period of time cannot be assessed.

Most studies regarding microalbuminuria ae done in western countries. In comparison to the study of microalbuminuria in diabetes mellitus, the studies in hypertension are very small in number as well as population size of the study.[9-10] Moreover, the general awareness and concern about diabetes is extremely large as compared to hypertension in the population.

The MAGIC study studies microalbuminuria with coronary disease and retinopathy only. There are only isolated studies involving microalbuminuria and target organ damage in non-diabetic population. Available studies have shown association between microalbuminuria and target organ damage.[10-11] Hence, we made comparisons with results of these studies to our present study.

In our study (as noted in Table 1), the prevalence of Microalbuminuria was 35.42% which correlated with the Indian study done by Jalal et al[12]. No other Indian study in similar form was identified. The prevalence was found higher than that in the MAGIC[13] study. This highlights the probable delay in the diagnosis and institution of treatment for an asymptomatic disease like hypertension in the sub-continent.

The study also noted an increase in the prevalence of microalbuminuria with increased duration of hypertension. This correlates with the African American study of kidney disease and hypertension.[14] Also, the albuminuria quantitatively showed a significant increase with increasing duration of hypertension ('R' value > 0.4)

Statistically significant relation between Obesity and Prevalence of microalbuminuria was noted in the study (table 2). This correlates with the Gubbio population study.[15] The Indian study by Jalal et al[12] had revealed a positive though statistically insignificant relation. Obesity is associated with hyperinsulinemia which contributes of endothelial dysfunction and is the postulated hypothesis for the increase in incidence of microalbuminuria.

Correlation between target organ damage and microalbuminuria (table 3) was found significant. The relation was strongest with cardiovascular disease and inconclusive for retinopathy due to limited sample size. This correlates with Bigazzi et al[16] as well as the MAGIC study.[13] Redon et al found that patients with albuminuria had a larger left ventricular mass and a higher degree of LVH.[17] The Framingham eye study had recorded a prevalence of 0.8% of retinopathy in a non-diabetic population. However, relation with microalbuminuria has not been studied. Though both patients of retinopathy in the present study had microalbuminuria, statistical analysis was not possible due to the small sample size.

Results of the study as tabulated in table 4 also suggest a positive correlation with parameters of the lipid profile. Jalal et al[12] had noted that in non-diabetic population,[18] Microalbuminuria predicted derangement of cholesterol primarily as opposed to diabetic population, where triglycerides are more predictive of microalbuminuria. Similar trend was noted in the present study.

Conclusions:

1. The prevalence of microalbuminuria in non-diabetic hypertensive population is 35.42%, higher than the international estimates but corelating well with other Indian studies.
2. There was a statistically significant relation between obesity (BMI> 25) and the prevalence of microalbuminuria.
3. Presence of microalbuminuria has a significant correlation with following target organ damage:

a. Left ventricular hypertrophy
b. ischemic heart disease
c. cerebrovascular accident

However, relation to retinopathy could not be established due to small sample size and presence of only 2 patients with retinopathy.

4. There was a significant correlation between microalbuminuria and dyslipidaemia.

Based on the findings of the present study, we can conclude that the Predictive value of microalbuminuria in detecting target organ damage is 92.15%, while, the predictive value of a negative test is 85.48%. Microalbuminuria being an easy test can be an effective tool not only for early detection of target organ damage but also for risk stratification of hypertensive population especially at the time of diagnosis. This can help in appropriate allocation of healthcare resources in evaluation of secondary causes of hypertension as well as evaluation of target organ damage in a non-diabetic hypertensive population.

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