

The Association of Microalbuminuria With Components of Metabolic Syndrome, in North Indian Population: A Hospital Based Study



Medical Science

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ABSTRACT

Introduction - Metabolic syndrome (MetS) is a major public-health problem worldwide. The aim of the study was to explore the association of microalbuminuria and metabolic syndrome.

Material & method: The present study was conducted at Department of Biochemistry, Subharti Medical College & Hospital. Metabolic syndrome was diagnosed by the IDF 2005 criteria. A total of 88 consecutive cases of metabolic syndrome were selected for the study. A corresponding number of age & sex matched volunteers were selected as controls. Other than the routine parameters & those pertaining to the diagnosis of metabolic syndrome, microalbumin & creatinine were estimated in all urine samples. Microalbuminuria was defined as urine albumin- creatinine ratio of 30 to 300mg/g.

Results: Urinary albumin creatinine ratio (UACR) was significantly higher in cases as compared to control ($p < 0.002$). We observed that 22.7% of case subjects had microalbuminuria, whereas 4.5% of control subjects had microalbuminuria. All components of metabolic syndrome were associated with increased risk of microalbuminuria, the strongest association being with high blood pressure.

Conclusion: Microalbuminuria being an independent predictor for cardio-vascular and renal injury, routine screening for microalbuminuria, as additional criteria for metabolic syndrome, should be considered, to further fine tune the interpretation of metabolic syndrome.

INTRODUCTION

Metabolic syndrome (MetS) is a major public-health problem worldwide. It is defined as constellation of an interconnected physiological, biochemical, clinical, and metabolic factors that directly increases the risk of atherosclerosis^{1, 2}.

Worldwide prevalence of MetS ranges from <10% to as much as 84%, depending on the region, urban or rural environment, composition (sex, age, race, and ethnicity) of the population studied, and the definition of the syndrome used^{3, 4}.

Recent studies using Indian specific criteria for overweight (BMI > 23), obesity (BMI > 25), and abdominal obesity (WC > 90 cm in men and > 80 cm in women) have found that prevalence rates among Asian Indians exceeding those in the US population⁵.

Microalbuminuria is an early marker of chronic kidney disease (CKD)⁶ and vascular dysfunction⁷ and is associated with a higher risk of renal function loss,⁶ cardiovascular events^{6,8} and all-cause mortality⁸.

Microalbuminuria is relatively common in patients with metabolic disorders, such as T2DM⁹ and has been incorporated into the definition of the metabolic syndrome of the World Health Organization¹⁰.

Microalbuminuria is currently defined as a urinary albumin excretion (UAE) of 30 to 300 mg/24 hours, (24-hour urine collection) or as urinary albumin excretion rate (AER) of 20 to 200 $\mu\text{g}/\text{min}$, if measured in a timed urine collection, or of 30 to 300 mg/g, if measured with the use of the urinary albumin:creatinine ratio (ACR) in a spot urine collection¹¹. The ACR is a more convenient test for patients and may be less prone to errors due to improper collection methods¹².

Microalbuminuria measurement is a good screening test for early detection of renal disease, and may be a marker for

the presence of microvascular disease in general¹³.

As there were only few studies available relating microalbuminuria and metabolic syndrome on Indian population, we proposed to study the association of microalbuminuria with metabolic syndrome and its components.

MATERIAL AND METHODS

This was a hospital based prospective type, case control study conducted in the department of biochemistry Subharti Medical College, Meerut after obtaining ethical clearance from the institutional ethical clearance committee. Informed consents were taken from every subject before including in the study. A total of 100 patients who fulfill the criteria of metabolic syndrome proposed by IDF 2005, within the age group of 16 to 65 years, attending the specialty OPD for metabolic syndrome in Subharti medical college and 100 age and sex matched control subjects were included in the study. Those patients having abnormal urea and creatinine values, acute and chronic nephritis, severe uncontrolled hypertension, diabetic ketoacidosis, congestive cardiac failure, pregnancy, fever, severe exercise and psychological stress and any other chronic disease were excluded from the study.

Anthropometric measurement

Weight was recorded in Kilogram by an electronic weighing machine. Height was recorded in centimeters using a height scale. Abdominal girth was measured using a measuring tape in centimeters.

Urine sample collection

Spot morning urine samples were collected and stored at -20°C . Urinary Microalbumin was estimated using ELISA kit (DRG Pvt Ltd, USA) on ELISA reader (Readwell touch, Robonek Pvt Ltd India).

Other parameters

Fasting Plasma Glucose (FPG), serum TG and HDL-C were

processed in Vitros-250 auto analyzer using readymade dry chemistry kits procured from Ortho-Clinical Diagnostics, Johnson & Johnson, USA.

Statistics

The data was analyzed using Excel 2007, R2.8.0 Statistical Package for the Social Sciences (SPSS) for windows version 16.0 (SPSS Inc; Chicago, IL,USA). The data of the groups of metabolic syndrome (case) and non-metabolic syndrome (control) were expressed as mean \pm SD. Multiple logistic regression analyses was performed to study the association of microalbuminuria with the metabolic syndrome and its components.

RESULT AND OBSERVATIONS

The present study was conducted on 88 subjects who fulfilled criteria of Metabolic Syndrome, as defined by the International Diabetic federation in 2005. Randomly selected age and sex matched control group of 88 subjects were chosen from the healthy subjects who did not satisfy the criteria of Metabolic Syndrome (MetS) and were included as study controls.

Biochemical parameters of the individuals in the present study are given in the Table 1.

Mean HDL cholesterol levels decreased and the mean levels of the rest of the parameters increased in subjects with metabolic syndrome and were statistically significant.

Table 1- Biochemical parameters of case and control

Bio-chemical parameters	Case		Control		Total		P – value
	Mean	Sd (range)	Mean	Sd (range)	Mean	Sd (range)	
Micro Alb(μ g/ml)	30.7	(0.7-285)	5.2	(0.6-53.6)	17.9	(0.6-285)	<0.001
Creat (mg/dl)	124.3	(11.4-332)	117.1	(1.6-357)	120.7	(1.6-357)	0.550
Uacr (mg/g)	29.6	(0.3-268)	6.2	(0.3-62.9)	17.9	(0.3-268)	<0.002
Fastingtg (mg/dl)	177.6	\pm 67.5	104.9	\pm 35.5	141.2	\pm 65	<0.001
Hdl-c (mg/dl)	42.2	\pm 7.4	48.6	\pm 9.1	45.4	\pm 8.8	<0.001
Fbs (mg/dl)	110	\pm 50.1	82.5	\pm 10.8	96.2	\pm 38.7	<0.001

In our study, we have assessed the components of metabolic syndrome using both the BMI and WC. The correlation coefficient value between UACR and BMI ($r=0.201$, $p=0.060$) versus UACR and waist circumference ($r=0.332$, $p=0.002$.) suggests the good influence of waist circumference on UACR (Table 2). Our study indicates statistically significant positive correlation coefficient between WC and other parameters such as weight($r=0.731$), systolic blood pressure ($r=0.460$), diastolic blood pressure ($r=0.386$), microalbumin ($r=0.437$), UACR($r=0.332$), blood glucose (F) ($r=0.262$) Though positive correlation coefficient was found between some of the variables and BMI, only systolic blood pressure value($r=0.228$) was statistically significant. (Table 2)

Table 2 - Correlation coefficient between variables BMI & WC with metabolic syndrome components

Variables	BMI		WC	
	r value	P value	r value	P value
AGE	-.031	.773	.174	.106
WT	.561*	.000	.731**	.000
HT	-.513	.000	.194	.071
BP Systolic	.228*	.033	.460**	.000
BP Diastolic	.108	.317	.386**	.000
MICRO-ALB	-.177	.099	.437**	.000
CREAT	-.101	.349	.136	.206
UACR	.201	.060	.332**	.002
FAST-TG	-.085	.432	.101	.348
HDL-C	.152	.156	-.044	.969
FBS	.025	.818	.262**	.014

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

DISCUSSION

The present study is a cross sectional, observational or case control, hospital based study to find out any possible relation between metabolic syndrome and urinary excretion of microalbuminuria in north Indian population of Meerut in the age group of 16-65 years using IDF criteria. The mean age of the total study population was 38.4 ± 10.4 . The mean (\pm SD) age of the metabolic Syndrome group was 38.1 ± 10.3 and majority (43%) of the subjects belonged to age group of 36-45 years. Many of the studies reported maximum number of metabolic syndrome patients in age groups around this ranges 14-16. But there are also some studies which have shown that metabolic syndrome increases significantly with age 17-19.

Percentage of metabolic syndrome patients were almost two times higher in the older age group (50-55 and older) when compared to younger age groups.^{20,21} Such findings were not seen in the present study, as it was a hospital based case control study with a small sample size.

It was also observed in the present study that metabolic syndrome patients were more prevalent in females (52.2%) and than males (47.72%). Many of the studies worldwide and in Indian subcontinent have reported higher prevalence of metabolic syndrome in women^{14,17,18, 21-23}.

In our study the average mean of albumin-to-creatinine ratio, waist circumference, BMI, systolic and diastolic BP, fasting glucose level, and triglyceride level were significantly higher in metS with p value <0.001. Similar findings were reported by Walvekar S. et al²⁴.

The prevalence of microalbuminuria in the present study was 13.6% comparable to the findings of Jiang et al²⁵ and Hao Z. et al²⁶. In the present study 22.7% of cases ($n=88$) had microalbuminuria (21.7% females and 23.8% males) and 4.5% of control subjects had microalbuminuria (6.5% females & 2.4% male) comparable to the findings of Hyun Lee et al²⁷.

In our study the prevalence of microalbuminuria was five times higher in cases than in control. Sheng et al²⁸ reported prevalence of microalbuminuria was two times higher in metabolic syndrome in Chinese population.

Our finding on the association between microalbuminuria and the metabolic syndrome is in line with the results of the recently published study by Palaniappan L et al²⁹.

This suggests that the observed association between MetS and microalbuminuria is true. However, as most of these studies were cross sectional in nature, larger prospective studies would be needed to confirm the positive association between MetS and microalbuminuria.

CONCLUSIONS:

It is observed that microalbuminuria is much more prevalent in persons with the metabolic syndrome, mainly attributable to high diastolic blood pressure and high fasting triglyceride. Microalbuminuria is currently an indication of interventions, such as blood pressure lowering, even in the absence of hypertension or diabetes. However, the metabolic syndrome is still considered as a controversial and ambiguous phenomenon and by and large inadequately managed. One of the important implications of our study is that we probably should consider to screen microalbuminuria in persons with prehypertension or prediabetes, such as the blood pressure and glucose components of the metabolic syndrome, and to identify those at high cardiovascular risk.

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