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Research Article

STUDY OF SERUM URIC ACID LEVELS IN PATIENTS DIAGNOSED WITH METABOLIC SYNDROME IN A HOSPITAL-BASED STUDY IN WEST BENGAL

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ABSTRACT

Objective: The occurrence of hyperuricemia is growing even in developing countries. It has been known to be associated with metabolic syndrome (MetS). MetS is a bunch of numerous metabolic disorders including reduced high-density lipoprotein cholesterol (HDL-C), hypertension, hyperglycemia, abdominal obesity, and raised triglyceride level in serum.

Methods: The present work was done in the Department of Biochemistry in combination with Medicine Department, SRIMS and Sanaka Hospital, Durgapur, WB, India. A total of 50 diagnosed MetS patients were selected for further studies and same number (50) of healthy volunteers controls without MetS were selected. Diagnosis of MetS was done according to the National Cholesterol Education Program Adult Treatment Panel-III.

Results: In our study, the level of serum uric acid (SUA) is high in MetS patients (7.8 mg/dL) compared to control group (4.6 mg/dL). The compared between two groups was statistically significant ($p<0.000$).

Conclusion: Our study showed that the components of MetS are increased with rise in the concentrations of SUA.

Keywords: Serum uric acid, Diabetes mellitus, Hypertension, Metabolic syndrome, National Cholesterol Education Program Adult Treatment Panel-III.

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INTRODUCTION

Rise in blood pressure (BP), abdominal obesity, and insulin resistance (IR), these all are collection of signs and symptoms of metabolic syndrome (MetS). MetS patients are also associated with rise risk of chronic kidney disease (CKD), type 2 diabetes mellitus (DM), and cardiovascular disease (CVD) is a significant reason of mortality [1]. MetS patients have three times more chance to suffer from stroke or heart attack and two times more chance to die [2]. Hence, MetS patients should be diagnosed as early as possible and is desirable as lifestyle interventions and enough treatment of causative factors related with MetS can protect from CVD. Earlier research found that the rise in waist circumference (WC) was a dependable 1st step in detecting persons with MetS and it is very easy method to perform [3].

In the recent years, the incidence of hyperuricemia has increasing and also increasing in developing countries [4]. Hyperuricemia takes place due to unusually rise in the level of blood serum uric acid (SUA). Various studies have advised that hyperuricemia is related with MetS. Hyperuricemia occurs due to a number of causes such as alcohol intake, hypothyroidism, IR, obesity, CKD, and drugs like (cyclosporine and diuretics) [5]. Incidence of hyperuricemia is classified into 3 functional types, raised formation of uric acid, reduced excretion of uric acid, or mixed type. Rise in secretion of uric acid is due to high levels of purine in the diet which causes rise in purine metabolism. Drugs, kidney disease and competition for excretion among uric acid and other molecules are the causes for decreased excretion of uric acid [5]. In this research, SUA levels were studied in the patients of MetS in a tertiary care center of West Bengal.

Aims and objectives

1. MetS and control subjects are identified
2. Measurement of WC, diastolic and systolic BP in control and MetS patients
3. Analysis of fasting blood sugar (FBS), lipid profile, SUA in MetS patients and control subjects.

METHODS

The research has been conducted from May 2024 to September 2024.

Study area

Present work was done in the Department of Biochemistry in combination with Medicine Department, SRIMS and Sanaka Hospital, Durgapur, WB, India.

MetS was diagnosed according to the National Cholesterol Education Program Adult Treatment Panel-III (NCEP ATP-III) criteria

If any 3 of the following risk factors are present [6].

- Fasting blood glucose >110 mg/dL
- Central obesity, WC >102 cm in men and 88 cm in women
- Serum triglyceride (TG) >150 mg/dL, high-density lipoprotein (HDL) cholesterol <40 mg/dL in men and <50 mg/dL in women
- Taking any antihypertensive drugs or BP >130/85 mmHg.

Study population

A total of 50 diagnosed MetS patients were selected for further studies and same number 50 of healthy volunteer's controls without MetS were selected.

Participants who are involved in the study, informed consent has been taken from them.

Inclusion criteria

- Diagnosed MetS patients (NCEP ATP-III criteria) above 35 years of age.

Exclusion criteria

1. Patients who are already taking medications for hyperuricemia
2. Patients suffering from any febrile illness
3. Pregnant women
4. Subjects consuming alcohol more than twice a week

5. Patients of CKD
6. Hypothyroidism
7. Critically ill patients.

WC measurement was done through tape in a horizontal plane, center among the inferior margin of the ribs and the superior border of the iliac crest [7].

Uric acid normal values are 2.4–6.0 mg/dL in female and 3.4–6.9 mg/dL in male [5].

Ethical approval

Institutional ethics committee has approved the study.

Sample collection

MetS patient and control subjects were asked to report in fasting state. A trained laboratory technician was recruited for collection of blood samples. For the collection of blood samples, venipuncture was done through antecubital vein. 5 mL of blood sample was collected. Serum was allowed to separate and consequently, various tests were done. Glucose oxidase and peroxidase method are used to measure FBS, Glycerol-oxidase peroxidase method is used to measure TG, and enzymatic assay method for HDL-C, SUA is measured by Caraway's method.

Statistical analysis

Statistical examinations were done with the help of Statistical Package for the Social Sciences 23 version software. The result was compared between controls and cases. The association among serum uric and different components of MetS (FBS, systolic blood pressure [SBP], diastolic blood pressure [DBP], WC, HDL-C, and TG) was used done by student's t-test. At 95% confidence intervals, p<0.05 was taken as significant.

RESULTS

In this study, total number of patients was 100 (100%). Among that 50 (50%) were having MetS as cases and 50 (50%) were healthy persons as controls. In this study, we tried to evaluate SUA levels among various components (FBS, SBP, DBP, WC, HDL-C, and TG) of MetS.

Table 1 and Fig. 1 shows that mean FBS for control subjects is 66.04±5.90 mg/dL and for MetS patients is 142.06±55.09 mg/dL. The comparison between two groups was statistically significant (p<0.000). Mean TG for control subjects is 113.07±27.09 mg/dL and for MetS patients is 251.07±110.17 mg/dL. The comparison between two groups was statistically significant (p<0.000). Mean HDL-C for control subjects is 53.19±5.81 mg/dL and for MetS patients is 36.50±13.50 mg/dL. The comparison between two groups was statistically significant (p<0.000).

Mean WC for control subjects is 79.41±3.88 cm and for MetS patients is 102.05±7.5 cm. The comparison between two groups was statistically significant (p<0.000).

Mean SBP for control subjects is 111.88±5.76 mmHg and for MetS patients is 146.93±20.89 mmHg. The comparison between two groups was statistically significant (p<0.000).

Mean DBP for control subjects is 75.06±5.55 mmHg and for MetS patients is 94.0±9.70 mmHg. The comparison between two groups was statistically significant (p<0.000).

Table 2 and Fig. 2 shows that mean SUA for control subjects is 4.6 mg/dL and for MetS patients is 7.8 mg/dL. The comparison between two groups was statistically significant (p<0.000).

DISCUSSION

One of the very complex disorders in rising clinical challenge is MetS. This research was done because the information will help the physician, so that physician will make treatment plans for managing MetS patients, screening type 2 DM risk, and CVD risk and consequently improving in the diagnosis of disease.

The present work was done in the Department of Biochemistry in combination with Medicine department of, SRIMS and Sanaka Hospital, Durgapur, WB, India. A total of 50 diagnosed MetS patients (according to NCEP ATP-III criteria) were selected for further studies and same number (50) of healthy volunteers controls without MetS were selected.

Table 1: Relationship among different components of MetS and healthy control

Parameters	Control	Case	p-value
FBS (mg/dL)	66.04±5.90	142.06±55.09	<0.000
TG (mg/dL)	113.07±27.09	251.07±110.17	<0.000
HDL (mg/dL)	53.19±5.81	36.50±13.50	<0.000
WC (cm)	79.41±3.88	102.05±7.5	<0.000
SBP (mmHg)	111.88±5.76	146.93±20.89	<0.000
DBP (mmHg)	75.06±5.55	94.0±9.70	<0.000

FBS: Fasting blood sugar, TG: Triglyceride, HDL-C: High-density lipoprotein cholesterol, WC: Waist circumference, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, *P*<0.05 is considered significant

Table 2: Mean serum uric acid level in MetS patients and controls groups

S. Uric acid	Group	Mean	p-value
	Case	7.8 mg/dL	<0.001
	Control	4.6 mg/dL	

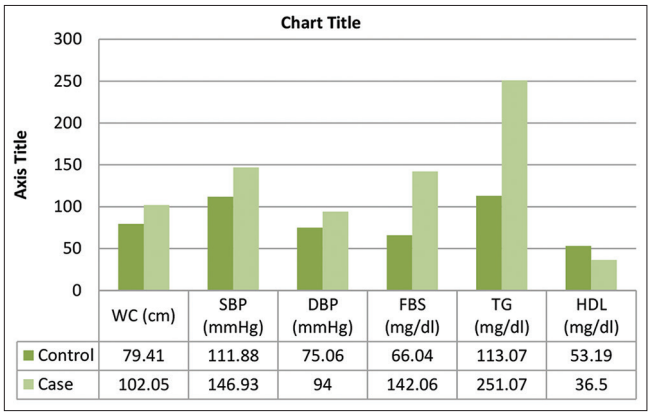

Fig. 1: Bar diagram showing relationship among different components of metabolic syndrome and healthy control

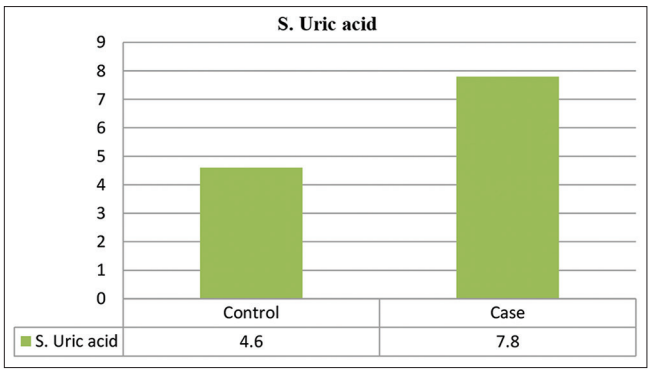

Fig. 2: Bar diagram showing result of serum uric acid between metabolic syndrome and healthy control

In our study, the mean FBS (142.06±55.09) was considerably elevated in MetS patients while differentiate among control group (66.04±5.90) (p<0.000). Becker and Jolly (2006) [8], and Yoo *et al*. (2005) [8] found that hyperglycemia was a significant risk factor for hyperuricemia. Nakanishi *et al*., 2003 [11] study of 3681 Japanese adult and found rise of SUA concentration in males which raised the risk of type 2 diabetes. Yoo *et al* study reported that increase level of uric was positively associated with hyperglycemia. IR can be the linking among them [9].

The mean TG (251.07±110.17) was considerably elevated in MetS patients while differentiate among control group (113.07±27.09) (p<0.000). The mean HDL-C (36.50±13.50) was considerably decreased in MetS patients while differentiate among control group (53.19±5.81) (p<0.000). Nakagawa *et al*., 2006 [8]; Conen *et al*., 2004 [8]; Schachter, 2005, [8] studies have found that hyperuricemia is associated with components of MetS, such as dyslipidemia, hypertension, obesity, and hyperglycemia [9].

In our study, the mean WC (102.05±7.5) was considerably elevated in MetS patients while differentiate among control group (79.41±3.88) (p<0.000). One of the main components of MetS is obesity. A study done by Matsuura *et al*. (1998) [8] and Bonora *et al*. (1996) [8] found that central body fat distribution and obesity were associated with hyperuricemia [9].

The mean SBP (146.93±20.89) was considerably elevated in MetS patients while differentiate among control group (111.88±5.76) (p<0.000); similarly, the mean DBP (94.0±9.70) was considerably elevated in MetS patients while differentiate among control group (75.06±5.55) (p<0.000). Schachter *et al*. [8] study has been recommended the value of SUA can play a chief role in the pathogenesis of hypertension in the early onset [9].

The mean SUA (7.8 mg/dL) was considerably elevated in MetS patients while differentiate among control group (4.6 mg/dL) (p<0.000). The present study looks over the association among MetS and SUA in common peoples. Although, in general adult, limited studies have recognized the information about the link of SUA with MetS. In this research, a positive association between SUA with MetS and its components in general adults was found. In this study, there is a rising trend in the levels of individual components of MetS across the SUA quartiles. Our studies have consistent with the findings reported in Iranian 17, European, Japanese 30, 31, Chinese 19, and United States population [10]. In human cohort epidemiological studies, several study confirmed a positive association between SUA and the prevalence of MetS. Although, it is still debated whether raised in SUA level is a risk factor or only a biomarker in the development and progression of MetS. [11].

A very important evidence is that SUA as a causative factors of MetS was found in the investigational survey done by Nakagawa *et al*. in fructose-fed rat model (animal model of MetS) that found a decrease in SUA levels by allopurinol (inhibitor of xanthine oxidase) reversed the feature of MetS [4].

CONCLUSION

Our study showed that the components of MetS are increased with rise in the concentrations of SUA. In our study, SUA was significantly associated among the occurrence of MetS and components of MetS. Hence, early diagnosis of MetS may be helpful for the prevention of hyperuricemia.

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CONFLICTS OF INTEREST

No conflict of interest.

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