ISSN 2394–806X (Print), ISSN 2454-5139 (Electronic)
IJHRMLP, Vol: 03 No: 02 July, 2017
Printed in India

ORIGINAL PAPER

Correlations between Levels of Serum Uric Acid and Parameters of the Metabolic Syndrome

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***Received** on November 12, 2016; **editorial approval** on January 24, 2017*

ABSTRACT

***Introduction**: The metabolic syndrome is a growing general public health problem all around the world. Component of metabolic syndrome including diabetes, hypertension, dyslipidemia, and obesity are closely associated with risk factors defined for cardiovascular diseases. Serum uric acid level has been suggested to be associated with factors that contribute to the metabolic syndrome. This study was aimed at finding correlations between levels of serum uric acid and parameters of the metabolic syndrome among health care workers. **Materials and methods**: The participants (60 male, 52 female) were health care workers (doctors, sisters, paramedical staff, and 4th grade workers). Participants were evaluated with relevant history, clinical examination and laboratory investigations. **Results**: In this study, prevalence of metabolic syndrome was 28.58% (26.67% in male and 30.77% in female). Out of 112 cases 30.30% of doctors, 29.63% of nurses, 30% of paramedical staff and 25% of forth grade workers had metabolic syndrome. Prevalence of hyperuricemia in male group was 25% and in female it was 15.38% (overall 20.54%) out of which 24.24% of doctors, 11.11% of nurses, 30% of paramedical staff and 18.75% of IV-Grade workers. Waist circumference was found to be significantly associated with serum uric acid among doctors (<0.05) and nurses (<0.001). Systolic blood pressure was found to be significantly associated with serum uric acid among nurses (<0.01) and paramedical staff (<0.001). **Conclusion**: All the parameters of Metabolic Syndrome except Serum HDL were found to be significantly correlated with level of serum uric acid level as a whole among the study population.*

***Keywords:** Heath care workers, Hyperuricemia, Waist circumference*

INTRODUCTION

The metabolic syndrome is a growing public health problem all around the world. Component of metabolic syndrome including diabetes, hypertension, dyslipidemia, and obesity are closely associated with risk factors defined for cardiovascular diseases. Serum uric acid level has been suggested to be associated with factors that contribute to the metabolic syndrome. Determination of Uric acid level could be of great importance, especially in populations, such is population of Vojvodina, where 58.5 % of citizens are overweight and obese. Possible explanation for the association between higher waist circumference and hyperuricemia is generated from the evidence of independent correlation between uric acid and leptin levels, which could be a pathogenic factor responsible for uric acid level increase in obese patients. Available data indicate that the prevalence of the metabolic syndrome in Indians varies according to region, extent of urbanization, lifestyle patterns, and socioeconomic/cultural factors. Recent data showed that about one-third of the urban population in large cities in India have metabolic syndrome. Overall, the prevalence of the metabolic syndrome in migrant Indians in UK varies from 20 to 32%. The prevalence of the metabolic syndrome in migrant Indians is higher than in many other ethnic groups. Surveys in large cities in different parts of the country suggest that about one-third of the urban population in large cities in India have metabolic syndrome. Data from North India show that 66% of men and 88% of women, classified as "non obese" on the basis of the international cut-off of body mass index (BMI), cardiovascular risk factors. The term "**metabolic syndrome**" was used in 1977 by **Herman Haller** who was studying the risk factors associated with atherosclerosis. The need to precisely define metabolic syndrome stems from the need to detect accurately individuals at high risk for CVD and

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type 2 diabetes mellitus. The three components of atherogenic dyslipidemia (increased low-density lipoprotein (LDL), decreased HDL-C and high blood triglyceride concentrations) are individually associated with a cardiovascular risk, while insulin resistance significantly increases the risk of developing type 2 diabetes mellitus, although approximately 25% of insulin resistant patients have normal glucose tolerance. The association between uric acid and the Metabolic Syndrome is uncontested, but the cross-sectional nature of these studies makes it difficult to ascertain if Uric acid has a causal role in Metabolic Syndrome or is a mere consequence. Sui[1] noted higher rate of incident Metabolic Syndrome with increasing Uric acid categories, reporting men in the upper third of Uric acid levels as having 60% higher odds of developing Metabolic Syndrome which supports data obtained from both Korean and Chinese populations.

Aims and objectives: (1) To observe the serum uric acid level among the study population. (2) To find of the prevalence of metabolic syndrome among the study population (3) To correlate serum uric acid level with the components of metabolic syndrome as determined according to the criteria of the **AHA/NHLBI** (Correlation of serum uric acid with waist circumference, blood pressure, fasting blood sugar, serum triglyceride, serum HDL).

Materials and methods: Place of study: Gauhati Medical College and Hospital, Guwahati (from 1st July 2015 to 30th June 2016). **Source of data:** The participants were health care workers (doctors, sisters, paramedical staff, and 4th grade workers). **Type of study:** Observational Study**. Sample size**: 112 (60male, 52female) **inclusion criteria:** Health Care Workers of GMCH, Doctors, nurses, paramedical-staff and Forth Grade workers taken randomly, who volunteered. **Exclusion criteria:** Known case of cardiovascular disease (History of coronary artery disease & myocardial infarction), Acute infectious disease, Psoriasis, recurrent attacks of gout, Progressive malignancy under chemotherapy, Persons taking drugs like diuretic and uric acid lowering agent, Known case renal insufficiency with decreased eGFR. **Clinical examination:** Height, weight, waist circumference, blood pressure were measured with standard protocols. **Weight Measurement**: Participants were weighed in kilograms using **a digital weight scale.** Weight was measured in the early morning with empty stomach.

Height Measurement: This stature measurement is collected on all subjects. Standing height is measured using a stadiometer with a fixed vertical backboard and an adjustable head piece.

Waist circumference Measurement: Waist circumference was determined using a nonstretchable tape. Took the measurement to the nearest 0.1 cm at the end of the SPs normal expiration.

Blood pressure Measurement: (i) Blood pressure was measured twice to the nearest 2 mmHg by a mercury totally closed desk-top sphygmomanometer. (ii) Preparation for measurement: Before the blood pressure measurement begins, subjects were asked to abstain from eating, drinking (anything else than water), smoking and taking drugs that affect the blood pressure one hour before measurement. (iii) Position of the arm: The measurements were made on the right arm whenever possible, with subject's arm resting on the desk so that the antecubital fossa is at the level of the heart and palm is facing up. (iv) Cuff should encircle 80 percent or more of the patient's arm circumference. 11. Mercury column should be deflated at 2 mm per second. (v) Number of measurements: Three measurements were taken one minute apart. (vi) Position: Three positions measurements were done (supine, sitting and standing). The average value of these two measuring points for systolic and diastolic blood pressure was recorded.

Investigations: Fasting lipid profile, Fasting blood sugar, Serum uric acid, Serum Creatinine. Metabolic Syndrome was defined by (AHA/NHLBI any 3 of 5 features) [1.East Asian and South Asians Men ≥ 90 cm Women 80 cm and Japanese Men ≥ 85 cm Women ≥ 90 cm. 2. Triglyceride ≥ 150 mg/dl or on drug therapy for high triglycerides. 3. HDL Men <40 mg/dl, Women <50 mg/dl or on drug therapy for low HDL. 4. Blood pressure Systolic ≥ 130 mmHg and/ or Diastolic ≥ 85 mmHg or on drug therapy for hypertension. 5. Fasting glucosee ≥ 100 mg/dl or on drug therapy for elevated glucose ≥ 100 mg/dl (includes diabetes. Hyperuricemia is defined as ≥7mg/dL for men and ≥ 6.0mg/dl for women.

Statistical analysis: Statistical analysis was done wherever applicable. Simple observations were expressed as percentage. P-values were calculated using "GRAPHPAD INSTAT" software where two variables were to be looked for any significant association. P-value was obtained either using Chi-square test or Fisher's exact test, depending upon the sample size. A p-value < 0.05 was considered to be significant statistically.

RESULTS AND OBSERVATION

Distributions of cases are shown in **Table 1**.

Table 1 Showing Distribution of Participants According to Occupation

OCCUPATION	NUMBER	PREVALENCE
DOCTOR	33	29.46%
NURSE	27	24.11%
PARAMEDICAL STAFF	20	17.86%
FOURTH GRADE WORKER	32	28.57%
TOTAL	**112**	**100%**

The prevalence of increased waist circumference was highest among nurses. Prevalence of systolic BP 130mmHg or above was highest among doctors, whereas, prevalence of diastolic BP 85 mmHg or above was highest among paramedical staff. The prevalence of fasting blood sugar (100mg/dl or above) was highest among fourth grade workers.

The prevalence of serum triglyceride (150mg/dl or above) was highest among paramedical staff; protective cholesterol HDL {<40 mg/dl(male) or <50mg/dl(female)} was lowest among nurses as shown in **Table 2.**

Table 2 Prevalence of different parameters of Metabolic Syndrome Vs. Occupation

Occupation	Waist circumference>90cm (male)>80cm(female)	Systolic BP 130mmHg or above	Diastolic BP 85mmHg or above	FBS(100mg/ dl or above)	TG(150m g/dl or above)	HDL<40 mg/dl(mal e)<50mg/dl(female)
Doctors	27.27%	63.63%	33.33%	27.27%	30.30%	63.33%
Nurses	29.63%	51.85%	29.63%	14.81%	18.52%	70.37%
Paramedical Staff	25%	60%	45%	25%	45%	45%
Grade IV	25%	53.13%	21.88%	31.25%	28.13%	50%

DISCUSSION

In this study, prevalence of metabolic syndrome was 28.58% (26.67% in male & 30.77% in female). *D. S. Prasad*[2] in their study found women (52.2 %) had significantly higher rates of metabolic syndrome compared to men (34.2 %). In contrast, *Chow*[3] found a prevalence of metabolic syndrome of 26.9% in males and 18.4% in females in southern India. 30.30% of doctors, 29.63% of nurses, 30% of paramedical staff and 25% of fourth grade workers had metabolic syndrome.

In our study, prevalence of hyperuricemia in male was 25% and in female it was 15.38% (overall 20.54%). 24.24% of doctors, 11.11% of nurses, 30% of paramedical staff and 18.75% of forth grade workers had hyperuricemia. In the study by *Bandana sachdev*[4] prevalence of hyperuricemia in male was 14.4 % and in female it was 12.8% (overall 13.5%).

Among the participants waist circumference was found to be significantly associated with serum uric acid among doctors ($p<0.05$) and nurses ($p<0.001$). *Bandana sachdev* in her cross-sectional health examination survey too found hyperuricemia to be significantly associated with waist circumference. *JiHyon Lim et al*[5] in their study also found SUA levels were significantly and positively correlated with waist circumference.

Systolic blood pressure was found to be significantly associated with serum uric acid among nurses ($p<0.01$) and paramedical staff ($p<0.001$). *Dana Stefana Popescu et al*[6] in their study found SUA levels were significantly and positively correlated with systolic blood pressure. Diastolic blood pressure was found to be significantly associated with serum uric acid among doctors ($p<0.01$), nurses ($p<0.01$) and paramedical staff ($p<0.001$). *JiHyon Lim et al* found SUA levels were not significantly correlated with diastolic blood pressure. *Bandana sachdev* found hyperuricemia is significantly associated with diastolic blood pressure.

Fasting blood sugar was found to be significantly associated with serum uric acid among paramedical staff ($p<0.001$) and fourth grade workers ($p<0.001$). *Bandana sachdev* too reached similar conclusion.

Serum triglyceride level was found to be significantly associated with serum uric acid among nurses ($p<0.05$). *Yongqiang Li et al*[7] found serum uric acid levels were significantly and positively associated with serum triglyceride level. *Gladys Soans et al*[8] in their study found an increased uric acid level with increasing triglycerides. *Conen et al*[9]; *Schachter* and *Bandana sachdev* showed the same results.

Serum HDL was found to be significantly associated with serum uric acid among paramedical staff ($p<0.05$). Serum uric acid levels were significantly and negatively correlated with HDL-C in males, but not in females. *Sara Nejatinamini1 et al*[10] *in* their study, had found significant relationship of serum uric acid with low HDL level.

CONCLUSION

All the parameters of Metabolic Syndrome except Serum HDL were found to be significantly correlated with level of serum uric acid level as a whole among the study population. Among the professional subgroups, waist circumference was found to be significantly correlated with serum uric acid among doctors and nurses, systolic blood pressure was found to be significantly correlated among nurses and paramedical staff, diastolic blood pressure was found to be significantly correlated among doctors, nurses and paramedical staff, fasting blood sugar was found to be significantly correlated among paramedical staff and fourth grade workers, serum triglyceride level was found to be significantly correlated among nurses and serum HDL level was found to be significantly correlated with serum uric acid among paramedical staff and fourth grade workers. At multicentre, large number of subjects to be followed up for a long duration to get conclusive results.

Conflict of interest: None declared.

Ethical clearance: Taken.

Source of Funding: None.

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