

ASSOCIATION OF SERUM URIC ACID WITH OBESITY

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ABSTRACT

Objective: To observe any significant association between Serum Uric Acid and Obesity.

Material and Method: Hundred obese subjects above 40 years of age were randomly selected for the study. Subjects having any other illness were not included in the study. Hundred non-obese subjects were taken as control subjects.

Results: We observed that Serum Uric Acid was higher in both male and female obese subjects. Hence there is a positive association between Serum uric Acid and Obesity ($p < 0.05$).

Conclusion: Our study showed a significant association between Obesity and Serum Uric Acid ($p < 0.05$)

Key words: Serum Uric Acid, Obesity, Body Mass Index.

INTRODUCTION

Obesity is almost invariable in developing countries and almost all people accumulate some fat as they get older.¹ Many conditions and complications are associated with obesity. These include hypertension², breathlessness, ischemic heart disease³, coronary endothelial dysfunction⁴, stroke, diabetes mellitus (Type 2), hyperlipidemia, menstrual abnormalities, increased cancer risk^{3,5}, heart failure, psychological disturbances⁶, osteoarthritis of knees and hips, varicose veins, hiatus hernia, gallstones, postoperative problems, back strain, accident proneness, obstructive sleep apnoea¹, hypertonicity of body fluids⁷, risk of adverse pregnancy outcomes⁸ and abnormal reproductive hormone levels in women.⁹

Obesity can most easily be assessed in terms of height and weight. The method of estimating obesity is the body mass index (BMI).

BMI is calculated as follows.

$$BMI = \frac{\text{Body weight (Kg)}}{(\text{Height})^2 (\text{meters})}$$

The normal range of BMI is 20 to 25 Kg/m². The person having BMI 25-40 is said to have mild to moderate obesity and BMI over 40 is gross obesity. Generally obesity is taken to start at a BMI of 30. The BMI from 25.0 to 29.9 is overweight¹⁰

Uric acid is the end product of purine metabolism in humans. Humans convert the major purine nucleosides, adenosine and guanosine to uric acid via intermediates. Adenosine is first deaminated to inosine by adenosine deaminase. Phosphorolysis of the N-glycosidic bonds of inosine and guanosine catalysed by purine nucleoside phosphorylase, release ribose-1-phosphate and a purine base. Hypoxanthine and guanine next form xanthine in reaction catalysed by xanthine oxidase and guanase respectively. Xanthine is then oxidized to uric acid in the subsequent reaction catalysed by xanthine oxidase.¹¹ Normal value of serum uric acid is 3.4-7.0 mg/dl (202-416 μmol/L) in males and 2.4-5.7 mg/dl (142-339 μmol/L) in females.^{12, 13.}

Hyperuricemia can cause acute and chronic gout and urate renal stone formation¹⁴. It has been seen that hyperuricemia is commonly

SERUM URIC ACID LEVEL AND BODY MASS INDEX IN OBESE SUBJECTS

	Male		Female		Both sexes	
	Mean	Range	Mean	Range	Mean	Range
Body Mass Index	38.252 ± 5.098	49.781-30.103 = 19.678	39.095 ± 5.865	50.085-32.109 = 17.976	38.708 ± 5.543	30.103-50.085
Serum Uric Acid	6.023 ± 1.653	10.8-4.3 = 6.5	5.257 ± 0.935	9.6-3.8 = 5.8	5.604 ± 1.012	3.8-10.8

Table 1

associated with obesity, hypertriglyceridemia, diabetes mellitus, development and progression of coronary artery disease^{15,16} and hypertension¹⁷. As these diseases are also commonly associated with obesity¹, so need arises to see whether there is any independent association between Serum Uric Acid and Obesity. The objective of our study was to observe any significant association between Serum Uric Acid and Obesity.

MATERIAL AND METHODS

Hundred obese subjects (having Body Mass Index > 30) were selected from local population of people working/ residing in or around University of Peshawar for the study. Fifty subjects were male and 50 were female. The selection was on a simple random manner (every element in the population having equal opportunity of being included). All the subjects were above 40 years of age. Subjects suffering from other illnesses like Hypertension, Diabetes Mellitus, Ischemic heart disease and dyslipidemia were excluded from study. One hundred non-obese subjects (having Body Mass Index <25) were taken as control subjects from the same population, also in simple random manner, having similar age and sex as obese group. Fasting levels of Serum Uric Acid and Body Mass Index were measured.

Serum uric acid was measured by Enzymatic Colorimetric Method. The instrument was set up according to program. The filter used

was 520 nm (490-550 nm). Test tubes were set according to the specifications of the instrument. The contents of test tubes were mixed well and placed in incubator for 5 minutes at 37° C. The absorbance (A) was measured at 520 nm against the reagent blank. Standard Curve was prepared. Calculations were done as follows:

Uric Acid (mg/dL) = (Absorbance of Unknown/ Absorbance of standard) x concentration of standard

$$= \text{mg/dL} \times 59.485$$

$$= \text{mmol/L}$$

Data was statistically analyzed by Student T test. *p* value less than 0.05 was considered significant.

RESULTS

Serum Uric Acid level and Body Mass Index in obese subjects is given in table 1 and in non-obese (control) subjects is given in table 2.

As can be seen from table 1 and table 2, Serum Uric Acid was higher in both male and female obese subjects.

DISCUSSION

Many conditions and complications are associated with obesity. ¹Hyperuricemia is one of these conditions. Our study showed a positive association between Obesity and Serum Uric Acid (*p*<0.05). The results of our study are comparable

SERUM URIC ACID LEVEL AND BODY MASS INDEX IN NON-OBESE (CONTROL) SUBJECTS

	Male		Female		Both sexes	
	Mean	Range	Mean	Range	Mean	Range
Body Mass Index	23.908 ± 3.782	24.873-19.065 = 5.808	24.236 ± 3.907	24.908-19.547 = 5.361	24.153 ± 4.014	19.065-4.908
Serum Uric Acid	4.862 ± 0.905	7.4-3.8 = 3.6	3.913 ± 0.673	6.0-2.9 = 3.1	4.397 ± 0.826	2.9-7.4

Table 2

STANDARD ERROR OF MEAN AND t VALUE

	Male	Female	Both sexes
Body Mass Index (Obese group)	S.E.= 0.721	S.E.= 0.829	S.E.= 0.554
Serum Uric Acid (Obese group)	S.E.= 0.234 t= 4.357 p= < 0.05	S.E.= 0.321 t= 8.335 p= < 0.05	S.E.= 0.101 t= 2.945 p= < 0.05
Body Mass Index (Non-Obese group)	S.E.= 0.535	S.E.= 0.553	S.E.= 0.401
Serum Uric Acid (Non-Obese group)	S.E.= 0.128	S.E.= 0.095	S.E.= 0.083

Table 3

in most respects to many other related works. Santi MJ et al¹⁸ observed that Serum Uric Acid levels are elevated in overweight and obese males ($p < 0.001$). Ran XW et al¹⁹ also observed significant positive association between Obesity and Serum Uric Acid in male subjects.

Serum Uric Acid is not only associated with obesity but it is also positively and significantly associated with many other clinical conditions e.g. diabetes mellitus, hypertension and ischemic heart disease²⁰. Although these conditions are also associated with obesity but Serum Uric Acid is independently associated with all these conditions.²⁰ So it can be inferred that obese patients, who are also hyperuricemic, suffer more commonly from diabetes mellitus, hypertension and ischemic heart disease as compared to patients who are obese but not hyperuricemic. Increased levels of Serum Uric Acid also increases morbidity and mortality in these patients.^{21,22}

It is recommended that Serum Uric Acid should be routinely measured in all obese and overweight patients in order to prevent or at least delay complications due to raised Serum Uric Acid. Serum Uric Acid is also a reliable indicator for the "pre-metabolic syndrome" in obese patients.²³

Mechanism by which how Serum Uric Acid is increased in obese patients is not known but it has been observed that uric acid is a significant determinant factor of changes in body mass index, and serum uric acid concentrations predict subsequent weight gain.²⁴. So it is possible that increased levels of Serum Uric Acid may be a cause of weight gain rather than result of it, at least in some cases. More work needs to be done in this regard in order to establish the mechanism of the association between Obesity and Serum Uric Acid.

CONCLUSION

As is clear from table 1, 2 and 3, there is a significant association between Obesity and

Serum Uric Acid. As the obesity increases beyond 30 Kg/m², serum uric acid level also increases as compared to control (non-obese) group. This positive association is observed in both female and male groups. Hence, there is increased risk for all the diseases associated with increased levels of serum uric acid in obese people.

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