

Assessment of Obesity and Serum Uric Acid in General Population

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Abstract

Background: To assess obesity and serum uric acid in general population. **Subjects and Methods:** One hundred six adult subjects in age ranged 18- 58 years of either gender was selected. Height was measured with a standard stadiometer and weight was measured in light clothing on an electronic scale. Body mass index (BMI) was calculated by dividing the weight (kg) by the height (m) squared. Serum uric acid was measured by the PAP- uricase method. **Results:** The mean age of males was 34.5 years and in females was 38.2 years, weight was 67.8 Kgs and in females was 54.3 Kgs, height was 173.2 cm in males and 154.7 cm in females, BMI was 29.4 kg/m² in males and 24.3 Kg/m² in females and uric acid was 372.4 μmol/L in males and 286.2 μmol/L in females. There were 6 underweight, 4 normal, 2 overweight and 7 obese males and 3 underweight, 3 normal, 2 overweight and 4 obese females having raised uric acid respectively (364.7-996.2 μmol/L). A significant difference between UA and subjects with different BMI was observed (P< 0.05). **Conclusion:** It was found that serum uric acid was strongly associated with obesity. However, it was a small study, a large study is required to validate the findings.

Keywords: obesity, uric acid, population, weight.

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Introduction

Obesity is an increasingly serious public health problem on a global level, with a sustained increase in global mortality and incidence of chronic diseases.¹ Obesity exhibits an intimate correlation with multiple diseases (eg, hypertension, atherosclerosis, cardiopulmonary disease, metabolic syndrome, and cancer) and is also an induction factor responsible for increased risk of cardiovascular disease and all-cause mortality.² In addition, 25-hydroxyvitamin D Levels are negatively and independently associated with fat mass in healthy overweight and obese subjects.³

Uric acid is the final product of purine metabolism in humans. Uric acid is formed in the liver and excreted in urine through the kidney.⁴ Uric acid is a by-product of the continual process in the body, where old cells are broken down and new one are formed. In neutral or basic pH solution, uric acid (pKa=5.4) exists predominantly as urate

by deprotonation of the nitrogen at position 3.5 Urate is significantly more soluble than uric acid; however, a number of urate salts are known to crystallize in physiological environment which are deposited within soft tissues. In adult uric acid level vary with height, body weight, blood pressure, kidney function and alcohol intake. An independent risk factor for female abdominal obesity and MS is the elevated level of serum uric acid. According to the epidemiological studies on metabolic syndrome, serum uric acid were significantly related to several indices, such as body mass index (BMI), waist circumference, and dyslipidemia.⁶ Considering this, we selected present study to assess obesity and serum uric acid in general population.

Subjects and Methods

A total of one hundred six adult subjects in age ranged 18-58 years of either gender was selected. The purpose of the study was explained to the ethical committee and their

approval was obtained. All enrolled patients were informed regarding the study and their written consent was obtained. Demographic profile of each subject was recorded. Height was measured with a standard stadiometer and weight was measured in light clothing on an electronic scales. Body mass index (BMI) was calculated by dividing the weight (kg) by the height (m) squared. Serum uric acid was measured by the PAP- uricase method. After recording all the parameters, statistical analysis was carried out using Mann Whitney U test. Level of significance was set below 0.05.

Results

The mean age of males was 34.5 years and in females was 38.2 years, weight was 67.8 Kgs and in females was 54.3 Kgs, height was 173,2 cm in males and 154.7 cm in females, BMI was 29.4 kg/m² in males and 24.3 Kg/m² in females and uric acid was 372.4 μmol/L in males and 286.2 μmol/L in females (Table I)

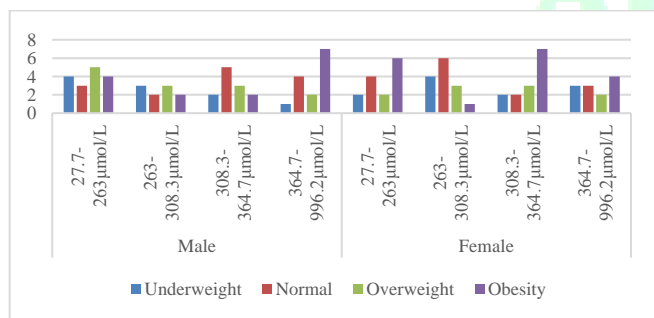
Table 1: Demographic data of patients

Parameters	Male	Female
Mean age (years)	34.5	38.2
Mean weight (Kgs)	67.8	54.3
Mean height (cm)	173.2	154.7
Mean BMI (Kg/m ²)	29.4	24.3
Mean uric acid (μmol/L)	372.4	286.2

Table 2: The prevalence of serum uric acid according body type

Gender	UA	Underweight	Normal	Overweight	Obesity	P value
Male	27.7-263 μmol/L	4	3	5	4	<0.05
	263-308.3 μmol/L	3	2	3	2	
	308.3-364.7 μmol/L	2	5	3	2	
	364.7-996.2 μmol/L	1	4	2	7	
Female	27.7-263 μmol/L	2	4	2	6	<0.05
	263-308.3 μmol/L	4	6	3	1	
	308.3-364.7 μmol/L	2	2	3	7	
	364.7-996.2 μmol/L	3	3	2	4	

There were 1 underweight, 4 normal, 2 overweight and 7 obese males and 3 underweight, 3 normal, 2 overweight and 4 obese females having raised uric acid respectively (364.7-996.2 μmol/L). A significant difference between UA and subjects with different BMI was observed (P< 0.05) (Table II, graph I).



Graph 1: The prevalence of serum uric acid according body type

Discussion

In adult, serum uric acid levels are positively correlated with body mass index (BMI). BMI is a simple index of weight for height that is commonly used in classifying overweight and obesity in adult population and individuals. Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health.7 World Health Organization (WHO) defines “overweight” as a BMI equal to or more than 25 and “obesity” as a BMI equal to or more than 30. The normal concentration of uric acid in the

serum of adults is in the range of 3-7 mg/dL. In women, it is slightly lower (by about 1 mg) than in men.8 The daily excretion of uric acid is about 500-700 mg. Hyperuricemia refers to an elevation of the serum uric acid concentration. Uric acid is sometime found in more soluble form as sodium urate. In severe hyperuricemia, crystals of sodium urates get deposited in the soft tissues, particularly in the joints. This causes the inflammation in the joints results in a painful gouty arthritis.9

Obese people have impaired kidney excretory function possibly because of extra weight and secondary as a result of increased prevalence of hypertension and diabetes mellitus which can affect renal function. Although the underlying mechanism of the impaired urate excretion in obese patients and its improvement during weight reduction is yet unclear, hyperuricemia associated with obesity can be treated very well only with appropriate diet therapy and in most cases there is no need for drug therapy.10

Our study showed that the mean age of males was 34.5 years and in females was 38.2 years, weight was 67.8 Kgs and in females was 54.3 Kgs, height was 173,2 cm in males and 154.7 cm in females, BMI was 29.4 kg/m² in males and 24.3 Kg/m² in females and uric acid was 372.4 μmol/L in males and 286.2 μmol/L in females. A study by Yadav et al11 showed that blood samples from 168 individuals were subjected for estimation of uric acid using PAP methods. Individuals were classified into overweight and obesity using BMI. Written questionnaire was used to assess the information regarding nutritional habit of individuals. Age and gender of the individuals show no significant correlation with serum uric acid level. While, the mean serum uric acid (MSUA) level of vegetarians and non-

vegetarians were 4.6 (\pm 1.1) mg/dl and 6.1 (\pm 1.5) mg/dL respectively. Similarly, the MSUA level of non-alcoholic and alcoholic was 5.2 (\pm 1.4) mg/dL and 6.7 (\pm 1.4) mg/dL respectively. Serum uric level showed significant correlation with BMI ($p=0.007$), dietary habits ($p<0.001$), and drinking habits ($p<0.001$). Age and gender of the test individuals doesn't affect the serum uric level significantly but BMI and nutritional habits like dietary and drinking habits significantly elevates the serum uric acid.

We found that there were 1 underweight, 4 normal, 2 overweight and 7 obese males and 3 underweight, 3 normal, 2 overweight and 4 obese females respectively having uric acid 364.7-996.2 μ mol/L respectively. Li et al [12] analyzed the association between serum uric acid (SUA) and metabolic state in obese inpatients and preliminarily explore potential mechanisms of hyperuricemia in obesity. A total of 153 obese inpatients were selected and assigned based on SUA level to the normal uric acid (NC group) or high uric acid (HUA) group. Patients' sex, age, height, weight, blood pressure, BMI, and prevalence of metabolic syndrome were collected and recorded. SUA, FPG, fasting insulin (Fins), HOMA-IR, HOMA-IS, HbA1c, TGs, TC, LDL-C, and HDL-C levels were tested. Pearson correlation analysis was performed to analyze the correlation between SUA and related metabolic indicators. Logistic regression was performed to analyze independent risk factors of hyperuricemia in obesity. In the HUA group, the patients were predominantly males, and BMI, DBP, TGs, FPG, fasting insulin (Fins), HOMA-IR, HOMA-IS, and metabolic syndrome were higher than those in the NC group ($P<0.05$), while HDL-C was lower than that in the NC group ($P<0.05$). There were no significant differences between the groups in TC or LDL-C. Pearson correlation analysis showed that in obese patients, SUA was positively correlated with BMI, fasting insulin (Fins), HOMA-IR, HOMA-IS, TGs, and metabolic syndrome and negatively correlated with age and HDL-C. Logistic regression showed that BMI, hyperinsulinemia, and insulin resistance were independent risk factors of hyperuricemia.

Conclusion

It was found that serum uric acid was strongly associated with obesity. However, it was a small study, a large study is required to validate the findings.

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