

Correlation Between Body Mass Index and Serum Uric Acid Among Healthy Pakistani Adults: A Cross-Sectional Comparative Study

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ABSTRACT

Aim: To assess the relationship between body mass index and serum uric acid among healthy Pakistani adults

Study design: A cross-sectional comparative study

Place and Duration This study was conducted in Bakhtawar Amin Medical and Dental College Multan from November 2020 to April 2022

Methodology: A total of 250 subjects were randomly recruited out of which 120 subjects were selected in this study. Each group comprised 60 subjects. Group A comprised healthy controls subjects, while Group B comprised hyperuricemic persons with no complaints. By dividing body weight (kg) by the square of height, the BMI was computed. We divided BMI into three categories using diagnostic criteria for obesity in Asian populations given by the WHO. Participants' fasting blood samples (5 mL) were taken under stringent aseptic conditions to measure the serum uric acid level. Version 23.0 of IBM-SPSS was used to store and analyse the data, Counts with percentages were reported on gender and BMI classifications between the two studied groups, and Mean with standard deviation were given for BMI and serum uric acid.

Results: In the present study in group A 66.7% were male gender, 63.3% were overweight, mean BMI was 24.2 (SD=±2.0) kg/m², and mean serum uric acid was 4.5 (SD=±0.6) units, whereas in group B there were 60% male gender, 70% were overweight, mean BMI was 23.6 (SD=±1.4) and mean serum uric acid was 8.1 (SD=±0.6) units. The independent sample test gives a significant mean difference in serum uric acid between group A and B samples with $p < 0.05$.

Conclusion: The study's findings show no significant correlation between serum uric acid, overweight and obesity among the Pakistani adult population.

Keywords: Body Mass Index, serum uric acid, Pakistan, adults, overweight

INTRODUCTION

Byproducts of purine metabolism include uric acid, and high serum uric acid (SUA) levels are thought to play a part in the development of gout. Two-thirds of SUA are created endogenously, with the remaining one-third coming from a diet high in purines.¹ More than 70% of uric acid excretion occurs through the kidneys, with the remaining 20% occurring by intestinal and biliary secretion. One of the main reasons for hyperuricemia and the onset of gout is abnormal SUA metabolism and its reduced renal excretion. Additional causes of hyperuricemia include increased exogenous protein consumption and endogenous uric acid synthesis in obese people.² Hyperuricemia is characterized by serum uric acid levels that are more than 6 mg/dL for women and 7 mg/dL for men.³ A growing body of research has revealed a link between hyperuricemia and dyslipidemia, elevated systemic inflammation, insulin resistance, diabetes mellitus, hypertension, chronic renal disease, and cardiovascular disease.⁴

The prevalence of hyperuricemia has been rising quickly worldwide during the last few decades. According to newly available data, hyperuricemia is increasingly common in low- and middle-income nations as well as the industrialized world. Obesity, eating a diet high in purines, and drinking alcohol are all found to be risk factors for hyperuricemia.⁵

The subject of numerous investigations has been potential causes of hyperuricemia. According to the Framingham study, gout patients have a considerably higher body mass index (BMI). About 3,153 people were followed for two years, and Ishizaka reported that SUA change was associated with BMI change.⁶ BMI is a significant modifiable risk factor for hyperuricemia in the USA, Japan, and other nations due to the well-established link between obesity and SUA.⁷ The body fat percentage can be easily determined using the BMI. It's determined by multiplying a person's height square in meters by their weight in kilograms. In a local study obese male and female individuals had higher serum uric acid levels, concluding a link between serum uric acid and obesity.⁸

Although a number of studies have previously shown a link between SUA and body weight, it was not fully understood how BMI related to the risk of hyperuricemia in Pakistani individuals. Determining the relationship between blood uric acid and body mass index in healthy Pakistani adults is what the current study is intended to do.

METHODOLOGY

After receiving hospital and ethical committee approval, this cross-sectional comparative study was conducted. A total of 250 subjects were randomly recruited out of which 120 subjects were selected in this study. Each group comprised 60 subjects. Group A comprised healthy controls subjects, while Group B comprised hyperuricemic persons with no complaints. All subjects underwent a physical examination by a licensed physician using established standard procedures. Participants' weight was taken while wearing loose clothing and no shoes. Both height and body weight were recorded. The BMI was calculated by dividing body weight (kg) by the square of height. Using the WHO's diagnostic criteria for obesity in Asian populations, we classified BMI into three categories. Normal weight = 18.5-23.0 kg/m², overweight = 23.0-27.5 kg/m², and obese 27.5 kg/m². Participants' fasting blood samples (5 mL) were taken under stringent aseptic conditions, after being let to coagulate, the serum was separated by centrifuging for 15 minutes at 3000 rpm. Hyperuricemia is characterized by serum uric acid levels that are more than 6 mg/dL for women and 7 mg/dL for men.

IBM-SPSS version 23.0 was used to store and analyse the data. Gender statistics were given as counts with percentages and BMI classifications between two studied groups, and Mean with standard deviation were given for BMI and serum uric acid. Pearson Chi-Square test was used to check the association of gender and BMI with two studied groups, Independent sample t-test was used to compare the mean of BMI and serum uric acid between groups A and group B whereas one-way ANOVA was applied to compare the mean serum uric acid with respect to levels of body mass index. The association between BMI and serum uric

acid was also investigated using Pearson correlation analysis. Statistics were considered significant for P-values under 0.05. On the study results, bar diagrams and scatter plots are provided.

RESULTS

Table 1 lists the initial characteristics of the analysed samples used in this investigation. There were 66.7% men., 63.3% were overweight, mean BMI was 24.2 (SD=±2.0) kg/m2, and mean serum uric acid was 4.5 (SD=±0.6) units, whereas in group B there were 60% male gender, 70% were overweight, mean BMI was 23.6 (SD=±1.4) and mean serum uric acid was 8.1 (SD=±0.6) units. The independent sample test gives a significant mean difference in serum uric acid between group A and B samples with p<0.05.

Table 1: Baseline features of study participants (n=120)

Characteristics	Group					p-value
	Group A		Group B			
	n	%	n	%		
Gender	Male	40	66.7	36	60.0	0.44
	Female	20	33.3	24	40.0	
BMI Levels	Normal weight	17	28.3	18	30.0	0.07
	Overweight	38	63.3	42	70.0	
	Obese	5	8.3	-	-	
BMI	Mean ±SD	24.2	2.0	23.6	1.4	0.09
Serum Uric Acid	Mean ±SD	4.5	0.6	8.1	0.6	<0.01*

Statistics were considered significant when *p<0.05.

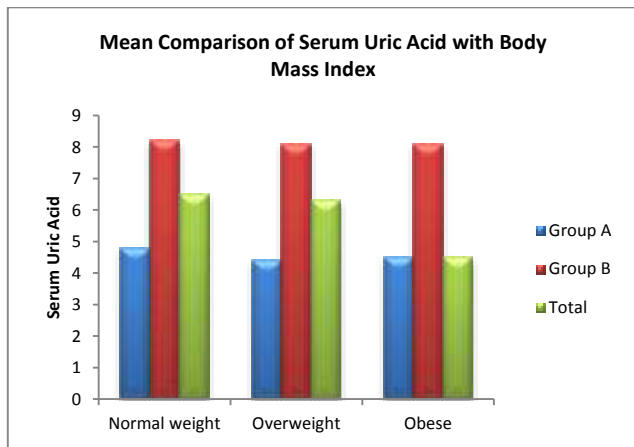
Table 2: Mean Comparison of Uric Acid across BMI Groups

Group	Serum Uric Acid			P-value
	Normal weight Mean (±SD)	Overweight Mean (±SD)	Obese Mean (±SD)	
Group A (n=60)	4.8(±0.7)	4.4(±0.7)	4.5(±0.6)	0.16
Group B(n=60)	8.2(±0.8)	8.1(±0.6)	8.1(±0.6)	0.64
Total (n=120)	6.5(±1.9)	6.3(±2)	4.5(±0.6)	0.08

Table 3: Correlation Analysis of Serum Uric Acid and BMI

Group	r-value	R-Square (%)	p-value
Group A (n=60)	-0.12	1.44	0.32
Group B(n=60)	0.09	0.81	0.47
Total (n=120)	-0.15	2.25	0.08

Statistics were considered significant when *p<0.05.



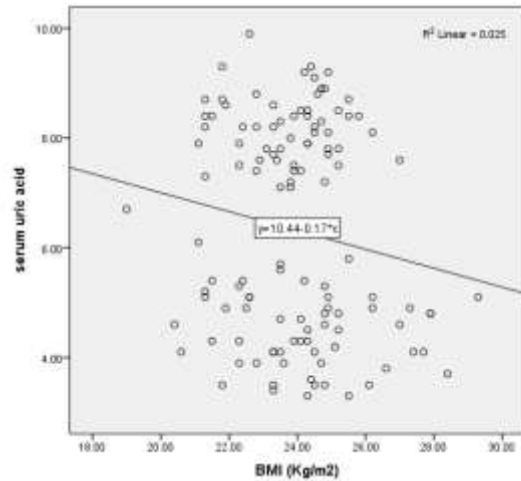
Bar Diagram 1:

Bar diagram 1 is showing serum uric acid with respect to BMI levels.

Table 2 reports the mean comparison of serum uric acid with respect to BMI levels, in group A for normal weight samples mean serum uric acid was 4.8 (SD=±0.7) units, for overweight samples

4.4 (SD=±0.7) units, for obese samples it was 4.5(SD=±0.6) units, in group B for normal weight samples mean serum uric acid was 8.2 (SD=±0.8) units, for overweight samples 8.1(SD=±0.6) units, for obese samples it was 8.1(SD=±0.6) units, whereas for total in normal weight samples mean serum uric acid was 6.5 (SD=±1.9) units, for overweight samples 6.3 (SD=±2.0) units, for obese samples it was 4.5(SD=±0.6) units. There were no significant mean differences observed for mean serum uric acid with respect to BMI levels, the p-value was greater than 0.05 using one-way ANOVA.

Table 3 shows that, in the group, A 12% negative correlation, in group B samples 9% positive correlation and in total samples, a 15% negative correlation was found. R-square showed a maximum 2.25% variation in serum uric acid was explained by body mass index.



Scatter Plot 2:

A Scatter plot shows a negative correlation between BMI and serum uric acid, on average 2.25% variation was explained by BMI for serum uric acid.

DISCUSSION

It has been shown that BMI is substantially related to hyperuricemia, which has significant implications for public health. The risk of an increased SUA level is expected to be better predicted by BMI. BMI is more appealing to clinical practitioners because it is simple to get. As a result, clinicians may more accurately forecast a person's risk of hyperuricemia or gout. A previously published article stated that reducing body weight was considered to be an efficient non-medical technique for lowering SUA levels in the Japanese population. The risk of developing gout was 39% lower in those who lost at least 10 pounds.⁶

In the current study, there were no significant mean differences observed in BMI levels with respect to mean serum uric acid. Correlation analysis of serum uric acid with body mass index, in group A 12% negative correlation, in group B samples 9% positive correlation and in total samples 15% negative correlation was found. (Statistically insignificant)

A local study found that among the 375 participants in this study, 208 (55.5%) males and 167 (44.5%) women completed it. Elevated SUA levels were present in 83 (39.9%) men and 30 (17.9%) women. There was a statistically significant correlation present between the BMI and mean SUA levels.⁹ In our study we did not find any correlation between serum uric acid and body mass index, this difference in results may be due to their inclusion criteria. They included hypertensive adults who had a sedentary lifestyle and were taking thiazide diuretics. Another local cross-sectional study of 134 females aged 20 to 72 years demonstrated a significant relationship between BMI and blood uric acid. It has

been noted that the levels of blood uric acid rise by up to 0.391 units for every unit increase in body mass index (BMI).⁹The different results may be due to only females in that study, while in our study we included both males and females.

According to an international study serum uric acid was correlated with various BMI groups along with systolic and diastolic hypertension. Participants with a BMI under 21.0 kg/m² had increased SUA levels that were positively connected with SBP and DBP, whereas those with a BMI of over 21.0 kg/m² had increased SUA levels that were negatively correlated with SBP and DBP.¹⁰In another study both males and females with a BMI of 24.0 kg/m², SUA had a positive correlation with both systolic blood pressure (SBP) and diastolic blood pressure (DBP). However, in females with a BMI of 24.0 kg/m², SUA levels significantly and positively correlated with DBP but not with SBP.¹¹The results of both studies were unrelated to our study because they included hypertensive patients, while we took only healthy adults.

Study limitations: This is a single-centre study conducted on a limited number of Pakistani adults, so a large centred study with a big sample size is needed to validate the recommendations

CONCLUSION

The study's findings show no significant correlation between serum uric acid, overweight and obesity among the Pakistani adult population

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Conflict of interest: None

Approval: It was taken from the ethical review committee of the institute

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