

# Serum Uric Acid Level and Obesity: An Association

GULAB KANWAR<sup>1</sup>, RAHUL KABRA<sup>2</sup>

<sup>1</sup> Professor & Head, <sup>2</sup> 3<sup>rd</sup> Year Resident, Department of Biochemistry, Govt. Medical College, Kota, Rajasthan, India

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**Abstract:** Obesity is a disease with increased BMI, so that the health and wellbeing are affected and is associated with a variety of adverse health conditions: diabetes, hypertension, dyslipidaemia, increased cardiovascular events, and elevated serum uric acid. In this study we tried to find out association of increased serum uric acid levels with obesity.

**Material and method:** This study was conducted in the Department of Biochemistry, GMC kota. 50 case samples and 50 control samples were taken. Serum was separated and serum uric acid levels were estimated by fully Automated Analyzer ERBA EM 360. Data was analyzed on Excel sheet and results obtained using Student's unpaired t- test and Pearson's correlation.

**Result:** Cases have significantly higher values for serum uric acid levels than controls and have significant positive Correlation With BMI.

**Conclusion:** Obesity is associated with increased serum uric acid levels. Therefore, patients presenting with this biochemical abnormality are recommended to be investigated for obesity and viceversa.

**Keywords:** Obesity, Serum uric acid, BMI, Hyperuricemia.

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## 1. INTRODUCTION

Obesity may be defined as a disease of extensive fat accumulation to the extent that health and wellbeing are affected. Obesity has long been recognized as an associated factor with a variety of adverse health consequences; chiefly among them are diabetes, hypertension, dyslipidaemia, increased cardiovascular events, and elevated serum uric acid<sup>(1-4)</sup>. The risk of gout was increased among men who had been overweight in adolescence<sup>(5)</sup>. It has been suggested that other factors, such as muscle mass, may also play a role in producing high serum uric acid<sup>(5)</sup>. Weight reduction has been associated with modest lowering of serum urate<sup>(6)</sup>.

Uric acid is the end product of purine degradation. It is produced by xanthine oxidase from xanthine which is in turn produced from purine. It is sparingly soluble in water.

Hyperuricemia may marginally increase the risk of CHD events<sup>[7]</sup>. Factors like obesity, alcohol intake, and multimetabolic disorders are determined to be independent predictors for the development of hyperuricemia<sup>[8]</sup>. In nonobese persons, death from cardiovascular disease has been found higher with increased level of serum uric acid but independent of bodyweight<sup>[9]</sup>.

The prevalence of hyperuricemia in adults has increased over the last several decades, especially in developed countries. In adults, serum uric acid levels are positively correlated with BMI, and hyperuricemia is considered to be a common lifestyle disorder related with obesity.

This study aims to find whether uric acid levels are increased in healthy obese when compared to healthy non – obese and if so is hyperuricemia associated with obesity on basis of BMI.

## 2. MATERIAL AND METHOD

This study was performed in the Department of Biochemistry, Government Medical College, and Central Laboratory NMCH Kota from period of September 2014 to October 2015. A total of 100 patients were studied, of which 50 patients

were cases that were categorized into Class 1, Class 2, Class 3 obesity (based on WHO classification) and 50 were controls who were patients without obesity or any other condition known to cause raised serum uric acid levels.

BMI was calculated as follows.

$$BMI = \frac{m}{h^2},$$

where  $m$  and  $h$  are the subject's weight and height respectively.

BMI is usually expressed in kilograms per square metre, resulting when weight is measured in kilograms and height in metres.

**Table-1: Classification of Subjects according to BMI**

Classification According to BMI		BMI (Kg/m <sup>2</sup> )
• Normal Weight		18.5 – 24.9
• Obese Weight		≥ 30
1.	class I obesity	30 – 34.9
2.	class II obesity	35 – 39.9
3.	class III obesity	≥ 40

**Inclusion Criteria:**

- 50 Obese with BMI ≥ 30 and 50 Non – Obese persons with BMI between 18.5 to 24.9 according to WHO’s criteria.
- Apparently healthy adults of age group : 18 – 50 years.

**Exclusion Criteria:**

- Pregnancy.
- Age <18
- Age > 50
- Diabetes Mellitus.
- Renal disorder
- Gout .
- Thyroid disease.
- Patients with malignancy
- Chronic liver diseases
- Smoking
- Alcoholics
- Clinical Findings of gout or extra- articular manifestations of hyperuricemia .

After explaining the type of study, written consent was taken from all the subjects. 12-hour fasting period, venous blood samples were collected from all the cases and controls. Serum was separated and serum uric acid levels were estimated by fully Automated Analyzer ERBA EM 360.

**Statistical Analysis:-** Statistical analysis was done using suitable statistical tool. Data was estimated on excel sheet and analysed statistically. Quantitative data was summarized in the form of MEAN ± SD and differences in mean of both the groups were analyzed using Student’s unpaired t-test . The P value <.05 was taken as significant. Association was found by Pearson’s Correlation.

### 3. RESULTS

**Table 2: S.Uric Acid levels between Obese and Non-Obese**

SUA Levels (mg/dl)	Number	Mean $\pm$ SD	P-Value	Significance
Obese	50	5.72 $\pm$ 1.67	0.0075	Significant.
Non - Obese	50	4.93 $\pm$ 1.18		

**Table 3: Study parameters according to Classes of Obesity (mean  $\pm$  SD)**

Study Parameters	Non – Obese BMI 18.5-24.9	Class-1 Obese BMI 30-34.9	Class-2 Obese BMI 35-39.9	Class-3 Obese BMI $\geq$ 40
BMI (kg/m <sup>2</sup> )	21.65 $\pm$ 2.24	31.33 $\pm$ 1.32	37.82 $\pm$ 1.42	47.25 $\pm$ 2.64
Uric acid (mg/dl)	4.93 $\pm$ 1.18	5.52 $\pm$ 1.82	6.17 $\pm$ 1.06	6.7 $\pm$ 0.82

**Table 4: Pearson's Correlation of BMI with Uric Acid**

Pair	non - obese	Obese
	r value	r value
BMI vs UA	.12	.26

### 4. DISCUSSION

This study was done to estimate the Serum Uric Acid levels in healthy obese subjects with BMI  $\geq$  30 kg/m<sup>2</sup> and to compare them with that in healthy non-obese subjects with BMI 18.5 – 24.9 kg/m<sup>2</sup> on basis of WHO's criteria for Obesity<sup>[10]</sup>, and to find out if there is any association between BMI and these parameters in obesity. The obese subjects were called Cases, and the non-obese as Controls.

The study was done on a fixed study format taking personal information, doing physical examination and then the overnight fasting venous samples were taken and were analyzed.

S.UA (mg/dl) levels in the study came out to be increased in cases with values (mean  $\pm$  SD) 5.72  $\pm$  1.67 mg/dl when compared to controls with 4.93  $\pm$  1.18 mg/dl as evident from Table 2. Although both the values are in normal range, but the higher levels are seen in cases which shows increase in uric acid levels in obese as compared to non-obese, which is also evident from the p-value .0075, indicating the increase in levels to be statistically significant as shown in Table 2.

Table 3. however shows that there is significant increase in levels of S.UA with increase in BMI which reflects a risk of hyperuricemia, cardiovascular events, renal failure and ultimately gout with increased BMI / Obesity. Results of S.UA levels (mean  $\pm$  SD) are 4.93  $\pm$  1.18 for non obese, 5.52  $\pm$  1.82 for class 1, 6.17  $\pm$  1.06 for class 2, and 6.7  $\pm$  0.82 for class 3 obesity. Table 4. shows the Pearson's Correlation ( $r=0.26$ ) between BMI and S.UA, showing positive correlation in case of obese, as compared to ( $r=0.12$ ) in case of non-obese showing no or minimal correlation between the two parameters.

Similar results were found in a study carried out by Yadav B K et al at the Nepal Police Hospital, Kathmandu. They found that S.UA levels showed significant correlation with BMI and also with nutritional habits like drinking alcohol or eating non – vegetarian food.<sup>[11]</sup>

Carlyne Remedios, Miloni Shah et al in a study done at Centre for Obesity and Diabetes Surgery, Mumbai India found that Indian Obese population have a significant high prevalence of Hyperuricemia.<sup>[12]</sup>

Ala'a A.Abdul-Majeed from College of Medicine, Al-Anbar University, Iraq in a study found out that the mean of S.UA in Obese is significantly higher than non obese controls and the difference in females was more significant than in males.<sup>[13]</sup>

### 5. CONCLUSION

By this study we conclude that serum uric acid is raised in and is positively correlated with obesity. The elevation of S.UA is associated with increased risk for CVD, renal disease, gout and ultimately mortality. It can be used as early biochemical marker of Obesity. Hyperuricemia increase as obesity increases.

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