



## “SERUM URIC ACID LEVELS WITH INSULIN RESISTANCE IN METABOLIC SYNDROME – A CORRELATION STUDY”

### General Medicine

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### ABSTRACT

**Background:** Metabolic syndrome (MetS) is a cluster of metabolic abnormalities that includes hypertension, central obesity, insulin resistance, and atherogenic dyslipidemia, which is strongly associated with an increased risk for developing diabetes and atherosclerotic and nonatherosclerotic cardiovascular disease (CVD). The increasing prevalence of Obesity across the world will result in an increased prevalence of Metabolic syndrome. However, obesity along with the MetS increases the risk of acquiring Diabetes and cardiovascular diseases (CVD). The prevalence of metabolic syndrome in adults ranges from 20 to 25%, but in those with type 2 diabetes, it can almost always approach 80%. The death rate from high BMI has increased globally by 28.3%. According to the WHO definition of metabolic syndrome, CVD mortality was 2.6 to 3.0 times higher and all-cause death was 1.9 to 2.1 times higher. Elevated uric acid is one of the characteristic signs of metabolic syndrome patients that has been associated with several cardiometabolic risk factors. Despite frequently being thought of as secondary to hyperinsulinemia, current research suggests that uric acid has a primary role in mediating this condition. According to multiple logistic regression analysis, the risk of MetS rose around 2-fold for every 1 mg/dl increase in blood uric acid. This study seeks to determine if insulin resistance and asymptomatic hyperuricemia are related in patients with metabolic syndrome. **Aim:** To study the correlation of Serum Uric acid levels with Insulin Resistance in Metabolic syndrome. **Materials And Methods:** A Hospital-based cross-sectional study was conducted in the Department of General Medicine, Santhiram medical college, and the general hospital for six months. A total of 50 cases with asymptomatic Hyperuricemia and insulin resistance who satisfy the criteria for metabolic syndrome and patients that were admitted to the hospital during this period were taken into the study. **Results:** Out of 50 patients a male preponderance of 72% was found in the study. Subjects in the Metabolic syndrome group had higher BMI, WC, SBP, DBP, FBS, fasting insulin, HOMA-IR index, TG, and HDL levels than the subjects in the non-MetS group. In this study, the mean serum uric acid was significantly higher in the MetS group than that in the non-MetS group. In the MetS group, the mean value of serum uric acid was  $8.1 \pm 1.8$  mg/dl. In the study, 78.6% of women and 75.4% of men had asymptomatic hyperuricemia. In MetS, there was a strong positive correlation between serum uric acid and insulin resistance. Additionally, a favorable association between serum uric acid and several MetS factors such as BMI, waist size, fasting blood sugars, fasting insulin, and HDL was observed. **Conclusion:** Serum uric acid showed a significant positive relation with insulin resistance in MetS. There was also a positive correlation noted between serum uric acid and various components of MetS i.e., BMI, waist circumference, fasting blood sugars, fasting insulin, and HDL.

### KEYWORDS

#### INTRODUCTION:

The recognition of the existence of metabolic syndrome (MetS) has developed over the last two decades, following the description of insulin resistance syndrome or syndrome X in 1988. Depending on the definition used, the metabolic syndrome may include measures of general obesity (as reflected by BMI), central obesity (as reflected by WC), dyslipidemia (low HDL-C and/or high triglyceride levels), hyperglycemia, high blood pressure and resistance to the action of insulin. The metabolic syndrome will become more prevalent due to the rising prevalence of obesity worldwide. Serum uric acid is the ultimate enzyme byproduct of human purine metabolism, and it has been hypothesized that hyperuricemia and MetS may have a shared etiology. Elevated uric acid levels are related to several cardiovascular diseases in addition to MetS in some cases. In the asymptomatic stage of type 2 diabetes, all of these metabolic abnormalities have been present for many years, and they predispose to the onset of problems even before clinical diagnosis. This study will help us in deciding the need to treat cases of MetS with asymptomatic hyperuricemia.

#### Aims And Objectives:

- To study the correlation between serum uric acid with insulin resistance in metabolic syndrome.

#### MATERIALS AND METHODS:

A Hospital-based cross-sectional study was conducted in the Department of General Medicine Santhiram Medical College, and General Hospital for six months after approval from the Hospital Ethics and Research Committee.

**Duration Of Study:** From May 2021 to October 2021

**Sample Size:** 50

#### Methods Of Data Collection:

- All the selected cases of metabolic syndrome admitted to Santhiram medical college and general hospital, Nandyal,

fulfilling the inclusion criteria, were taken for study after taking prior informed consent.

- Information is collected through a pre-structured proforma for each study subject
- The study was carried out on patients with diagnosed Metabolic Syndrome
- Qualifying study subjects will be undergoing detailed history, clinical examination, and laboratory investigations.

**Sampling Technique:** Simple Random Sampling

#### Inclusion Criteria:

- Patients with age more than 18 years
- Central obesity In men, waist  $>102$  cm In women, waist  $>88$  cm
- Hyperlipidaemia Elevated triglyceride ( $>150$  mg/dl) Reduced HDL cholesterol ( $<40$  mg/dl)
- Hypertension ( $>130/85$  mmHg)
- Fasting blood sugar level ( $>100$  mg/dl)
- Impaired fasting glucose levels:  $6.1$  to  $6.9$  mmol/l
- 2hour postprandial glucose during OGTT  $>200$  mg/dl
- Random blood sugar  $>200$  mg/dl
- Microalbuminuria: urinary albumin excretion ratio  $>20$  ug/min or albumin to creatinine ratio  $>30$  mg/gm
- Hyperinsulinemia  $>25$  mU/l
- Patients who are willing to participate and give informed written consent.

#### Exclusion Criteria:

- Renal disorders
- Alcoholics
- Smokers
- Gout
- Drugs that cause increased uric acid levels such as thiazides, theophylline, ascorbic acid, aspirin, cisplatin, diazoxide, epinephrine, ethambutol levodopa, methyl dopa, nicotinic acid, phenothiazines were excluded.

- Drugs that decrease serum uric acid levels such as allopurinol, azathioprine, fenofibrate, corticosteroids, estrogen, guaifenesin, mannitol, probenecid, and warfarin were excluded.

#### Data Analysis:

- Data was collected using a pretested proforma meeting the study's objectives. Detailed history, physical examination, and necessary investigations were undertaken.
- The chi-square and Fisher's Exact test were used in statistical analysis to compare proportions. At a P-value of 0.05, statistical results were considered significant <0.01.

#### RESULTS:

**Table 1: - Age distribution in the case group**

| Age     | No. of cases | Percentage |
|---------|--------------|------------|
| <20     | 1            | 2.0 %      |
| 20 – 30 | 8            | 16.0 %     |
| 30 – 40 | 6            | 12.0 %     |
| 40 – 50 | 10           | 20.0 %     |
| >50     | 25           | 50.0 %     |
| Total   | 50           | 100.0 %    |

In this study, 50 % of the patients with Metabolic syndrome were > 50 years of age.

**Table 2: - Gender distribution**

| Gender | No. of cases | Percentage |
|--------|--------------|------------|
| Female | 14           | 28.0 %     |
| Male   | 36           | 72.0 %     |
| Total  | 50           | 100.0 %    |

A male preponderance of 72% was found in this study. However, it was observed that there was a higher risk of metabolic syndrome cases in the male gender.

**Table 3: - Serum uric acid levels distribution in the cases**

| Variable     | Group | No. | Minimum | Maximum | Mean | S.D | P-value |
|--------------|-------|-----|---------|---------|------|-----|---------|
| S. Uric acid | Cases | 50  | 4       | 12      | 8.1  | 1.8 | <0.001  |

There is a significant difference ( $p < 0.001$ ) in the serum uric acid levels in most of the cases in the study group.

**Table 4: - Relation between serum uric acid and HOMA-IR using Pearson correlation**

| Relation                    | r - value | P- value |
|-----------------------------|-----------|----------|
| Sr. Uric acid and HOMA - IR | 0.4       | <0.001   |

It was observed that there was a significant correlation between serum uric acid levels and Insulin resistance.

#### DISCUSSION:

This research aims to investigate the relationship between insulin resistance and serum uric acid in Mets. Among the patients that were studied with metabolic syndrome, it was noted that 50% of the Mets patients were older than age 50 and 50% of patients were between 20 to 50 years of age group. Age-related increases in Mets prevalence have been noted. In this study, it was found that hyperuricemia and Mets were more common in men 36 (72%) and females 14 (28%). In contrast to past studies in India, where the frequency of Mets in women was 1.5–2 times greater than in men, our study found that the prevalence of Mets in men was 2 times higher than that in women. Men may be more likely to experience this condition due to higher rates of overweight BMI, poor blood glucose levels, high TG, and low HDL-C.

In this study serum uric acid shows a direct relation with Mets with maximum serum uric acid levels above 12 with a Mean value of 8.1 and SD of 1.8. In this study, HOMA-IR shows a direct relation with Mets, re-emphasizing that insulin resistance is a part of Metabolic syndrome. As the serum uric acid level rise, the values of HOMA-IR also raised showing an increase in insulin resistance. It was concluded that the serum uric acid levels linearly increased with increasing serum insulin levels, in newly diagnosed diabetic patients. Therefore, uric acid serves as a potential biomarker of glucose metabolism. In this study, a direct relation was found between serum uric acid and fasting insulin and BMI.

#### CONCLUSION:

- In this study, the prevalence of metabolic syndrome was higher among elderly males, than in females.
- Serum uric acid was significantly higher in patients with Mets compared to the normal subjects. It was markedly associated with all the components of metabolic syndrome, in particular with insulin resistance.
- Hyperuricemia was found to be an inherent component of metabolic syndrome and hence can be used as a simple marker for insulin resistance.
- We can consider treating hyperuricemia components in patients of metabolic syndrome with high uric acid levels (asymptomatic), because of its significant elevation as observed in this study.