

# Serum Uric Acid in Relation to Age and Sex in the Population of Tripura

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**Abstract:** *Background:* Recent studies shows that increased serum uric acid and aging are cofounders of many pathological conditions including gout, diabetes, CVD, CKD, decreased cognitive functions, including increased risk of mortality. *Aim:* Purpose of this study is to investigate the association of serum uric acid levels in relation to age and sex in the suburb population of Tripura. *Method:* A total of 274 number of serum sample was analyzed in our study. Serum Uric acid was estimated using uricase method. Statistical analysis was done using SPSS 18. *Results:* Hyperuricemia was more in male patients compared to female patient in the study population. Serum Uric acid was positively correlated with the age ( $p < 0.000$ ) in the whole study group. The normal uric acid level also gradually increases according to age in both male and female. *Conclusion:* Serum uric acid level increases with advancing age in the study population. Gradual increase in the normal uric acid levels is modest and linear in the men than in women.

**Keywords:** Serum Uric acid, Aging, Hyperuricemia, Tripura

## 1. Introduction

Uric acid is a weak organic acid forms after purine nucleotides degradation as end product (1). Uric acid is synthesized primarily in liver, intestine and other tissues such as muscles, kidneys and the vascular endothelium as the end product of purine nucleotides degradation. Uric acid synthesis is regulated by the xanthine - oxidoreductase enzyme, which converts hypoxanthine to xanthine and xanthine to Uric acid (1, 2, 3).

Plasma Uric acid acts as a potent antioxidant (4). Uric acid prevents peroxynitrite - induced protein nitrosylation, lipid and protein peroxidation and an inactivation of tetrahydrobiopterin, which results in scavenging free radical and chelating transitional metal ions (5). Uric acid also play a vital role in tissue healing via initiating the inflammatory process that is necessary for tissue repair, scavenging oxygen free radicals, and mobilizing progenitor endothelial cells (4, 6).

Recent studies showed there is a strong association of hyperuricemia with metabolic syndrome, cardiovascular diseases, diabetes and renal dysfunction and gout (7, 8, 9). The link of hypertension with uric acid was first published in 1870 by Mahomed et. al. (10) and after that some other studies like Benjamin De Beckera et. al, Atanu Ghosh et. al also found link of hypertension link with uric acid. (11, 12).

The association between serum uric acid and diabetes has different findings. Some studies reported a positive correlation between high serum uric acid levels and diabetes, whereas some other studies reported negative correlation (7, 8, 13). Several studies correlate serum uric acid with

coronary heart disease. The role of serum uric acid as an independent risk factor for cardiovascular disease is still remain indistinct although Hyperuricemia is associated with cardiovascular disease such as coronary heart disease (CHD), stroke and hypertension (14, 15, 16). Study showed serum uric acid is elevated in CKD patients; however a true pathogenic role in kidney function remains inconclusive (17, 18).

Excessive elevation of serum uric acid leads to Gout which is a systemic disease results from deposition of monosodium urate crystals (19). Hyperuricemia is the main pathogenic defect in gout despite other factors which can lead to development of gout (19, 20).

There are report of SUA levels in men and women increased with advancing age in Japanese cohort, Austrian cohort and Chinese population. (21, 22, 23). There are some studies in India on SUA in relation to hypertension, Diabetes and Changing normal range (24, 25) however association of Age with SUA was not seen in literature. Recent studies shows that increasing serum uric acid and aging are cofounders of many pathological conditions including gout, diabetes, CVD, CKD, decreased cognitive functions, including increased risk of mortality (26, 27) So, We have conducted this study to investigate the association of serum uric acid levels in relation to age and sex in the suburb population of Tripura

## 2. Method

A total of 274 number of serum sample was analyzed in our study. The sample were analyzed immediately after collection of blood from the patient. The patient selected had attended OPD service of Pathosure diagnostic and physician

Volume 11 Issue 10, October 2022

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suggested for the analysis of uric acid, urea and creatinine. The demographic data of the patient was collected in a particular performa. The serum sample was analysed in biochemistry analyser (BeneSphera, C61). Uric acid was estimated by uricase method as per manufacture's instruction (Coral clinical system, Goa, India).

#### Serum uric acid estimation:

Uric acid was estimated by uricase method (Coral clinical system, Goa, India) as per manufacture's instruction. Uricase converts uric acid to allantoin and hydrogen peroxide. The hydrogen peroxide formed further reacts with a phenolic compound and 4-aminoantipyrine by the catalytic action of peroxidase to form a red colored quinoneimine dye complex. Intensity of the color formed is directly proportional to the amount of uric acid present in the sample.

#### Statistical analysis

Statistically analysis was done using SPSS 18. Pearson correlation was done for the study population and  $p < 0.05$  is considered statistically significant.

### 3. Results

A total of 274 patients attending the outpatient clinics in the town of unakoti at Tripura. The basic demographic data and clinical data were obtained from the patient using a Performa. Out of the total of 274 patients, 160 were male (58.3%) and 114 were Female (41.7%). The mean age of male was 51 and mean age of female was 47.

The study population was divided into 4 groups ranging from 15 - 29 years, 30 - 44 years, 45 - 59 years and 60 years and above, based on their age. Serum uric acid value of 70 patients (26%) found to be abnormal out 274 patients. Out of 70 patients with abnormal uric acid 49 (70%) patients were male and 21 (30%) patient were female out 70 abnormal uric acid. (Figure 1).

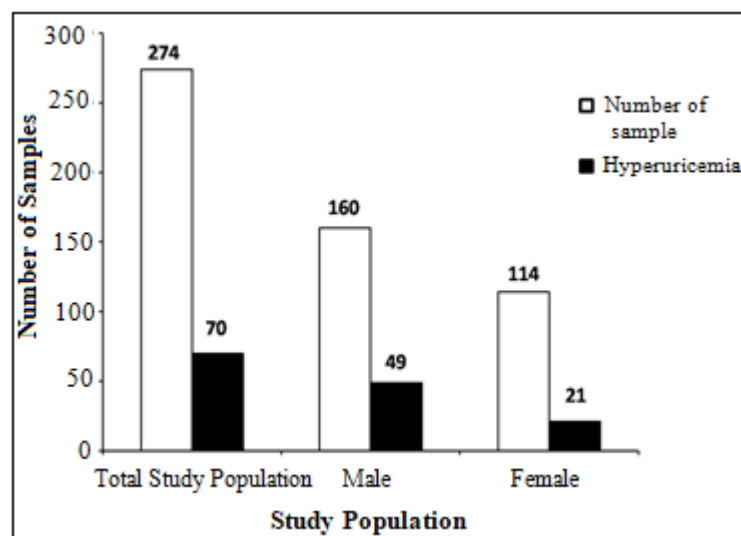


Figure 1: Hyperuricemia in Male, Female and in whole study population

Patient age group 60 years and above showed highest percentage of 37% hyperuricemia followed by 45 - 59 years with 27% hyperuricemia, 30 - 44 years with 18% hyperuricemia and 15 - 29 years 13% showing gradually increasing uric acid abnormality level according to age (Figure 2).

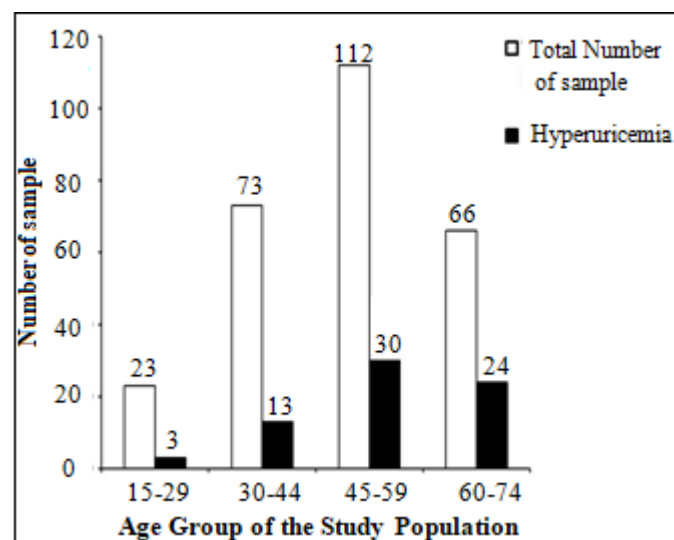
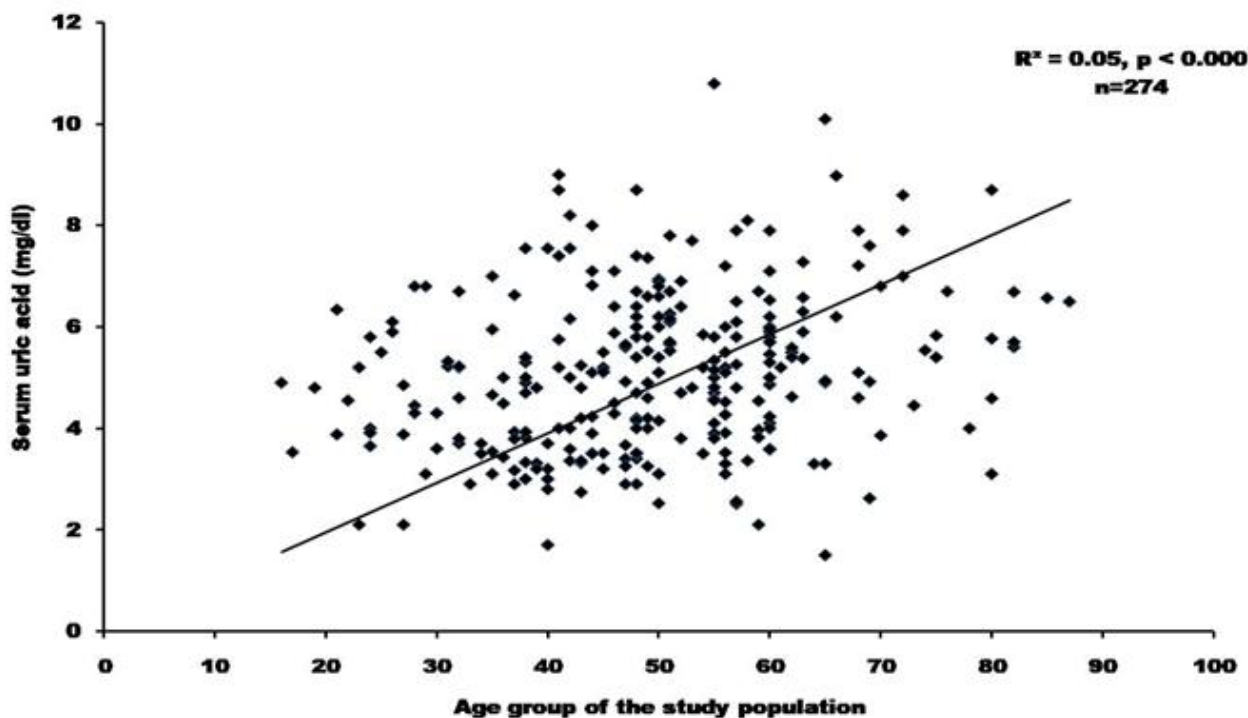


Figure 2: Hyperuricemia in different age group of the study population

Serum Uric acid was positively correlated with the age ( $p < 0.000$ ) in the whole study group (Figure 3). The normal uric acid level also gradually increases according to age in

both male and female. Table1 shows the mean uric acid levels in the study population according to the age and sex respectively.

**Figure 3 : Correlation between Serum uric acid and Age among the study population**



**Table 1:** Mean uric acid levels in different age group of the study population.

Age group (years)	Male (mg/dl)	Female (mg/dl)
15 - 29	5.26	3.9
30 - 44	5.58	3.7
45 - 59	5.7	4.4
60 and above	6.0	4.98

#### 4. Discussion

In the present study an attempt has been made to evaluate the association of serum uric acid in relation to age. Our study period was from 2019 to 2022 conducted for 3 years in suburbs of Tripura. A total of 274 patients were screened. 160 (58.3%) were male while 51 (41.7%) were female among 274 patients. Hyperuricemia was more in male patients compared to female patient. The level of uric acid is increasing with increasing the age of the male patients. However in case of women the level of uric acid is stable till the age 45 years, and after that starts increasing till the age of 85 years. From the study we have a clear indication of increasing the SUA level with age in Northeast Indian population.

A similar data of increased hyperuricemia in male has been earlier reported in a Chinese population. In a Chinese Study found that male had a higher prevalence of hyperuricemia in subjects younger than 70 years, while in the population elder than 70 years, the female subjects had the similar prevalence of hyperuricemia as male. (23) They also found that SUA level did not vary significantly in different age subgroups among elderly male.

Our study also reported a positive correlation of serum uric acid with increasing age in both men and women. A study in the United States from 1959 to 1960 reported that the SUA values in men increase rapidly to a peak level at 20 to 24 years, after which they declined slightly, and then reached a plateau, except for a slight later rise at 55 to 59 years whereas in a Japanese study reported that the SUA levels in men declined slightly from age 20 up to the seventh decade of life, whereas in women, the levels declined slightly from 25 years to about age 40, after which they rose up to the seventh decade of life. (21).

In recent Austrian study it was found that SUA levels increase with age, but to a different extent in men and women. In men, a modest and linear increase in SUA levels was observed from 20 to 80 years of age. However, in women SUA levels remained fairly stable until the age of about 50, but continued to increase suddenly afterwards which is in line with our present study. The Age - related distributions of SUA are argumentative in different cohorts and decades. Possible reasons could be population, period, life style changes viz consumption of sea food and occupation.

Process of aging increases the risk factors of many pathological conditions like diabetes, CVD, CKD and neurodegenerative diseases (27). Panel of clinical biomarkers for aging based on physiological system like lungs, livers, kidney, and immune system help in assessing the effect of aging. Linear correlation of serum uric acid

with clinical biomarkers of aging was also reported (26). Our present study also showed significant positive correlation of serum uric acid with age however it is still uncertain that increases in serum uric acid is contributed by age or by other factors like food habits, environmental factors, occupation, health condition of the population.

Limitation of the present study are low sample size which is confined to Tripura and the current results are only preliminary conclusion. However more longitudinal studies are required to demonstrate age related changes in increased serum uric acid levels.

## 5. Conclusion

In summary, SUA levels increase with advancing age in men and women. In men, a modest and linear increase in SUA levels however, in women SUA levels remained stable until a certain age, but increase suddenly afterwards.

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