

Role of URIC ACID in Disease: A Journey from Gout to Metabolic Syndrome

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Abstract

Background: Uric acid (UA) is the end product of purine metabolism. Its recent link with type 2 diabetes (T2D) and COVID-19 related complications has brought this molecule to limelight. From an innocent bystander initially thought to be associated only with gout to a central key player playing role in metabolic syndrome, uric acid has become the element of huge interest.

Aims and Objectives: The study was aimed to document the levels of serum uric acid (SUA) in general population across different age groups and gender.

Materials and Methods: A total of 858 subjects were recruited for the analysis of SUA. Samples were analysed on fully automated analyser (Beckman Coulter, AU5800). The levels were measured by uricase/POD method [1].

Results: The overall median SUA levels recorded in our population was 4.74 mg/dl (IQR = 3.61), which was within the normal reference limits. The UA levels in males were a bit higher (5 mg/dl) than females (4.5).

Conclusion: The results of our study show that serum UA levels in the study population were normal, well within the reference range. In the light of the fact that uric acid is a risk factor for many diseases, its continuous monitoring should be encouraged.

Keywords: Metabolic Syndrome; Serum Uric Acid; Kashmir; COVID-19

Introduction

The liver, muscles, and intestines synthesize UA [2,3]. UA is made up of purines. Exogenous sources that may elevate SUA, include fatty beef, organ meat, and shellfish [2,4]. The association between uric acid, more likely hyperuricemia was established some 150 years ago [5,6]. Initially uric acid was thought to play role in the pathogenesis of gout and kidney stones. However, as life progressed with speedy development, high levels of UA was linked with other diseases like hypertension (Htn), chronic kidney disease (CKD) and diabetes mellitus (DM) [7,8]. For the first time in 1951, hyperuricemia was associated with coronary heart disease (CHD) [9]. Data from previous researches hint at the possible etiological role of high UA in the pathogenesis of metabolic syndrome (MS),

cardiovascular diseases (CVD's) and renal disease [10,11]. It has been reported that COVID-19 infected patients develop marked hypouricemia [12,13]. Recent meta-analysis in china conducted in 15 cohorts revealed a significant positive association between serum UA levels and the prevalence of CKD in middle-aged patients [14].

In current population, a previous study reported the association of UA with Type 2 diabetes (T2DM) [15]. Earlier studies in the same region linked UA with gout and stone formation [16,17]. Another study associated UA with sepsis formation in severely ill patients in the same population [18]. One more study in the same region recognized UA as a risk factor for cardiovascular disease [19].

Considering the above facts, this study was aimed to assess the serum UA in general population of Kashmir, who visited Sheri-Kashmir Institute of Medical Sciences (SKIMS) Srinagar, major tertiary care hospital, from different parts of the valley for general consultation purpose.

Materials and Methods

The study was an observational retrospective in nature. A total of 859 blood samples were analysed in the department of clinical biochemistry. The analysis was done on fully automated analyser (Beckman Coulter, AU5800). The institute’s barcode system removes any likelihood of proxy, as previously data analysed from various patients on previous visits was discarded. Serum UA levels were measured by kinetic method. The reference range for serum UA ranged from 3-7 mg/dl. Statistical analysis was done on SPSS v26.

Results

The median age of the participants was 53 years. Out of 858 participants, 478(55.71%) were males and 380(44.28%) were females. 61 (7%) subjects had age < 20, whereas 215(25%) were those between 20-40 years old and 571 (66.5%) belonged to age group >40. The overall median serum uric acid (mUA) documented in mg/dl was 4.74 (IQR = 3.61). Males had slightly high mUA levels (4.99) than females (4.50). The mUA and levels in different age groups were recorded as, <20(4.7), 20-40(5.2) and >40(5.3) (Table 1). There was no statistically significant association noted between UA and gender (Table 2) as well as with different age groups (Table3).

	N (%)	mUA(mg/dl)	Reference range(mg/dl)
Age			
<20	61(7)	4.7	3.0-7.0
20-40	215(25)	5.2	
>40	571(66.5)	5.3	
Gender			
M	478(55.71)	4.99	
F	380(44.28)	4.50	

Table 1: Median Uric Acid (mUA) levels across Age and Gender groups in our population.

Gender	N	Mean Rank	Sum of Ranks	p-value
Male	478	443.42	211956.32	>0.05
Female	380	411.99	156555.42	

Table 2: Comparison of UA with Gender.

UA				
Age	N	Mean rank	Sum of ranks	P-value
<20	61	126.29	7703.50	>0.05
20-40	215	141.97	30522.50	
20-40	215	406.58	87415	>0.05
>40	582	396.20	230588	

Table 3: Comparison of serum UA levels with different Age groups in our population by using Mann-Whitney U test.

Discussion

Uric acid is a potential risk factor for gout, kidney stones and metabolic syndrome [20]. Recently its was associated with T2DM [21], and COVID-19 related complications [22]. The current study was an observational study. Serum UA levels recorded fell within the normal reference range. Previously UA has been studied thoroughly as a potential risk factor for many diseases and related complications in our population as mentioned above [15-17]. However, due to scarcity of previously published data, we could not find a report that could validate our findings. This could be because our study was designed to assess uric acid levels in random participants without knowing much about the ailment. It was a random trial in which people came to the emergency department for routine check-ups. As a result, it was designed to provide a broad assessment or screening of uric acid in the research population.

The most significant disadvantage of the study was that we had no clue about the disease status of the patients, and no thorough follow-up method was implemented.

Conclusion

Our results demonstrated that serum UA levels were within the normal range in the study population. Since uric acid poses a risk for numerous diseases, It is therefore important that regular monitoring is encouraged.

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