

Is the Cut off Limit of Normal Uric Acid & Calcium in Tropical Countries Different?

Divyanti Mishra and Vinod Kumar Mishra

Kanpur Urology Centre, Kanpur 208012, India

Abstract: Introduction: Nephrolithiasis is quite common in this part of the world. In the metabolic workup Uric acid and Calcium assay are important. Calcium & Uric acid lithiasis accounts for significant number of cases. But, the values given as reference do not seem to apply in tropical countries like India. We tried to analyse the values of Serum Calcium & Uric acid in both normal healthy individuals and those with calculus disease in out patient department. Material and methods: The study was conducted in outpatient department wherein Serum Uric acid, Calcium & Phosphorus levels were assessed in fasting state in all patients irrespective of age and sex in the period Jan. 2010- June 2015. A total of 9887 patients with stone disease were kept in Group A and 8967 patients with other diseases in group B who acted as control, were enrolled for the study. The demographic profile was recorded and associated metabolic disorders were also documented. Patients with associated features of bony pains and gout were also specified. Result: The Uric acid levels in the control group B were quite lower than the reference values in either sex. However, the values were more than 6 mg/dl in nephrolithiasis group A. The S.Calcium levels of control in group B were significantly lower than the reference value and patients with nephrolithiasis in group A also had hypocalcemia. Conclusion: Nephrolithiasis is a metabolic disorder with majority of patients having higher Uric acid levels with hypocalcemia in our population. The normal values in control group is on the lower side of reference value which could be due to variation on account of climatic, dietary and geographical factors. It needs broader studies to redefine reference values of Uric acid and Calcium in tropical countries like India.

Key words: Urolithiasis, uric acid, metabolic disorder, Calcium, gout, tropical countries hyperuricemia, hypocalcemia.

1. Background

Urolithiasis is quite common in India. In the metabolic workup, SUA (serum uric acid) and Ca (calcium) assay are being done routinely. But, although the values of SUA in patients with lithiasis are within the normal reference range yet patients had symptomatic disease. Similarly, the Ca levels are lower although the patient had Ca lithiasis. The prevalence of hyperuricemia and gout has been growing in Western countries for the past few decades [1, 2]. The worldwide rise in prevalence of hyperuricemia may be related to overweight and obesity [3], increased consumption of food rich in purines [4], alcohol [5] and soft drinks sweetened with fructose [6]. As a consequence the mean SUA levels in U.S. have increased from 3.4mg/dL in 1920 [7] to 6.25 mg/dL in 1970 [8]. It implies that perhaps it

might be appropriate to define the reference range of SUA and Ca levels according to physiological and pathological involvement in human disease rather than according to distribution of its circulating levels in the general population.

2. Objectives

We tried to analyse SUA and Ca levels in patients with Urolithiasis compared to controls (patients with other diseases), attending the outpatient department in an attempt to define their normal values compared to existing reference values.

3. Material and Methods

Study period: Jan. 2010-June 2015

Inclusion criteria:

- All patients with Urolithiasis irrespective of age and sex
- Normal renal functions

Corresponding author: Dr. V. K. Mishra, MS, M. Ch.,
Director, research field: nephrolithiasis.

Exclusion criteria:

- Renal failure
- Not willing to be part of study

All the patients attending the outpatient department were taken in the study after informed consent. Patients with Urolithiasis were grouped in A and those with any other ailment in group B. The demographic profile, detailed medical history and thorough clinical examination are done. All associated diseases like Gout, Diabetes, CAD (coronary artery disease), HTN (Hypertension) and dyslipidemia were also documented in both groups.

4. Specimen Collection and Handling Technique

The specimen is collected between 7.30 to 9.00 in the morning after overnight fasting. All patients were advised to take 15 min rest before blood collection. The venous blood samples were collected without tourniquet in a plain vacutainer red topped tubes or serum separator tubes (SST, Becton Dickinson, Franklin Lakes, NJ, USA). The tests were done in lab accredited by National Accreditation Board for Testing and Calibration (NABL). A detailed history of diet, smoking, alcohol and exercises was also taken.

5. Results

A total of 10,610 patients presented with Urolithiasis, of which 723 patients were disqualified because of raised creatinine. Hence only 9,887 patients were enrolled in group A. A total of 8,967

patients with other ailment were grouped in B (982 were excluded as they did not consent for investigations).

The demographic profile is as show in Table 1.

The SUA level in the control group B was quite lower than the normal reference values in either sex (Table 1). However, the values were more than 6 mg/dL in nephrolithiasis group. Which was again in normal range but, surprisingly, these patients had symptomatic stone disease with majority having features of Gout. The Ca levels of control in group B were significantly lower than the reference value and patients with nephrolithiasis in group A also had hypocalcemia. The values of calcium were also either below normal or as in lower range, in normal population in both sexes. Surprisingly, patients with calcium, lithiasis also had low calcium level.

The associated diseases in both groups are as Table 2.

It was observed that patients with Urolithiasis in group A had increased incidence of associated, diabetes, gout and dyslipidemia ($p > 0.01$). The incidence of HTN and CAD is comparable in both groups.

The dietary habits of both groups are as Table 3.

It was observed that Urolithiasis is more common in non vegetarian individuals ($p > 0.01$). There is significant increase of Urolithiasis in individuals with increased intake of alcohol ($p > 0.001$) and smoking ($p > 0.01$). Patients with sedentary life styles with no exercise are seen to have increased preponderance of urolithiasis.

Table 1 Demographic profile.

	Group A 9,887	Group A 9,887	Group B 8,967	Group B 8,967
	Male	Female	Male	Female
	6,193 (62.64%)	3,694 (37.36%)	5,890 (65.69%)	3,077 (34.31%)
S. Uric Acid mg/dL	6.8 ± 2.1 (Ref. 3.5-8.2)	6.1 ± 1.6 (Ref. 2.7-6.5)	4.1 ± 0.9 (Ref. 3.5-8.2)	3.2 ± 0.8 (Ref. 2.7-6.5)
Total S. Calcium mg/dL (Ref. 8.5-10.5)	7.5 ± 1.1	6.9 ± 0.8	8.1 ± 1.3	7.4 ± 1.2
S. Phosphorus mg/dL (Ref. 2.5-5)	2.2 ± 1.0	2.2 ± 0.9	2.3 ± 1.2	2.2 ± 1.2

Table 2 Co-morbid conditions.

	Group A (9,887)	Group B (8,967)
Diabetes	1,987 (20.09%)	1,293 (14.41%)
Hypertension	1,256 (12.70%)	1,360 (15.16%)
CAD	794 (8.03%)	768 (8.56%)
Gout	1,569 (15.86%)	1,050 (11.70%)
Dyslipidemia	2,549 (25.78%)	1,956 (21.74%)

Table 3 Dietary habits.

	Group A (9,887)	Group B (8,967)
Diet		
Veg.	5,142 (52%)	5,269 (58.7%)
Nonveg	4,745 (48%)	3,698 (41.25%)
Alcohol	2,130 (21.54%)	1,420 (15.83%)
Exercise	1,053 (10.65%)	1,598 (17.82%)
Smoking	1,369 (13.84%)	1,090 (12.15%)

6. Conclusions

Urolithiasis is a metabolic disorder with majority of patients having higher uric acid and lower calcium levels but majority had symptomatic gout, dyslipidemia and diabetes. The non vegetarian diets increased smoking and sedentary lifestyle also appear to have predisposition for Urolithiasis with raised SUA and low Ca levels although they appear within normal reference range.

Unfortunately, the reference range of SUA and Ca is deceptive. The patients of Urolithiasis have symptomatic gout even with normal references values. India is a tropical country with recent shift to Western life style in diet and increasing comfort s levels. We have observed lower level of SUA and Ca in normal control as well as patients with symptomatic Gout and Urolithiasis. There is a need for revision of reference value relevant to our country probably because of hot climate, increased sweating, dietary differences, food faddism and vegetarian diet with acidic urine, which predisposes for Urolithiasis. The low calcium levels and probably due to low calcium diet in general and homeopathy guided dietary restriction in stone population. A population based broader study is required to redefine the normal values of these

parameters in all regions.

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