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# EVALUATION OF ALTERED CALCIUMCREATININE RATIO AND URIC ACID CREATININERATIO IN PATIENTS OF UROLITHIASIS

**Dr. Navanil Roy*** Assistant Professor, Department of Biochemistry, Chandulal Shri Shankaracharya Medical College, Bhilai,Chhattisgarh, India* Corresponding Author

**Dr. Chaitanya S. Kulkarni** Assistant Professor, Department of Biochemistry, DY Patil Medical College Kolhapur, Maharashtra, India

ABSTRACT

The prevalence of stone disease in India is 11%. Adult men are 3 times more affected than women. Kidney stone disease is a major cause of morbidity in mankind. The metabolic defects are less likely to occur in the first time than recurrent stone formers. The present study was aimed determine the urinary levels of calcium, uric acid and creatinine. Calcium and creatinine ratio and uric acid and creatinine ratio was determined to screen patients with hypercalciuria and hyperuricosuria also find out recurrent stone formers. In our research work we took 30 clinically diagnosed cases of urolithiasis and 30 age and sex matched healthy controls. Our results showed increased concentration of stone promoters such as calcium & uric acid; and decreased concentration of stone inhibitors such as creatinine in urine of urolithiasis patients. Observations of our research work provide some evidence regarding the role of the above mentioned ratios in the pathogenesis of urolithiasis.

## INTRODUCTION:

Urolithiasis is defined as formation of polycrystalline aggregates composed of varying amounts of crystalloid and a small amount of organic matrix in the urinary tract (kidney, ureter & bladder).The life time prevalence of kidney stone disease is estimated 1% to 15% with the probability of having a stone according to age, gender, race and geographic location. Stone disease has the highest prevalence in whites followed by Hispanics, Asians and Africans. Stone disease is most common in 4$^{th}$ to 6$^{th}$ decade of life. Higher prevalence of stone is found in hot and dry climate. Seasonal variation in stone disease is likely related to temperature by way of fluid losses through perspiration and perhaps by sunlight induced Vitamin D. Heat exposure and dehydration constitute occupational risk factors for stone disease as well. Metabolic evaluation of the workers exposed to high temperature showed a higher incidence of low volume and hypocitraturia among the workers in the hot area. Those exposed to high temperature exhibited lower urine volumes and pH. Obesity and weight gain are independent risk factors for incident of stone formation. The incidence of stone disease is less in areas with hard water supply and more in areas with soft water supply. It begins with urine becoming super saturated with respect to stone formation salts, such that ions or molecules precipitate out of solution and form crystals or nuclei. Once formed crystals, crystals may flow out with the urine or become retained the kidney at anchoring sites that promote growth and aggregation and leads to stone formation. In normal human urine, concentration of calcium oxalate is 4 times higher than its solubility in water. Urinary factors favoring stone formation including low volume, hypocitratria and increased Calcium, Uric acid and Phosphorus increases Calcium oxalate super saturation. Once the concentration product exceeds the solubility product crystallization can potentially occur[1].

Calcium and Uric acid are seen in almost all the stones in different proportions. Previous studies have shown association of calcium and uric acid containing stones with hypercalciuria and hyperuricosuria. Idiopathic hypercalciuria has been increasingly recognized as a common pathology for renal stone disease. Hypercalciuria is defined as urinary calcium excretion of > 4 mg/kg/day[2].

A direct correlation between U Calcium/Creatinine in hypercalciuria has been shown by Osorio et al[3]. The tubular handling of promoters and inhibitors of stone formation as well as their urinary pattern can be strongly influenced by genetic factors.[4] A study have shown that urine Calcium/Creatinine value is believed to be varying with climate and exposure to sunlight, mineral composition of drinking water, dietary habits, age, genetics and sex[5].The present study was carried out to evaluate Calcium/Creatinine and Uric acid/Creatinine ratio in urolithiasis patients with hypercalciuria and hyperuricosuria.

## MATERIAL AND METHODS

The study was conducted from July 2012 to January 2013 in Department of Biochemistry, JJM Medical College, Davangere, Karnataka, India on 30 clinically and radiologically diagnosed cases of urolithiasis from Department of Urology, JJM Medical College and on 30 age and sex matched healthy controls taken from general population of Davangere. Prior to study, written consents were taken from psoriasis patients as well as healthy controls. An approval from Institutional Ethical Committee of JJM Medical College, Davangere was also obtained before study.

The urinary calcium was estimated by ARSEZANO'S method using semi-automated analyser. The urinary uric acid was estimated by URICASE method by semi-automated analyser. Urinary creatinine was measured by rapid enzymatic method in semi-automated analyser[9,6].

The results were analyzed statistically and were expressed as Mean±Standard Deviation. A p-value of 0.05 or less was considered as statistically significant [Table-1].

## RESULTS

A total of 30 urolithiasis patients with mean age of 45 years comprising and 30 controls with mean age of 45 years were investigated in this study. Study showed that the Urinary Calcium, Uric acid level were significantly increased ($p<0.05$) but Urinary Creatinine level was not significantly decreased or increased in urolithiasis patients as compared to healthy controls. This Study also showed that Urinary Calcium/Creatinine ratio and Uric acid/Creatinine ratio was significantly increased ($p<0.05$) as compared to healthy controls [Table-1].

## DISCUSSION

The recurrent nature of stone disease is a well-recognized clinical problem and often required surgical intervention for management. Kidney stones remain the major source of morbidity in human. It is generally believed that metabolic defects are less likely to occur in the patients with recurrent renal disease.

The relationship between calcium excretion and calcium intake are complex. Therefore both diagnostic and therapeutic purposes, it appears to be more useful to get information on the dietary dependence rather than on calcium dependence of hypercalciuria [2].

A study shows that a low calcium diet results in an excessively negatively calcium balance in patients with idiopathic hypercalciuria and renal stone. Patients in whom calcium was best absorbed from high calcium from high calcium diet also had the greatest calcium loss on low calcium diets. Study also suggested that a sustained high flux of calcium though kidney may attenuate the calcium conservation mechanisms in the renal tubules [3].

This would explain the higher calcium excretion during fasting that we found in stone formers as compared with normal subjects. Such a superfluous when the kidney is being flooded with calcium [4].

Values of creatinine tend to be lower in acidified or alkalinized samples than in untreated urines. This influence of pH has been predicted from studies of aqueous solutions [8].

Urinary ca/cr as high 0.44 in healthy Swedish children one has to consider that weather and dietary habits. Moreover several factors including geographic location, genetics, nutritional habits, source of drinking water, season, exposure to sunlight and even environmental pollutants have been postulated to explain the calcium /creatinine ratio in controls and cases [5].

The purpose of this study was to examine the pathophysiology of alkaline urine pH in patients with $CaPHO_4$ stones who do not have distal RTA. A second aim was to identify patients whom dietary factors do not seem to play a central role in the pathophysiology of their alkaline urine pH [6].

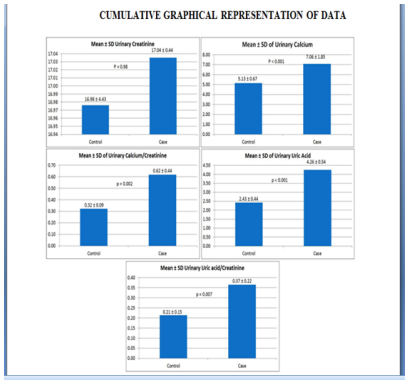
Hypercalciuria is a major risk factor for urolithiasis. Although hypercalciuria and bone mass loss are classic features of primary hyperparathyroidism, there is no evidence that the prevalence of osteopenia is statistically increased in lithiasic patients with idiopathic hypercalciuria[7].

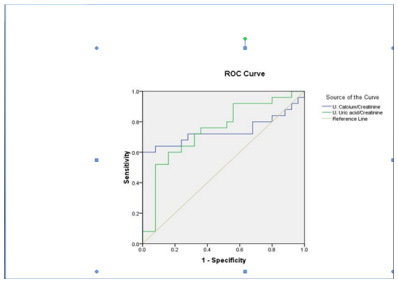
## CONCLUSION

In our study we found that urinary calcium and uric acid were found to be increased and there was no significant change in urinary creatinine level. Ratios such as calcium creatinine ratio and uric acid creatinine ratio were also increased. There was a significant co relation between the promoters and inhibitors with stone formation in the urinary tract. High concentration of calcium and calcium/creatinine ratio and uric acid/creatinine is used as an index of stone formation and also a screening tool to detect hypercalciuria and hyperuricosuria respectively.

**TABLE 1**

| Parameters | Controls | Cases | P value |
|---|---|---|---|
| U. Calcium | 5.13 ± 0.67 | 7.06 ± 1.85 | < 0.001 |
| U. Uric acid | 2.43 ± 0.44 | 4.26 ± 0.54 | < 0.001 |
| U. Creatinine | 16.98 ± 4.43 | 17.04 ± 0.44 | 0.98 |
| U. Calcium/Creatinine ratio | 0.32 ± 0.09 | 0.62 ± 0.44 | 0.002 |
| U. Uric acid/Creatinine ratio | 0.21 ± 0.15 | 0.37 ± 0.22 | 0.007 |

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