

A Study of 24 Hour Urinary Calcium, Phosphorus and Uric Acid Levels in Normal Subjects and Patients with Urolithiasis

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Research Article

Abstract: Background: Urinary stone formation is a common health problem worldwide. All forms of calculi are found in the renal and urinary tract of patients. Renal calculi are most commonly found in adults as compared to children. **Objective:** The aim of this study was to identify the level of calcium, phosphorus and uric acid in the urine of patients with urinary stones. **Methods:** The study was conducted over a period of six months (from March to August 2013). It is a descriptive cross sectional study. 24 hours urinary calcium, phosphorus and uric acid levels were determined with the help of Dimension rxL fully auto analyser using the kits supplied by Siemens. Data was collected from 60 subjects. **Results:** The prevalence of urolithiasis in male patients was 63.3% and 36.7% in female patients ($p < 0.05$). 24 hour urinary calcium in patients and control was 315 ± 102.5 and 255 ± 175.3 ($p < 0.03$). urinary phosphorus levels in patients with stones were statistically significant (330 ± 112.3). **Conclusion:** Higher levels of urinary calcium was found in patients with urolithiasis in this subjects. Urine phosphorus levels were also statistically significant.

Keywords: Hyperphosphaturia, hypercalciuria, urolithiasis, hyperuricosuria.

Introduction

Urolithiasis or urinary calculi is more prevalent in males than in females with the ratio of 4:1. There are multiple factors involved in the stone formation. Subjects who work in warm environments and experience strenuous physical exertion are more prone to urinary calculi.¹ Studies have shown that metabolic causes of urolithiasis were hypercalciuria, high or low pH of urine, hyperuricosuria. Deficient urinary excretion of citrate has often associated with urinary stone formation. Raised urinary uric acid is a well known risk factor for calcigenesis and in some cases, chronic dehydration or persistent low urinary pH may be causative factors.² So the aim of this study was to identify the levels of calcium, phosphorus and uric acid in the urine of patients of Marathwada region with urinary calculi.

Material and Methods

This is a prospective study conducted in the Department of Biochemistry, MGM Medical College and Hospital,

Aurangabad over a period of six months (from March to August 2013). The study is a cross sectional study where quantitative methods were used. 24 hours urine samples from 60 subjects were collected during the study period and they were divided into two groups. Group I- patients with urinary calculi and Group II-Subjects of similar age and sex matched without urinary calculi. All patients with urinary calculi were included in the study except those who required immediate treatment and those females who were pregnant. 24 hours urine sample were collected from both the groups and analysed using Dimension rxL fully auto analyser using the kits supplied by Siemens. Validity and reliability of the study were ensured by standardization and calibration of laboratory methods. The data were categorized according to presence or absence of urolithiasis. Data analysis was done using Statistical Package for Social Sciences (SPSS) version 17.0. p value < 0.05 was considered significant.

Results

A total of 60 subjects (30 cases and 30 controls) were eligible after excluding for final data analysis. The mean age of the patients was 40.2 ± 13.5 years, out of which 38 (63.3%) males and 22 (36.7%) females. (table 1) Metabolic analysis showed that in patients with urolithiasis 24 hours urine calcium and uric acid excretion are higher than control, while phosphorus levels were not significant. Urinary calculi was more prevalent in (30%) in 27-36 years of age. A total of 40% patients had comorbid conditions such as diabetes mellitus, hypertension and others. Out of 30 patients with urolithiasis, 85% had urinary calculi. The most common site of urolithiasis was kidney. 25% patients had history of previous surgery for urinary stones.

Table 1: showing comparison of subjects with and without urinary calculi

Variables		Subjects with urinary calculi(n=30)	Subjects without urinary calculi(n=30)	p value
Age (years)		40.2±14.2	40.1±16.8	0.866
sex	Males	20	21	0.76
	Females	10	09	
Daily fluid intake (L)		2.4±0.8	2.3±0.8	0.69
24 hours urine(ml)		3065±1024	3022±1003	0.833
24 hours urine calcium(mg)		315±102.5	205±105.3	0.0001*
24 hours urine phosphorus(mg)		190±112.3	182.5±115.5	0.387
24 hours urine uric acid(mg)		550.5±265.3	480.6±310.5	0.02*
*p-value <0.05 statistically significant (student t-test)				

Discussion

In the present study, different metabolites of 24 hour urine sample were assessed in patients with and urinary stones. It is known from studies that raised excretion of uric acid, calcium and phosphorus in the urine increases the formation of urolithiasis.³ In our study urinary calcium and uric acid levels were raised in patients with urolithiasis as compared to those without urolithiasis. We found the levels of 24 hour urine volume were increased but the levels of phosphorus were within normal limits. In our study there was a significant correlation between 24 hour fluid intake and output but there was no significant difference in patients with or without urolithiasis in terms of 24 hour fluid intake and urolithiasis.⁴ Despite the evidence that the urine volume was the most important risk factor of all parameters evaluated, there are few studies carried out to support the assumption of prophylactic effects of an adequate fluid intake. The study by Borghi et al confirms that urine volume is a real risk

factor in urolithiasis and that an increase in fluid intake to at least 2 L/day is the initial therapy for the prevention of stone recurrences.⁵ Although hypercalcuria and hyperuricosuria are definite risk factors for urolithiasis, we are having the similar findings in our study. This can be explained by multifactorial origin of urinary calculi and genetic variation in Marathwada region subjects. This can be shown by various studies on family history and urinary calculi.⁶

Conclusion

In conclusion, excretion of phosphorus was less in urinary calculi patients while 24 hour urinary calcium and uric acid were higher. These findings can be used for diagnosis and prognosis purposes. Abnormal urinary parameters is not only the risk factor for urolithiasis. These findings may also be due to conditions like climate, diet socio-economic factors, genetic etc.

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