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Serum and 24-Hour Urinary Uric Acid Levels in Patients With Urolithiasis

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Background: Renal stone disease is a common urologic disorder affecting a large number of patients around the world. Risk factors like anatomical abnormalities and genetic metabolic environmental and dietary parameters have important roles in urinary stone formation. One of its metabolic parameters is uric acid.

Objectives: The aim of this study was to evaluate the level of uric acid in serum and 24-hour urine samples of patients with urolithiasis and compare them with healthy general population.

Materials and Methods: This was a case-control study performed in the urology clinic of Noor hospital, affiliated to Isfahan University of Medical Sciences, between February 2009 and July 2010. Patients diagnosed with urolithiasis were enrolled as the case group. Healthy subjects from the general population were recruited as the control group. The patients were referred to the laboratory for checking the serum and 24 hour urinary uric acid levels.

Results: Forty five patients with renal stone and 90 healthy controls were enrolled. The level of serum uric acid was significantly higher among the patients (P = 0.003) and male patients had dramatically higher levels than females (P = 0.002); but, the urinary uric acid levels were not significantly different between the cases and the controls or the males and the females.

Conclusions: Serum uric acid level may be useful in the screening of renal stones, especially in patients with a positive history of this disease.

Keywords: Uric Acid; Urolithiasis; Kidney

1. Background

Renal stone disease is a common urologic disorder which affects a large number of patients around the world (1, 2). This disease occurs in about 10% of people during their lifetime and recurs in 50 - 70% of these patients (1-3). Some risk factors like anatomical abnormalities of the urinary system, genes, and environmental metabolic and dietary parameters have important roles in urinary stone formation (2, 4, 5).

Because of its high prevalence as well as the effects of metabolic and dietary parameters, the idea of checking some of these biochemical factors in these patients seems to be a reasonable screening. These biochemical factors help us to diagnose the at-risk populations, so that preventive measures could be applied. One of these parameters is uric acid which is a product of purine metabolism and is a main constituent of renal stones, especially in low-pH urines (6-9).

2. Objectives

The aim of this study was to evaluate the level of uric acid in serum and 24-hour urine samples of patients with urolithiasis and to compare them with the healthy general population.

3. Materials and Methods

This was a case-control study performed in the urology clinic of Noor hospital, affiliated to Isfahan University of Medical Sciences, between February 2009 and July 2010.

Patients diagnosed with urolithiasis (with any size or composition) by an expert urologist were enrolled as the case group. Healthy subjects from the general population were recruited as the control group. None of the subjects had known cardiac, renal or rheumatologic disorders. Pregnant individuals, as well as subjects who used corticosteroids, diuretics and uricosuric drugs, were not entered in to the study.

Written informed consent was obtained from all of the subjects. They provided a complete physical history, underwent some examinations and filled out a questionnaire. This questionnaire covered demographic data,

history of urologic disorders, especially renal stones, and past medical, surgical and drug history. The patients were referred to the laboratory for checking the serum and 24-hour urinary uric acid levels.

The data was analyzed using SPSS software, 16th version. Chi-square and Fisher's exact tests were used to analyze the qualitative parameters and independent t-test was used for quantitative parameters. The ethics committee of Isfahan University of Medical Sciences approved the study.

4. Results

Forty five patients with renal stone and 90 healthy controls were enrolled. Their mean ages were 46.0 ± 14.6 and 45.6 ± 12.5, respectively (P = 0.90). Their demographic data is summarized in Table 1. The treatment method of the case group is presented in Table 2. The serum and 24-hour urinary uric acid levels of both groups and their details according to the patients' gender are shown in Tables 3 and 4.

According to Table 1, a positive past history of nephrolithiasis was significantly more prevalent in the patients compared to the control group (P = 0.001). According to these results, the level of serum uric acid was significantly higher among the patients (P = 0.003) and the male patients had dramatically higher levels than females (P = 0.002); but, the urinary uric acid levels were not significantly different between the cases and the controls or the males and the females.

Table 1. Demographic Information of Case and Control Groups

Parameter	Case Group	Control Group	P Value
Age, y	46.0 ± 14.6	45.6 ± 12.5	0.90
Gender, Male/Female, %	73.3/26.7	73.3/26.6	
Marital Status, Married/Single, %	88.9/11.1	80/20	0.25
Positive Nephrolithiasis Past History	84.4	0	0.001

Table 2. The Treatment Method of Case Group [a]

Treatment Method	Patients, No. (%)
No treatment	6 (13.3)
Conservative treatment	12 (26.7)
ESWL	7 (15.6)
Surgery	4 (8.9)
TUL	3 (6.7)
Other methods	13 (28.9)

[a] Abbreviations: ESWL, extracorporeal shock wave lithotripsy; TUL, transurethral lithotripsy.

Table 3. Serum and 24-Hour Urinary Uric Acid Levels of Both Groups [a]

Parameter	Case Group	Control Group	P Value
Serum uric acid, mg/dL	6.2 ± 1.2	5.3 ± 1.3	0.003
24 hours urinary uric acid, mg/dL	627 ± 222	653 ± 234	0.580

[a] Data are presented as Mean ± SD.

Table 4. Serum and 24-Hour Urinary Uric Acid Levels of Both Groups According to Gender

Parameter	Case Group			Control Group		
	Male	Female	P Value	Male	Female	P Value
Serum Uric Acid, mg/dL	6.3 ± 1.2	5.9 ± 1.3	0.002	5.7 ± 1.3	4.5 ± 1.2	0.380
24-Hour Urinary Uric Acid, mg/dL	656 ± 234	551 ± 166	0.170	674 ± 219	548 ± 246	0.060

5. Discussion

The goal of this study was to evaluate the level of serum and urinary uric acid in patients with nephrolithiasis and compare them with healthy subjects. About 70% of the patients were males; in other studies, the prevalence of renal stones were three times higher in males than in females (9-12). About 89% of the patients were married. The marital status was not significantly different between the groups; it may affect the occurrence of urinary stones. Married people are usually older and their life style is different. In addition, some genitourinary infections are more prevalent in married people. Further studies should be conducted to evaluate the effects of this factor on the incidence of urinary stones.

About 84% of patients had a positive history of urolithiasis. The process of stone formation usually has a genetic background and these patients may experience several episodes of renal stones. Environmental factors like nutritional habits, occupational status and life style can affect the stone formation process (11-14). Therefore, patients who present the first episode should be educated about these risk factors.

In different studies, biochemical factors have been evaluated in patients with renal stone. Some of them reported that hypernatriuria, hypercalciuria, low fluid intake, abnormal uric acid metabolism and acidic urine were the main biochemical disturbances in these patients (15-24).

In this study, the level of serum uric acid was significantly higher in the case group and in the male patients, but the 24-hour urinary uric acid levels were not dramatically different. Some studies have confirmed the role of urinary uric acid in formation of calcium oxalate stones, which accordingly demonstrates the importance of the treatment of hyperuricosuria (22, 24-33). This study did not show such difference. However, other studies have shown significant differences in among 24-hour urinary samples.

According to this study, the serum levels of uric acid correlated more strongly with urolithiasis than urinary levels; thus, checking the serum levels of uric acid as a routine test among patients at risk of stone formation seems to be helpful (34-36).

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