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The Possible Role of Urinary Tract Infection in Urinary Stone Formation in Children

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Abstract

Background and Aim: The aim of this study was to evaluate urinary metabolic features as a risk factor in stone formation.

Methods: In this case-control study, 222 children ranging from 6 months to 16 years old suffering from urolithiasis in our university hospitals in Iran in 2019-2020 were selected through random sampling and were subsequently evaluated. The research group were children with urinary stones and urinary tract infection and the control group encompassed children with urinary stones and without urinary tract infection. Data was analyzed using statistical package for social sciences (SPSS) version 16 (SPSS Inc. Chicago, IL) for windows.

Results: The ratio of average amounts of calcium, magnesium, oxalate, cystine, uric acid, and citrate to creatinine showed no significant differences between the two groups.

Conclusion: Urinary tract infection cannot be considered as a factor for stone formation in the urinary tract due to changes in urinary biochemical characteristics.

Keywords: Urolithiasis; Urinary Tract Infection; Children.

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Introduction

The incidence of urolithiasis in childhood is higher than previously recorded in prior studies in Iran. The prevalence has increased recently, even in regions not endemic for urinary calculus disease (1-3). This could be related to an increased awareness of the phenomena or to the extension of ultrasonography to routine practice in pediatrics. About 7% of urinary calculi occur in children younger than 16 years of age (4, 5). Generally, the incidence of urinary calculi in children is about 2% to 3% (6). Urinary tract stones are common to all countries and regions of the world; however, its prevalence in Asian countries and the Middle East is greater than other regions of the world in as such that Iran is considered as an endemic area in which approximately 7% of renal stones are seen in children under 16 years (7).

Several mechanisms for the formation of urinary tract stones such as epithelial defect have been mentioned in the literature. Although the role of bacteria and urinary tract infections in the creation of struvite stones has been acknowledged, the role of bacteria in the development of metabolic disorders as a possible cause for many urinary stones has been rarely considered. The aim of this study was to evaluate the metabolic risk factors of urolithiasis in children.

Methods

In this case-control study, after receiving the ethics approval and patient informed consent, 222 cchildren 6 months to 16 years old with urolithiasis who referred to our university hospitals in Iran in 2019-2020 were selected through random sampling.

Urolithiasis was diagnosed by an urologist with 10 years of experience. Patients were divided into two groups with 111 members in each. The cases were children with urinary stones and a urinary tract infection, and the control group included children with urinary stones without a urinary tract infection. Urine calcium, oxalate, citrate, uric acid, cysteine, and creatinine were measured then the ratio to urine creatinine was measured, so that urine concentration did not lead to false results. The researchers considered children aged 6 months to 16 years with urinary stones as inclusion criteria. Cases with abnormalities in the urinary system, urological disorders, underlying systemic disease or without lack of consent to participate in the study were excluded from the research. Individuals were asked to sign an informed consent form before answering the questionnaire. All the personal information of the patient remained anonymous.

Data was analyzed using the statistical package for social sciences (SPSS) version 16 (SPSS Inc. Chicago, IL) for Windows. Normal distribution variables (approved by one-sample Kolmogorov–Smirnov test) were compared using an independent sample t-test between the groups and paired sample t-test within the groups. P value < 0.05 was considered statistically significant.

Results

Eventually 222 cases (113 males and 109 females) underwent analysis. One hundred and eleven patients were considered as the control group and 118 as cases under study. Gender distribution differed between the two groups significantly. (P=0.000) (Table 1). According to table 1, there is no ssignificant difference in term of age between the groups. (P=0.87).

Table 1. Gender and Age Distribution of study groups

Groups	Gender		Age	
	Male	Female	>24 months	<24 months
Case	70	41	25	86
Control	43	68	24	87
P Value	0.000		0.87	

Table 2 shows the difference in ratio of the mean of urinary calcium, oxalate, citrate, cystine, uric acid, and magnesium to creatinine between the two groups. As per the table, daily excretion of calcium, uric acid, oxalate, cystine and magnesium did not differ statistically in the two groups. However, urinary citrate was significantly lower in stone formers than in the control group (p = 0.01).

Table 2. Urine Examination data of study groups

Groups	Case	Control	P Value
Calcium/Cr*	0.35±0.35	0.42±1.4	0.59
Oxalat/Cr	0.42±2.5	0.6±3.76	0.67
Citrate/Cr	0.88±2.04	2.69±7.1	0.01
Cystine/Cr	0.001±0.09	0.00±0.00	0.15
Uric acid/Cr	1.04±0.6	1.93±8.7	0.28
Mg/Cr**	0.19±0.16	0.16±0.19	0.27

*Creatinine **Magnesium

Discussion

The research found that urine infection is a factor in the changing of the ratio of citrate to creatinine in the urine of patients with suspected urinary tract stones. Tekin et.al (8) reported that urinary oxalate was significantly higher, and urinary citrate was significantly lower in stone formers than in controls. In the current study, urinary oxalate was lower and urinary citrate was significantly lower in stone formers than in controls.

According to a study carried out by Nowakowska et.al (9), the majority of patients with urolithiasis were females. This finding was not in line with our study. According to our study, most patients were males. Alpay et.al (10) indicates that metabolic abnormalities include hypercalciuria, hypocitraturia, hyperoxaluria, hyperuricosuria, and cystinuria. In the current study, analysis revealed hypocalciuria, hypooxaluria, hypocitraturia, and cystinuria.

Alemzade -Ansari et.al (11) concluded that the most common metabolic risk factors for infantile urinary calculus were hypercalciuria, hypocitraturia, hyperoxaluria, and hypomagnesuria. These findings were reported by Cambareri et.al (12). The current research was in line with the results for hypocitraturia.

Robert et.al (13) demonstrated that infection can be a factor for change in the ratio of nitric acid to creatinine in the urine of patients with suspected urinary tract stones. This research concluded that infection was not a factor for change in the ratio of

nitric acid to creatinine in the urine of patients with suspected urinary tract stones.

Conclusion

In conclusion, infection in the urine of patients with urinary tract stones which could cause changes in urethra chemical and metabolic characteristics.is not effective
in the formation of stones in urine It is believed that further studies with a larger sample size will confirm the results of this study.

Conflict of Interest

The author declares no conflicts of interest.

Financial Support

Not declared.

Ethics

In this query, individuals were asked to sign an informed consent form before answering the questionnaire. All the personal information of the patient remained anonymous.

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