Metabolic Disorders in Iranian Children with Urolithiasis

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ABSTRACT

Background: Children with urolithiasis have a wide range of metabolic disorders which should be carefully considered. The response to medical treatment could predict recurrence and need for surgical interventions.

Objectives: The goal of this retrospective study is to determine the prevalence of metabolic disorders in Iranian children and assess patients’ response to treatment based on the etiology of their urolithiasis.

Material and methods: Medical record of 100 children with urolithiasis who were referred to Bahrami hospital (affiliated hospital of Tehran University of Medical Sciences) between 2007 and 2017. Data regarding age, sex, family history, symptoms, size of the stones, type of treatments, response to treatment, and recurrence were recorded for all cases.

Results: Subjects had a mean age of 36 ±36 months and 62 (62%) of them were females. Twenty-two percent had a family history of urolithiasis. The mean age was 37.2±35 months in the complete response group, 38±44.4 months in the partial group, and 30±33.1 months in the no response group (p=0.7). There was no significant difference regarding sex and age with treatment response (p=0.8). In the complete response group, nearly 72% of cases had stones with sizes less than 3 mm. Three cases had surgical interventions and 18 had recurrence.

Conclusion: Hypercalciuria followed by hyperoxaluria were the most common metabolic disorders in Iranian children with urolithiasis. Stone size plays an important role in the response to treatment.

Keywords: urolithiasis, children, Iran.
INTRODUCTION

One of the important renal disorders in pediatric patients is urolithiasis, which has a wide geographic variation (1). In recent years, its incidence and prevalence increased dramatically, which is related to the higher rates of recurrence and morbidity (2-6). Different elements such as climate, diet, genetic inheritance and socioeconomic factors have been considered to have roles in urolithiasis development in children (1, 7).

Most children with urolithiasis have metabolic disorders which cause a higher risk of recurrence (1). So, metabolic evaluation after urolithiasis diagnosis will be helpful (8). Identification of metabolic abnormalities will lead to a better management (administration of non-pharmacological and pharmacological interventions) to prevent recurrence (8, 9).

On the other hand, urinary tract anatomical malformations, urinary tract infections and nutritional changes predispose children to urinary infections, and therefore, urinary infectious stones can be formed (10).

Contrary to the adolescent group, there are little studies regarding this issue in pediatric population. The goal of this retrospective study is to determine the prevalence of metabolic disorders in Iranian children and how patients respond to treatment based on the etiology of their urolithiasis.

METHODS

This is a retrospective study conducted in Bahrami hospital (affiliated hospital of Tehran University of Medical Sciences) between 2007 and 2017, which was approved by the Ethics Committee of Tehran University of Medical Sciences.

Inclusion criteria: all children aged under 14 with urolithiasis.

Exclusion criteria: follow up duration less than six months.

Data regarding age, sex, family history, symptoms, size of the stones, type of treatments, response to the treatment, and recurrence occurrence were recorded for all cases.

SPSS version 24 (SPSS Inc., Chicago, IL, USA) was used for data analysis. Data was shown in mean ±SD for continuous and frequencies for categorical variables.

ANOVA test was used for comparing continuous data between groups. P value lower than 0.05 considered as significant.

RESULTS

Medical records of 100 patients were reviewed. Mean age was 36±36 months and 62 of them (62%) were females. Twenty-two percent had family history of urolithiasis. Agitation was the most common symptom (Table 1).

The mean age was 37.2±35 months in the complete response group, 38±44.4 months in the partial group and 30±33.1 months in the no response group (p=0.7).

There was no significant difference regarding sex and age with treatment response (p=0.8). In the complete response group, nearly 72% of cases had stones with sizes less than 3 mm (Table 2).

Sixty-five patients underwent polycytrate solution therapy. Fifty-two cases had complete re-
**Metabolic Disorders and Urolithiasis**

<table>
<thead>
<tr>
<th>Family history</th>
<th>Complete N= 73</th>
<th>Partial N= 11</th>
<th>No response N=16</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metabolic disorder</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cystinuria</td>
<td>14 (19.1%)</td>
<td>4 (56.3%)</td>
<td>4 (25%)</td>
<td>0.7</td>
</tr>
<tr>
<td>Hyperoxaluria</td>
<td>16 (21.9%)</td>
<td>2 (18.2%)</td>
<td>4 (25%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Hypercalciuria</td>
<td>13 (17.8%)</td>
<td>3 (27.3%)</td>
<td>8 (50%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Hyperuricosuria</td>
<td>13 (17.8%)</td>
<td>1 (9%)</td>
<td>1 (6%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Hypocitratury</td>
<td>13 (17.8%)</td>
<td>5 (45.4%)</td>
<td>3 (18%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Normal</td>
<td>17 (23.2%)</td>
<td>0</td>
<td>0</td>
<td>0.001</td>
</tr>
</tbody>
</table>

| Size | Less than 3 mm | 52 (71.2%) | 5 (45.4%) | 5 (31.2%) | 0.004 |
| | More than 33 mm | 21 (28.7%) | 6 (54.6%) | 11 (68.8%) | 0.004 |

**DISCUSSION**

The results of the current study showed that hypercalciuria followed by hyperoxaluria were the most frequent metabolic disorders in children with urolithiasis. We also found that 62% of all enrolled cases were female. In a previous study conducted by Amancio, 106 children with urolithiasis were evaluated; most cases (69%) were males, and hypercalciuria followed by hypocitraturia were the most frequent underlying metabolic diseases (10). Two previous studies reported that there were more hospitalized girls than boys due to urolithiasis (11, 12), which confirms our findings. On the other hand, the prevalence of urolithiasis is higher among males than females, ranging from 1.2:1 up to 4:1, which is consistent with adults (13-15). In the study of Ertan et al, most cases were males (55%) and the mean age of subjects was 66 months (1).

Urinary stones affect children of all ages and the mean age in this study was three years old, which is lower than the mean of other developing countries such as Turkey, Pakistan, Armenia and Tunisia (7.3 years) (16-18). In North America, the mean age is slightly higher, ranging from 11.3 to 13.2 years (4, 5, 19).

In the current study, 22% had a positive family history, while in previous studies, positive family history was reported among 40%-85% of cases (10, 20, 21).

The most clinical manifestations in children of this study were agitation, abdominal pain, and UTI. In the study of Amancio et al., abdominal pain, renal colic and urinary tract infection were the most common clinical symptoms (10), while Ertan et al. found that abdominal pain and UTI were the most frequent manifestations (1). Children with urolithiasis can have a wide range of clinical manifestations such as renal colic, hematuria, vomiting, abdominal, flank and pelvic pain, recurrent or isolated urinary tract infections (14).

Seventy-three cases had metabolic alterations, while hypercalciuria was the most common metabolic disorder. Metabolic alterations have been previously reported in 33% to 93% of pediatric patients (2, 4, 10, 20), while hypercalciuria occurred in 72% to 88% of explored cases (4, 9, 19, 20). Hyperoxaluria followed by hypocitraturia were the second and the third metabolic alterations in the current study, which is in agreement with the findings of Amancio et al.
(20). This could indicate that metabolic evaluation in children with urolithiasis should be considered.

Non-pharmacological and pharmacological treatment in children with urolithiasis tends to prevent formation of new stones and reduce the size of stones, which will lead to morbidity reduction. In the current study, more patients with hyperoxaluria responded completely to the medical treatment, while more subjects with hypocitratury had only partial response to the medical treatment.

Citrate therapy is useful to reduce recurrence and stone growth (22). ESWT was applied in 11 cases, three cases underwent surgery and 18 had recurrence. In previous studies, recurrence was reported to range between 19% and 50% (15, 19, 23).

The difference regarding the recurrence rate can be according to various sample sizes, different follow-up durations, types of stones, and underlying metabolic disorders (10).

**CONCLUSION**

Hypercalciuria followed by hyperoxaluria were the most frequent metabolic disorders in children with urolithiasis. Stone size plays an important role in treatment response.


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References