DOI: https://doi.org/10.53350/pjmhs2023175306

ORIGINAL ARTICLE

Frequency of Different Metoboloic Abnormalities in Paediatric Age Group with Renal Stone Diseases

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ABSTRACT

Introduction: Up to 15% of children under the age of 15 may have paediatric urolithiasis, which is linked with severe morbidity and high recurrence rates. This condition is still a serious urological concern. In 86% to 96.1% of kids with kidney stone disorders, metabolic abnormalities are one of the most frequent causes of urolithiasis. Hypercalciuria, hyperoxaluria, hyperuricosurea, and hypocitraturea are the most prevalent metabolic disorders. In order to treat and prevent renal stones in children with renal stone disorders, it is crucial to identify several metabolic abnormalities.

Materials and Methods: Descriptive Cross-Sectional Study at the IKD, HMC, Urology Department. This research covered paediatric patients with urolithiasis under the age of 15 years. All patients with urolithiasis had a 24-hour urine assay for metabolic abnormalities on their first visit.

Results: 119 individuals, or 72.12%, of the total 165 patients, exhibited metabolic disorders. Out of 119 patients, hypercalciurea affected 56 patients (47.05%), hypocitraturea affected 31 patients (26.05%), hyperoxalurea affected 18 patients (15.12%), and hyperuricosurea affected 14 patients (11.65%). 41 patients, or 34.45% of the 119 total patients, were female youngsters, making up 78 patients (65.54%). The most frequent findings were hypocitraturea and hypercalciuria.

Conclusion: Urolithiasis in children is often brought on by metabolic disorders, which are curable and avoidable. In order to detect, treat, and prevent urolithiasis recurrence as well as morbidities brought on by urolithiasis in paediatric patients, it is advised that all paediatric patients presenting with urolithiasis for the first time undergo extensive investigation.

Keywords: Metabolic Abnormalities**,** Recurrent Renal Stones, Urolithiasis

INTRODUCTION

Paediatric urolithiasis persists in resource-poor nations [1-4]. Compared to 1% in rich countries, 15% of children under 15 may be affected [5]. Over the past 20 years, paediatric urolithiasis has increased, causing severe morbidity and high recurrence rates [6-10]. Paediatric urolithiasis is a major urological issue [1,10].

Paediatric urolithiasis risk factors include genetic inheritance, dietary habits, metabolic abnormalities, environmental factors, anatomical features, and calculi-causing medications3. Metabolism and morphology cause urolithiasis [5,7]. Children commonly have metabolic and genitourinary abnormalities [2,3,11]. Most children with renal stones have metabolic issues [7,12].

50% of paediatric stone disease patients have metabolic changes [5]. Metabolic problems in children increase recurrence [4,10,13]. One research found 20–40% recurrence rates with varied follow-up times [4]. According to another study, 6.5% to 44% of youngsters had reoccurring stones every 3-6 years. Children with metabolic problems are five times more likely to have recurring stones [10]. According to ten-year investigation, metabolic abnormalities cause most paediatric kidney stones [4].

One study revealed 30% of children with renal stones had metabolic abnormalities3, and two more found 96.1%.8,10. Most metabolic diseases that cause calculi include hypercalciuria, hyperoxaluria, hyperuricosure, hypocitrature, renal tubular acidosis, and cystinuria1,3,7. Most metabolic abnormalities were hypercalciuria [8,14].

One study found metabolic abnormalities in 42.7% of paediatric renal stone patients. Hypercalciuria (21.7%), hyperuricosure (11.5%), hypocitrature (11.5%), and cystinurea (3.8%), were the metabolic anomalies most linked with calculus formation. Another study found metabolic abnormalities in 96.1% of children, including hypercalciuria in 79.6% [14]. Two investigations of urinary risk factors in stone formers in one location found that 26-27% of children had hyperuricosurea, 11-26% had hypercalciuria, 40-43% had hyperoxaluria, and 63-87% had hypocitrature.

41% of Turkish participants had hypercalciuria, 40% had hypocitraturea, 22% had hyperoxaluria, 9% had hyperuricosurea, and 4% had cystinurea.1. Metabolic screening and treatment of metabolic disorders prevent stone formation [13,15].

Urolithiasis therapy and prevention need evaluation of urinary risk factors, especially in children when diet and medication may address most risk factors [13]. Every young patient with their first kidney stone must undergo a diagnostic examination to detect any metabolic issues that may cause recurrent urolithiasis.

METERIALS AND METHODS

Study design: Descriptive Cross Sectional Study

Study Setting: Department of Urology team A, Institute of kidney diseases, Hayatabad Medical Complex, Peshawar.

Duration of study: From 1 March 2019 to 31 March 2020.

Sampling: Male and female patients aging less than 15 years presenting with renal stones were enrolled. Patients taking antacids for gastritis, K-sparing diuretics and indinavir were excluded. Participants were recruited through non-probability consecutive sampling technique.

Data collection: Participants who were enrolled had a thorough medical examination and history review. All patients had thorough laboratory testing for their metabolic profiles, which included measurements of their uric, oxalate, and serum calcium levels. A 24-hour urine test was performed to check for excessive metabolic component excretion. Urinary oxalate, uric acid, and uric acid cutoffs were established at 750ng/24 hours, 40mg/24 hours, and 300mg/24 hours, respectively.

Data analysis: MS Excel was used to collect the data, while IBM SPSS version 24 was used for analysis. While categorical data were shown as frequencies and percentages, numerical variables were shown as mean, standard deviation, or median (IQR). Independent sample t test and chi square test were used as statistical tests of significance for quantitative and qualitative variables, respectively. Statistics were deemed significant if P 0.05.

RESULTS

This research had 165 patients in total. All had a 24-hour urine study to check for levels of calcium, citrate, oxalate, and uric acid; 119 patients (72.12) showed metabolic abnormalities. Hypercalciuria, hyperoxaluria, hyperuricosurea, and hypocitraturea were all recognised as metabolic anomalies. In the 72.12% of patients with metabolic abnormalities, hypercalciuria was seen in 56 patients (47.0%), hypocitraturea in 31, hyperoxaluria in 18, and hyperuricosurea in 14 patients (11.65%). 78 individuals—or 65.54

percent—of the 119 patients with metabolic disorders were male children. 41 patients out of 119 total patients, or 34.45% of patients, were youngsters. The range of ages was 8 months to 14.5 years. 7.8 years old on average.

Metabolic problems were more prevalent in patients aged 5 to 10 than in other age groups. Under the age of 5, 32 patients (26.89%), between the ages of 5 and 10, 48 patients (40.33%), and between the ages of 10 and under 15, 39 patients (32.77%), all exhibited metabolic abnormalities.

In our investigation, the most prevalent metabolic abnormalities in patients with urolithiasis in the paediatric age range were hypercalciuria and hypocitraturia.

DISCUSSION

Urolithiasis has caused urinary calculi for centuries [16,17]. Paediatric urolithiasis, which varies regionally, is a major kidney disease. What is the link between the dramatic growth in its incidence and prevalence in recent years and the increasing rates of recurrence and morbidity? Climate, diet, genetics, and socioeconomic factors have been associated to urolithiasis in children18. Most children with urolithiasis have metabolic abnormalities, which increase recurrence risk. Urinary calculi plague children. Delaying calculi diagnosis or treatment may cause renal parenchyma damage and kidney failure [3].

In poor countries including the Middle East, Turkey, and the Far East, paediatric urolithiasis is endemic [2]. Urolithiasis morbidity has increased, which explains its growing attention. Previously deemed accidental, children and babies are now affected. Many commentators suggest that, especially in the juvenile population, urolithiasis should be considered more as a symptom than a disease, needing both long-term specialist therapy and a complete investigation of the probable causes following diagnosis [16]. A substantial risk factor for paediatric calculus disease has been established in the United States as hypersecretion of calcium. According to Battino and colleagues, the most frequent metabolic imbalance in youngsters with nephrolithiasis is a calcium-related anomaly. Low levels of magnesium and citrate in the urine, as well as hyperroxaluria and hyperuricosurea, were all common outcomes in a Pakistani examination. The most frequent risk factor for patients with calcium calculus sickness among Turkish children has been discovered to be hypocitraturea. In Turkish paediatric calculus formers, Tekin and colleagues discovered hypocitraturea as the most important metabolic risk factor and hyperoxalurea as a common etiologic component that coexists with hypocitraturea [19]. All patients with a family history of calculus also had a metabolic aetiology, which is assumed to be the source of calculus development. Most metabolic abnormalities were hypercalciuria [2].

All study participants got a 24-hour urine calcium, oxalate, uric acid, and citrate analyses as part of a metabolic workup. All urolithiasis patients got 24-hour urine tests for calcium, oxalate, uric acid, and citrate on their initial visit. Most patients had metabolic problems, including hypercalciuria and hypocitrature. Hyperuricosurea, hypercalciurea, and hyperoxalurea were also anomalies. In Pakistan and Turkey, 5–15% of children have urinary tract stones, compared to 5% in high-income countries [1,2] Children's urinary stone symptoms differ from adults'.

Hypercalciuria is the main metabolic cause of stone formation in Khyber Pakhtoonkhwa. Statistics define hypercalciuria in children as urine calcium excretion above 4 mg/kg.[21,22,23]. Hypercalciuria was found in 47.05% of 56 24-hour urine samples. Park et al. found 35–65%. Most instances of hypercalciuria are idiopathic and caused by excessive gastrointestinal calcium absorption or renal tubule calcium reabsorption. Hypocitraturea in children is less than 400 mg/g creatinine excreted in 24 hours.23.31 patients (26.05%) had hypocitraturea. Hypocitraturea is another recognised calcium oxalate stone risk factor. Urine oxalate levels over 0.5 mmol/1.7 m2/day indicate hyperoxalurea in children.[18] individuals (15.12%) had hyperoxalurea. Urinary oxalate excretion may affect calcium oxalate stone formation because a little change in urine oxalate may produce a big shift in citrate, a crucial inhibitor. Hyperuricosurea in children occurs when uric acid excretion exceeds 815 mg/1.7 m2/day.14.5%, or 14 patients, developed hyperuricosurea. Uric acid, a consequence of purine metabolism, crystallises urine and forms calcium oxalate stones. It promotes urinary stones by lowering urinary inhibitors[23]. Lithorisk (24-hour urine analysis) Urine ions interact with other components. Physicochemical and anatomical factors affect crystal formation. Variables include solute excretion rate, urinary super saturation, ionic strength, flow rate, pH, and urinary tract development anomalies. 24 hour urine parameters for children have no defined reference values. It depends on the child's age, diet, and weather. Research has investigated numerous reference range values. Rizvi et al.'s reference ranges were considered. This investigation was done in our subcontinent under similar climatic and nutritional conditions.

CONCLUSION

Urolithiasis in children is often brought on by metabolic disorders, which are curable and avoidable. In order to properly diagnose metabolic abnormalities, treat and prevent urolithiasis recurrence, as well as reduce or prevent morbidities caused by urolithiasis in paediatric patients, it is advised that all paediatric patients presenting with urolithiasis for the first time undergo thorough investigation and treatment.

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