PEDIATRIC URINARY STONE PROFILE IN SAIFUL ANWAR HOSPITAL

[1] Muhammad Firas Balafif, [1]Besut Daryanto, [1]Pradana Nurhadi.

[1] Department of Urology, Faculty of Medicine/University ofBrawijaya, Saiful Anwar General Hospital, Malang.

ABSTRACT

Objective:*This study aims to provide an overview of the characteristics of age, gender, stone location, stone side, stone analysis, and management of pediatric urinary stone in the tertiary hospital.****Material &Methods:*** *This was a retrospective study done over a period of four years from January 2019 - December 2023 in our institution. The patient has undergone supporting examinations to confirm the diagnosis. Clinical data including the patient's age, gender, stone location, stone side, stone analysis, and management were observed. Data were analyzed descriptively and using SPSS 17.0.****Results:*** *Total of 55 cases of upper and lower urinary tract stones were encountered in our study with a mean age of 11.2 years. The highest incidence was 15-18 years old (36.4%). The distribution by gender showed a higher prevalence in males (67.2%) compared female patients (32.8%). The kidney stone was the most frequent clinical presentation (36.3%). From the upper urinary tract stone, the left side becomes the predominant area (54.2%). The most common stone constituent was calcium oxalate (41.8%). The kidney stone was mostly treated with Percutaneous Nephrolithotomy (PCNL) (75.0%).****Conclusion:****Pediatric urinary tract stone patients in our institution are predominantly male, with a peak rate in 15- 18 years old, most commonly found in the kidney, predominantly on the left side, and the most common stone constituent was calcium oxalate. Th kidney stone is mostly treated with PCNL.*

Keywords: *Bladder stone, pediatric urinary stone, cystolithotripsy.*

ABSTRAK

Tujuan: *Penelitian ini bertujuan untuk memberikan gambaran karakteristik usia, jenis kelamin, letak batu, sisi batu, analisis batu, dan penatalaksanaan batu saluran kemih anak di rumah sakit tersier.* ***Bahan & Cara:*** *Penelitian retrospektif ini dilakukan selama empat tahun dari Januari 2019 - Desember 2023 di institusi kami. Pasien telah menjalani pemeriksaan penunjang untuk memastikan diagnosis. Data klinis termasuk usia pasien, jenis kelamin, lokasi batu, sisi batu, analisis batu, dan penatalaksanaan diamati. Data dianalisis secara deskriptif dan menggunakan SPSS 17.0.* ***Hasil:*** *Sebanyak 55 kasus batu saluran kemih atas dan bawah ditemukan dalam penelitian kami dengan usia rata-rata 11.2 tahun. Insiden tertinggi adalah usia 15-18 tahun (36.4%). Distribusi berdasarkan jenis kelamin menunjukkan prevalensi lebih tinggi pada pasien laki- laki (67.2%) dibandingkan pasien perempuan (32.8%).Batu ginjal merupakan presentasi klinis yang paling sering (36.3%).Dari batu saluran kemih bagian atas, sisi kiri menjadi area yang dominan (54.2%).Pembentuk batu yang paling umum adalah kalsium oksalat (41.8%). Tindakan pada batu ginjal sebagian besar diobati dengan Percutaneous Nephrolithotomy (PCNL) (75.0%).****Simpulan:*** *Pasien batu saluran kemih anak di institusi kami sebagian besar laki-laki, dengan tingkat puncak pada usia 15-18 tahun, paling sering ditemukan di ginjal, terutama di sisi kiri, dan pembentuk batu yang paling umum adalah kalsium oksalat. Batu ginjal sebagian besar diobati dengan PCNL.*

Kata Kunci: *Batu kandung kemih, batu saluran kemih anak, cystolithotripsy.*

Correspondence:Besut Daryanto; c/o: Department of Urology, Faculty of Medicine/University of Brawijaya, Saiful Anwar General Hospital, Malang, Jl. Jaksa Agung Suprapto No.2, Klojen, Kec. Klojen, Malang, Jawa Timur 65112, Indonesia. Phone: +6282233678283.Fax: +62341333030. Email: urobes.fk@ub.ac.id.

INTRODUCTION

Urinary stone is a condition characterized by the deposition of salts and minerals within the urinary tract. Over the past few decades, the incidence of pediatric urinary stones has been gradually increasing, emerging as a global concern. Previous studies have reported that one in 1.000 to 7.500 pediatric hospital admissions are related to kidney stone cases. More recent studies indicate a nearly fivefold increase in hospital admissions for kidney stones over the past decade.[1-2] Pediatric urinary stone remains endemic in developing countries, with a prevalence reaching 15% in children under 15 years old. In contrast, in developed countries, the prevalence ranges from 1-5%, with

higher incidence rates in males compared to females. However, the incidence in females has been increasing, from 7.7 per 100.000 in 1996 to 21.9 per 100.000 in 2007. In males, the incidence increased from 8 per 100.000 in 1996 to 15.3 per 100.000 in 2007.[1,3]

In developing countries, most of the stones found are bladder stones, with a predominance of ammonium acid, uric acid, and urate stones, which are associated with reduced availability of dietary phosphate. The prevalence rates are approximately 10% in Nepal, 21% in Tunisia, 18% in Pakistan, and 70% in Cameroon. Indonesia is part of the "Afro-Asian endemic bladder stone belt," although this is shifting. Unfortunately, the condition remains prevalent in the Middle East, India, Thailand, and Indonesia, where the economy primarily depends on agriculture.[3-5]

Pediatric urinary stone presents a distinct mechanism compared to adults, differing in prevalence, etiology, and clinical presentation. This condition should not be overlooked, as it is associated with high morbidity rates, primarily due to the high likelihood of recurrence.[2] Studies indicate that nearly 55% of etiologies are idiopathic, 25% are metabolic, 7% are infection-related, and 12% are due to anatomical abnormalities. Additionally, hot climate conditions and poor nutrition are significant risk factors.[3] Indonesia has a diverse range of races, ethnicities, and geographical distributions, yet data on the prevalence of pediatric urinary stone remains unclear.

OBJECTIVE

This study aims to provide an overview of the characteristics of age, gender, stone location, stone side, stone analysis, and management of pediatric urinary stone in the tertiary hospital. The aim of this retrospective study to determine pediatric urinary stone characteristics of patients, age, gender, stone location, stone side, stone analysis, and management.

MATERIAL &METHODS

This research was conducted at Saiful Anwar General Hospital and a retrospective study done over a period of four years from January 2019 - December 2023 in our institution. Inclusion criteria were patients diagnosed with urinary stone based on abdominal CT-scan and aged up to 18 years old. The patient has undergone supporting examinations to confirm the diagnosis. Clinical data including the patient's age, gender, stone location, stone side, stone analysis, and management were observed. Data were analyzed descriptively and using SPSS 17.0.

RESULTS

In this study, a total of 55 pediatric patients diagnosed with urinary stone were included, with a mean age of 11.2 years. The peak incidence distribution according to age was highest in the 15-18 years age group (36.4%), followed by 11-15 years (27.2%), 6-10 years (25.4%), and 0-5 years (20.0%). The distribution by gender showed a higher prevalence in males, with 37 patients (67.2%) compared to 18 female patients (32.8%). The basic characteristics of the study population are depicted in Table 1.

Table 1.Baseline characteristics population of study

Characteristic	N (%)	Percentage (%)
Age (years old)		
0-5	11	20.0
6-10	14	25.4
11-15	15	27.2
15-18	20	36.4
Gender		
Male	37	67.2
Female	18	37.8

Table 2. Stone location characteristic

Location	N	%
Kidney	**20**	
Bilateral	4	20.0
Unilateral	16	80.0
Right	6	37.5
Left	10	62.5
Ureter	**17**	
Bilateral	NA	0
Unilateral	17	100
Bladder	**15**	
Urethra	**5**	
Anterior	2	40.0
Posterior	3	60.0

Among the 55 included patients, the most common clinical presentation was kidney stones, found in 20 patients (36.36%), followed by ureteral stones in 17 patients (30.91%), bladder stones in 15

patients (27.27%), and urethral stones in 5 patients (9.09%). Of the kidney stones, 16 patients (80%) had unilateral stones, with a higher occurrence on the left side, observed in 10 patients (62.5%). All ureteral stones were found to be unilateral, and urethral stones were predominantly located in the posterior urethra, with 3 patients (60%).

The most common type of stone found was calcium oxalate accounting for 41.8% of cases, followed by magnesium ammonium phosphate at 25.5%, and mixed composition stones at 20%. The most frequent operative intervention for kidney stones was percutaneous nephrolithotomy (PCNL), performed in 75% of cases, while bladder stones were primarily treated with percutaneous cystolithotripsy in 73.3% of cases.

Table 3. Stone type characteristics.

Stone Analysis	N	Percentage (%)
Magnesium ammonium phosphate	14	25.5
Calcium Oxalate	23	41.8
Amonium Acid Urate	7	12.7
Mixed	11	20.0

DISCUSSION

In this study, we investigated pediatric urinary stone cases at a tertiary hospital. We identified 55 pediatric patients with urinary stone, with the most common age group being 15-18 years. Urinary stone has become a significant burden in adult cases, with a risk of approximately 10-15%. Typically, it is more common in males compared to females; however, recent trends show a shift towards a more balanced gender ratio. The study revealed that pediatric urinary stone cases predominantly occur in the 15-18 year age group, with the most frequent stone location being the kidneys.[6] A precise explanation of the strong relationship between age and stone formation remains unclear. It is hypothesized that hormonal changes related to puberty in the age group might play a role. Additionally, risk factors present in patients, such as obesity, are known to influence urinary pH, sodium, phosphorus, and oxalate levels, thus increasing the risk of stone formation. Conversely, individuals who are not overweight are more prone to conditions such as hyperoxaluria and hyperuricosuria.[7-8] A study in South Carolina also reported that 57% of urinary tract stone incidents occur in individuals aged 15-19 years.[9] Additionally, poor dietary choices or inappropriate types of food, including high salt intake and low fluid consumption, can increase the risk of stone formation.[6]

Clinical presentations frequently include abdominal pain and flank pain. A study in North America found that 63% of pediatric patients with urinary stones experienced flank pain, and 82% of cases exhibited microscopic hematuria upon evaluation. Other potential symptoms include dysuria, gross hematuria, urgency, nausea, and vomiting. In infants, pain caused by stones is often misdiagnosed as colic and suspected to have gastrointestinal causes.[9] Current trends also show that females are now more frequently affected by urinary stones compared to males, with a ratio of 2:1. This shift is influenced by hormonal changes experienced by females.[5]

This study found that renal stones were more prevalent compared to other locations, followed by bladder stones. Calcium oxalate stones were the predominant component, accounting for 73% of renal stone cases, followed by struvite stones (13%) and calcium phosphate stones (9%).[10] The high incidence of kidney stones in children is influenced by metabolic risk factors. Studies have found that idiopathic hypercalciuria, hypocitraturia, and hyperoxaluria are the most common predisposing factors.[11] This condition is related to dietary habits or eating patterns that vary across countries and may also be influenced by hereditary factors affecting urinary chemistry. Anatomical abnormalities are also a risk factor for kidney stones, as they can lead to urinary tract stasis.[12]

The limitations of this study include its focus on a single tertiary hospital and the relatively small sample size. Future research should involve multicenter studies to enhance the understanding of prevalence and epidemiology of pediatric urinary stone.

CONCLUSION

Pediatric urinary tract stone patients in our institution are predominantly male, with a peak rate in 15- 18 years old, most commonly found in the kidney predominantly on the left side, and the most common stone constituent was calcium oxalate. The kidney stone is mostly treated with PCNL and for bladder Stone is mostly treated with percutaneous cystolithotripsy.

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