

Clinical Audit of Pediatric Urolithiasis: A Cross-sectional Study

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Abstract

Background: Urolithiasis is a common cause of hospital visits in emergency department. The epidemiology of the disease has been dramatically increased. In India, the lifetime prevalence of urolithiasis was 7.9% (5.7–10.8%). Around 7% of all stones occur in children younger than 16 years. Developing countries are endemic for bladder calculi and contribute a majority of stones from 10% in Nepal, and 21% in Tunisia, to 18% in Pakistan and 70% in Cameroon. In contrast to this bladder stones are rarely reported from the developed countries. Urolithiasis is associated to an increased risk of chronic nephropathy, so early detection is very important for these patients.

Materials and Methods: A total of 70 patients, suffering from urinary tract stones, were enrolled in the study over a period of 2 years. A detailed history relating to the disease process and about socioeconomic, cultural, and economic backgrounds of the patient is taken.

Results: In our study, we observed that 75.7% patients were males with majority of them belonging to 6–12 year age group (48.6%). Majority of the patient belonging to the lower socioeconomic status (68.6%) and consuming mixed diet (72.9%) and hard water (71.4%). Majority of the patients had single stone (75.7%) and were composed of calcium (58.6%). Most commonly located in bladder (52%). Most common symptom was pain (97.1%).

Conclusions: Gender of the patient, socio economic status of the family, their dietary habits, and source of drinking water have a direct relation with the presence of stones. Majority of the patients had single stone and most commonly it was found in urinary bladder followed by renal stones. Majority of the stones were symptomatic, with pain being the most common symptom which was present in almost all the patients.

Key words: Urolithiasis, Calcium stones, Bladder calculi

INTRODUCTION

Urolithiasis is a common cause of hospital visits in emergency department. The epidemiology of the disease has been dramatically increased. In India, the lifetime prevalence of urolithiasis was 7.9% (5.7–10.8%).^[1] The

incidence of stone disease peaks around fourth to sixth decade and is more common in men than in women. While considered to be relatively rare in the pediatric patient, a growing body of evidence suggests that urolithiasis is becoming more common in children.^[2] Around 7% of all stones occur in children younger than 16 years.^[3] Developing countries are endemic for bladder calculi and contribute a majority of stones from 10% in Nepal, and 21% in Tunisia, to 18% in Pakistan and 70% in Cameroon. In contrast to this bladder stones are rarely reported from the developed countries.^[4] In comparison with adult stone diseases, children are more likely to have etiological factors such as UTI, anatomic abnormalities, and surgical alterations. At present, the incidence of upper tract calculi

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Table 1: Age distribution

Age groups	Frequency	Percent
<3 years	3	4.3
3–6 years	18	25.7
6–12 years	34	48.6
12–18 years	15	21.4
Total	70	100.0

Table 2: Sex distribution

Sex	Frequency	Percent
Female	17	24.3
Male	53	75.7
Total	70	100.0

Table 3: Distribution based on socio-economic status

Socio-economic status	Frequency	Percent
Lower	48	68.6
Middle	22	31.4
Upper	0	0.0
Total	70	100.0

Table 4: Distribution based on dietary habits

Dietary habits	Frequency	Percent
Mix	51	72.9
Vegetarian	19	27.1
Total	70	100.0

Table 5: Distribution based on water source

Water source	Frequency	Percent
Hard Water	50	71.4
Normal	20	28.6
Total	70	100.0

in children is increasing worldwide. The reason for such an increase is not clear, but is associated to climactic (global warming seems to predispose to urolithiasis, thanks to the reduced urine output and to insufficient water intake), and diet changes (foods rich in sodium, animal protein and carbohydrates, typical from industrialized countries, and would favor the formation of calculi), genetic inheritance and, possibly, other environmental factors. Natural passing or surgical removal of the stone does not eliminate the cause, and many such patients suffer recurrences.

Urolithiasis is associated to an increased risk of chronic nephropathy, so early detection is very important for these patients. However, with such light cast upon this issue, it is critical for urosurgeon to strive for a stronger understanding of pediatric urolithiasis. During this review,

Table 6: Distribution based on type of stone

Type of stone	Frequency	Percent
Calcium	41	58.6
Mixed+Not Diagnosed	29	41.4
Total	70	100.0

Table 7: Distribution based on number of stones

Number of stones	Frequency	Percent
1	53	75.7
2	4	5.7
Multiple	13	18.6
Total	70	100.0

Table 8: Association between number of stones and different locations

Location	Number of Stones			Total
	1 (n=53)	2 (n=4)	Multiple (n=13)	
Bladder				
Count	46	1	5	52
%	86.8	25.0	38.5	74.3
Renal				
Count	4	3	13	20
%	7.5	75.0	100.0	28.6
Urethral				
Count	2	0	0	2
%	3.8	0.0	0.0	2.9
Ureteric				
Count	1	2	1	4
%	1.9	50.0	7.7	5.7

we hope to spot the factors potentially contributing to rise in the childhood prevalence of urolithiasis.

MATERIALS AND METHODS

This was a cross-sectional study conducted at M.Y. Hospital and M.G.M Medical College, Indore, Madhya Pradesh, during 2020–2021. A total of 70 patients of 1 month–18 year age group from various socioeconomic, cultural, and economic backgrounds were included in this study who were suffering from various kind of urinary stones. Patients with congenital abnormalities, metabolic/intestinal disorders, endocrinal diseases, and renal or hepatic insults were excluded from the study. Informed consent (Assent) was taken from all patients or parents of the patient included in the study.

Patients were categorized into four groups on the basis of age-

1. Group 1: 1 months–3 years.
2. Group 2: 3–6 years.
3. Group 3: 6–12 years.
4. Group 4: 12–18 years.

All patients in study underwent a detailed history taking along with general examination and investigations. Their personal history, medical history, family history, dietary history, socio economic history, clinical history pertaining to pain hematuria, and fever were recorded and documented. Various blood investigations (CBC, RFT, SE, URINE R/M, URINE C/S, and Sr. Calcium); radiological investigations (X-ray KUB, USG KUB, IVP, DMSA, and CT Urogram); and stone analysis were done. All the data were processed to establish the relationship between the above mentioned factors and pattern of urinary stone diseases in pediatric population.

RESULTS

This was a cross-sectional study consisting of 70 cases suffering from different kinds of urolithiasis [Tables 1-8].

DISCUSSION

Age Distribution

In our study, it was observed that maximum number of patients were in 6–12 year age group (48.6%). In this age group, children are more communicative about their symptoms, therefore higher chances of them showing up in the hospitals. Furthermore, all the dietary and demographic factors have a cumulative effect with advancing age, leading to formation of stones. Similar results were found in the other study such as Barata and Valette,^[5] Rizvi *et al.*,^[6] and Qaader *et al.*^[7]

Sex Distribution

In our study, we found that majority of the patients were male (75.7%) compared to females (24.3%). Males have high resistance pathway in urinary system which causes stasis of urine for longer duration and that could cause increased incidence of the development of stones. Similar results were also seen in Barata and Valette,^[5] Rizvi *et al.*,^[6] Qaader *et al.*,^[7] Wathigo *et al.*,^[8] and Faridi and Singh^[1] study.

Distribution Based on Socio-economic Status

In our study, we observed that majority of the patients belonged to the lower income society with 68.6% belongs to the lower class and 31.4% belonging to the middle class according to modified Kuppuswamy scale^[9] It is significantly related to the presence of stone. Lower socioeconomic status is associated with poor nutrition, heavy water with high mineral content, and higher incidence of UTI due to inadequate hygiene. Furthermore, the study was conducted in the public hospital, patients belonging to the upper class are unlikely, and hence a significant relationship could not be established.

Distribution Based on Dietary Habits

In our study, we observed that 72% of the patients consume mixed diet and rest 27.1% was consuming vegetarian diet. Mixed diet is high in protein and mineral content which leads to increased acidity of urine and increased urinary excretion of mineral which when added together can lead to stone formation.

Distribution Based on Water Source

In our study, we observed significant relation on the type of water consumption with that of the presence of stones, hard water was consumed by 71.4% of patients under study. Hard water is high in mineral content, which could be causative of stones.

Distribution Based on Type of Stone

In our study, we observed that the most common stone that was seen in the studied patients was found to be calcium oxalate stones 58.6%. Most of the dietary and environmental factors have role in development of calcium stones. High mineral and protein diet, hard water, dehydration due to climatic factors, and poor nutrition all are causative for stone formation. The results seen in the following studies, that is, Barata and Valette,^[5] Rizvi *et al.*,^[6] Qaader *et al.*,^[7] and Wathigo *et al.*^[8] showed calcium as a major constituents of urinary stone.

Distribution Based on Number of Stones

In our study, it was observed that the 75.7% of the stones were single. Similar results were observed in Faridi and Singh^[1] study.

Distribution Based on Location of Stones

In our study, it was observed that most common location of the stone was bladder which was 74.3%. According to the literature, developing nations are endemic for bladder stones. Furthermore, urinary bladder is the dilated part of the urinary system and distally sphincters are present, therefore stasis of urine occurs for longer duration which can cause crystallization of stones. This is in contrast to other study like Rizvi *et al.*^[6] where renal stones were found to be predominant. Wathigo *et al.*^[8] observed in their study that the most common were ureteric stones 47%. In Qaader *et al.*^[7] study, upper urinary tract stone was common in both children (84.6%) and adults (80.7%). Studies that were conducted in developed countries were found to have upper urinary tract stones.

CONCLUSION

From our study, we can conclude that urolithiasis have a relation with multiple factors.

1. Gender of the patient, socio economic status of the family, their dietary habits, and source of drinking water have a direct relation with the presence of stones.

2. In our study, majority of the patients under study belonged to the lower socioeconomic status, which could be due to the poor nutrition availability or the water supply which makes them more prone for the development of the stones. Furthermore, the study was conducted in a government hospital set up which has more number of patients from the lower socioeconomic status due to economic reasons.
3. Dietary habits are very much influenced by the culture and economic status of the family of the patients. In our study, we found that those following vegetarian diet have fewer incidences of urinary stones.
4. Our study concluded that the males have higher predilection for the development of stones.
5. In our study, we found that the patients with stone majorly consumed hard water, which is significantly related with the type of stone. Hard water consists of added mineral which leads to higher incidence of stone formation.
6. From our study, we can conclude that majority of the stones are calcium oxalate stones.
7. Majority of the patients had single stone and most commonly it was found in urinary bladder followed by renal stones. According to the literature, developed countries has change in incidence from the lower to upper urinary tract stones, but developing countries have lower urinary system, stones are more common than the other.
8. Our study included a total of 70 patients, which has showed the result as described. We need to do a study with large sample size to establish any significant relations with the factors.

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