



## A Preliminary Study of Pediatric Urolithiasis Cases with Special Reference to Metabolic Evaluation.

### KEYWORDS

Pediatric, urolithiasis, metabolic, evaluation

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**ABSTRACT** **BACKGROUND** – Urolithiasis is known to occur since, prehistoric times. It is relatively uncommon in children compared with adults & occurs because of a variety of factors, including defined metabolic & genetic disorder, geographic & socioeconomic boundaries, & exposure to medication & other environmental influences. The specific aims of this study are to find the incidence of pediatric urolithiasis in the region & to assess various metabolic risk factors contributing to formation of pediatric urolithiasis.

**METHODS** – Patients upto age of 12 years who consented for metabolic evaluation during May 2005 to Nov. 2006 admitted in our hospital were included in the study.

**RESULTS** - The overall ratio of pediatric to adult urolithiasis was found to be 1:20. Male/ female ratio in pediatric age is 4:1. This study showed higher prevalence in 8-12 years of age. Rural (88%) & poor socio-economic status group (52%) have higher incidence. Vesical calculus is more common than renal calculus. None of the patient came with a recurrence in our study.

**CONCLUSION** – Pediatric urolithiasis is relatively uncommon as compared to adults & is more common in males. Higher socio-economic status & urban lifestyle predisposes to upper urinary tract stones & lower socio-economic status & rural background children had lower urinary tract stones.

**CONFLICTS OF INTEREST** – none

### INTRODUCTION

Urolithiasis is relatively uncommon in children compared with adults & occurs because of a variety of factors, including defined metabolic & genetic disorder, geographic & socioeconomic boundaries & exposure to medication & other environmental influences. Due to small size of the urinary tract in young children, some forms of intervention that are routinely used in adults, such as ureteroscopy & percutaneous procedures, must be used more judiciously<sup>1</sup>.

Urinary stones in children fall into three categories: renal stones in premature infants, upper tract stones seen in children & adolescents, & endemic bladder stone.

Nephrocalcinosis occurs in a significant proportion of infants with birth weight less than 1500g. Urinary oxalate excretion is increased in very-low-birth-weight infants receiving hyperalimentation, perhaps as a result of the conversion of ascorbate & glycine present in these solutions to oxalate.<sup>2</sup>

Renal calculi occurring in children or adolescents is associated with anatomic abnormalities in 10-40% of patients. Most common lesion is ureteropelvic junction obstruction. About 75% cases have a urinary tract infection.<sup>3</sup> There are two types of stones in children. Struvite stones & calcium oxalate stones both are associated with infection.

Most pediatric bladder calculi in endemic areas are com-

posed of ammonium acid urate<sup>4</sup>, calcium oxalate or a mixture thereof.

### MATERIALS & METHODS

This preliminary study was conducted on patients of pediatric urolithiasis admitted in various surgical wards of our hospital from May 2005 to Nov 2006. Patients were evaluated by detailed clinical history, physical & local examination including signs & symptoms pre as well as postoperatively. The study had been approved by the ethical committee of our institution.

All urolithiasis cases upto the age of 12 years who consented for metabolic evaluation were included in the study. Various investigations were conducted including Hb, BT, CT, complete urine examination, blood sugar, serum urea, serum creatinine, s. uric acid, s. calcium, s. phosphorus, 24 hrs urinary calcium, 24 hr urinary phosphorus, 24 hrs urinary creatinine, 24 hr urinary uric acid, USG, X-Ray chest PA view, X-Ray KUB, IVU, cystoscopy etc. All investigations feasible in our clinical setting were carried out.

### RESULTS

The study group consisted of 25 patients of which 44% were in age group > 8-12yrs & 28% in 0-4 & 4-8 years age group. Higher prevalence of urolithiasis in male child (68%) as compared to females(32%). There was greater prevalence of pediatric urolithiasis in rural area 88% than in urban area 12%. Higher incidence was seen in poor socio-

economic group i.e. 52%, less in middle & lower class.

Pain was present in 92% of patients, burning micturition in 56%, hematuria in 20% & retention of urine in 44%. Most of the patients had UTI (84%) along with stones (Table 1). 20% of children showed presence of calcium oxalate crystals in urine.

20% of children showed presence of calcium oxalate crystals in urine. 64% had hypouricemia, 32% had hyperphosphatemia & 76% had decreased calcium levels in serum (Table 2). Most of cases of urolithiasis i.e. 64% showed hypercalciuria (Table 3). 24% cases showed increased phosphate excretion in urine. Only 4% showed hyperuricosuria which was found only in vesical calculus cases.

None of the patients came with a recurrence in our study, coinciding with earlier finding that recurrence usually does not occur in pediatric urolithiasis cases.

## OBSERVATION TABLE

**Table 1 - Symptomatology in Pediatric Urolithiasis**

	Vesical		Ureteric		Renal		Total	
	No.	%	No.	%	No.	%	No.	%
Pain	12	48	2	8	9	36	23	92
Hematuria	01	4	01	4	3	12	5	20
Retention of urine	10	40	1	4	0	0	11	44
Burning micturition	12	48	1	4	1	4	14	56
Renal Failure symptoms	0	0	0	0	0	0	0	0
Gastrointestinal symptoms	0	0	0	0	1	4	1	4
Total	12	48	2	8	11	44	25	100

Pain was present in 92% of patients, burning micturition in 56%, hematuria in 20% & retention of urine in 44%. So, most common symptoms in children were pain & burning micturition.

**Table 2 - Serum calcium levels in pediatric urolithiasis**

S. Calcium(mg/dl)	Vesical		Ureteric		Renal		Total	
	No.	%	No.	%	No.	%	No.	%
<8.5	11	44	2	8	6	24	19	76
8.5-10.5	1	4	0	0	5	20	6	24
>10.5	0	0	0	0	0	0	0	0
Total	12	48	2	8	11	44	25	100

We found presence of hypocalcemia in 76% of pediatric urolithiasis cases & normocalcemia in 24% cases.

**Table-3 - Urinary Calcium Excretion in Pediatric Urolithiasis**

U. Calcium(mg/24hrs)	Vesical		Ureteric		Renal		Total	
	No.	%	No.	%	No.	%	No.	%
<100	0	0	0	0	1	4	1	4
100-320	6	24	1	4	1	4	8	32
>320	6	24	1	4	9	36	16	64
Total	12	48	2	8	11	44	25	100

64% cases show hypercalciuria with maximum 36% hypercalciuria in renal calculus cases.

## DISCUSSION

This study was carried out in our hospital from May 2005 to November 2006. A total of 25 cases were examined. 4.5% of all urolithiasis cases were in pediatric age group. Of these 3.6% were males & 0.9% were females. i.e. male: female ratio is 4:1. This is different from the study by Benvet et al 1973<sup>5</sup> & Malik et al 1975<sup>6</sup> who found male:female ratio of 2:1. Diamond & Menon 1991<sup>3</sup> found a male: female ratio of 1.5:1 in children.

Vesical calculus was most common in pediatric population in 48% followed by renal stone 44%, ureteric calculus in 8% children. This finding is consistent with study by Valyesevi & Reen, 1968<sup>7</sup>, who emphasized predominance of bladder calculi in South East Asia due to local dietary patterns in infants.

Our study reveals higher prevalence of pediatric urolithiasis in rural area i.e., 88% compared to urban prevalence of 12%. There was higher prevalence of lower urinary tract disease – bladder calculi & lower ureteric stone disease in rural population as compared to urban prevalence of upper urinary tract stones.

Maximum prevalence of stone disease was found in poor socio-economic group i.e.52% as compared to middle class (36%) & upper class (12%). This is in accordance with the study by Singh et al, 1990<sup>8</sup>, who noted that poor population in this region consumed large quantity of oxalates either due to desire to supplement diet with green leafy vegetable or due to financial constraints to eat cheaper food which are rich in oxalates e.g. amaranths & chenopodium species which are locally known as "dandi chaulai" & " bathua".

Clinically, 92% of children presented with pain in our OPD. This is in contrast study by Malek et al, 1975<sup>6</sup> who reported 38% of children presenting with pain. Hematuria occurred in 20% of children with stones.

Retention of urine was present in 44% of our patients. This is in contrast to study by Thalut & Rizal et al, 1976<sup>9</sup> who found this symptom to be rare.

Burning micturition was found in 56% of our patients in our study while Lim et al 1996<sup>10</sup> found it in 22% of their cases.

In urine analysis, most of the patients had urinary infection. 84% showed presence of WBC/pus cells upto significant levels i.e. >5cells/HPF. 80% had microscopic hematuria (significant is >1RBC/HPF).

52% showed bacteria in urine & 20% showed calcium oxalate crystals in urine. In contrast, western countries showed UTI in less number of cases. Lim et al 1996<sup>10</sup> found UTI in 22% cases. Malek et al 1975<sup>6</sup> found UTI in 15% cases. Hence UTI is more common in developing nations like India.

We found that 76% of children having low calcium levels< 8.5mg/dl & only 24% were normocalcemic. This finding is consistent with observations made by Stanbury et al( 1962), Hamburger ( 1968), Coburn et al( 1969), Makoffet al(1969) & Mansouri et al( 1970).

Our study found hyperphosphatemia in 32% children. Significantly, 5 out of 12 of vesical calculus patients showed higher phosphorus levels in serum.

68% had normal serum phosphorus levels. Norman Noe et al (1983)<sup>12</sup> also found normal serum phosphorus levels.

Hypercalciuria was present in 64% of all pediatric urolithiasis cases of which maximum number of cases were found in renal calculus (36%).

Laufer J & Boichis H stated in 1989<sup>11</sup> that calcium stones are associated with hypercalciuria.

Alan H. Bennett et al (1973)<sup>5</sup> stated that urinary tract calculi in children may be associated with stasis, certain metabolic disorders or may be idiopathic. Most stones are unilateral, due to stasis & located in the kidney.

## CONCLUSION

Higher socio-economic status & urban lifestyle predisposes to upper urinary tract stones & lower socio-economic status & rural background children had lower urinary tract stones.

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