

# Bladder Stone Disease in Children: Clinical Studies

Pages with reference to book, From 94 To 101

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## Abstract

One hundred eighty children with bladder stone disease (BSD) and 50 normal children were studied between July 1979 and June 1982.

The peak age group in BSD children was between 2-4 years and the male to female ratio was 9:1. Hospital reporting of stone formers showed no significant relationship to mean monthly temperature or relative humidity. Painful micturition was the commonest clinical presentation (71.7%). Twenty patients had associated renal disease and associated upper tract calculi were not commonly seen (3.3%).

Radiology provided definitive diagnosis of bladder stones in 95% patients.

One hundred fifty eight stone formers underwent operative procedures for removal of stones. The occurrence of complications was significantly higher in children with co-existing urinary tract infection. Operative mortality was 0.6%. In 61% BSD children the probable etiological factors predisposing to stone formation could not be detected. On follow-up the recurrence rate was found to be 1.1%. (JPMA 34:94,1984).

## Introduction

Archaeological discoveries provide sufficient proof for the assumption that vesical calculi in children occurred since antiquity (Anderson, 1972 cited by Van Reen, 1981). The high prevalence of childhood bladder stones has been documented in Europe and North America in the 18th and 19th century (Yelloly, 1829; Cummings, 1977). At the turn of the century, however, the geographical foci of childhood BSD shifted to the East, stretching in a broad belt from Egypt through Iran, Pakistan, India, Thailand, to Indonesia (Halstead, 1977; Thalut et al., 1976; Van Reen, 1981). However, sources in literature also indicate that incidence of upper tract calculi in children from Turkey, China and Phillipines is rising although endemic calculi were common in these countries fifty years ago (McLaren, 1963; Remzi et al., 1980; Dajani et al., 1981; Blacklock, 1982)

McCarrison (1931) provided the first epidemiological data on urinary stone disease in Indo-Pak sub-continent. Several workers have shown the clinical importance of urolithiasis in Pakistan (Ilahi, 1967; Shahjehan and Rahman, 1971; Rizvi, 1975; Khan, 1977; Rahman and Van Reen, 1981). Although there is agreement that childhood urolithiasis in our country is predominantly of lower urinary tract type, a need was felt to study the problem in greater detail. The present study is an attempt in this direction.

## Material and Methods

One hundred eighty consecutive children upto the age of twelve years, admitted with bladder stone disease (BSD) in Urology ward of Civil Hospital, Karachi between July, 1979 and June, 1982, were included in the study. Fifty healthy children drawn from the relations of BSD children with a similar age, sex, ethnic and socio-economic background were included in the study as controls.

The diagnosed patients were admitted and their clinical and dietary history was recorded on a proforma. Detailed clinical examination was undertaken in both the patients and controls. Laboratory investigations include urinalysis and complete blood picture. A 24 hours urine sample was collected

for estimation of volume, specific gravity and pH. The serum studies included total proteins (Reinhold, 1953, cited by Varley, 1969), blood urea (Diacetyl method, cited by Wooten, 1974) and serum electrolytes (Varley, 1969). Serum and 24 hr urinary calcium (Bauer et al, 1962) inorganic phosphate (Gomori, 1942, cited by Varley, 1969) uric acid (Caraway, 1963 cited by Varley) were estimated. Radiological investigation included plain film of abdomen (KUB). Intravenous Urography (IVU ) was done where plain x-ray was equivocal in the presence of strong presumptive evidence of bladder stones. Endoscopy was done in those patients where clinical and radiological evidence indicated lower tract obstruction.

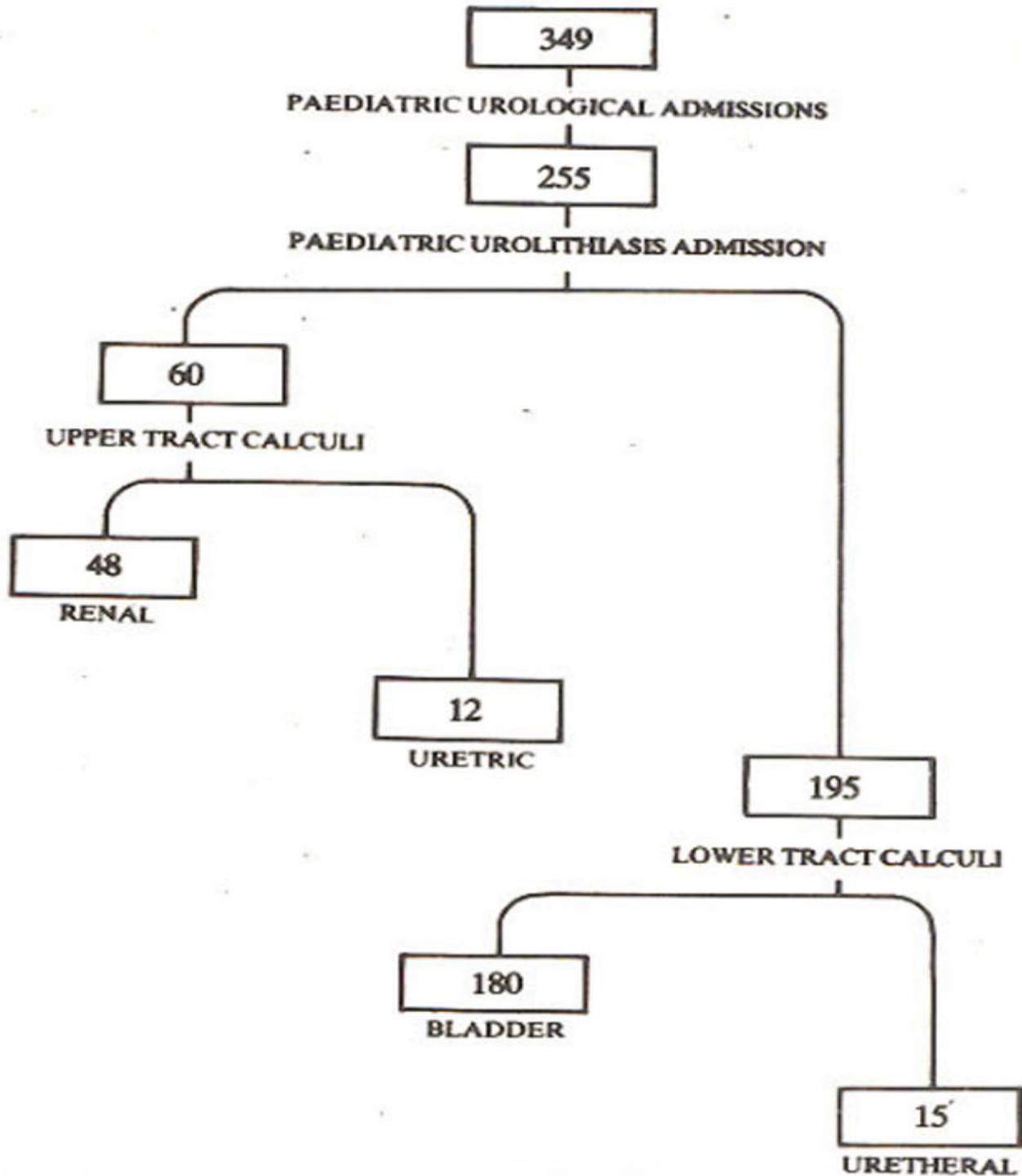
The patients underwent cystolithotomy for removal of stones. In those where the stone had got impacted in urethra on its descent from bladder, a urethrolithotomy was undertaken.

The children were followed up after a month and then at yearly interval unless they had any symptoms when they were asked to come immediately.

## **Results**

The patients came from all parts of the city although the majority came from underdeveloped areas where most civic amenities were severely lacking. These BSD children constituted 15.8% of urological admissions, 51% of paediatric urological admission and 70.4% of paediatric urolithiasis cases during the period of study (fig 1).

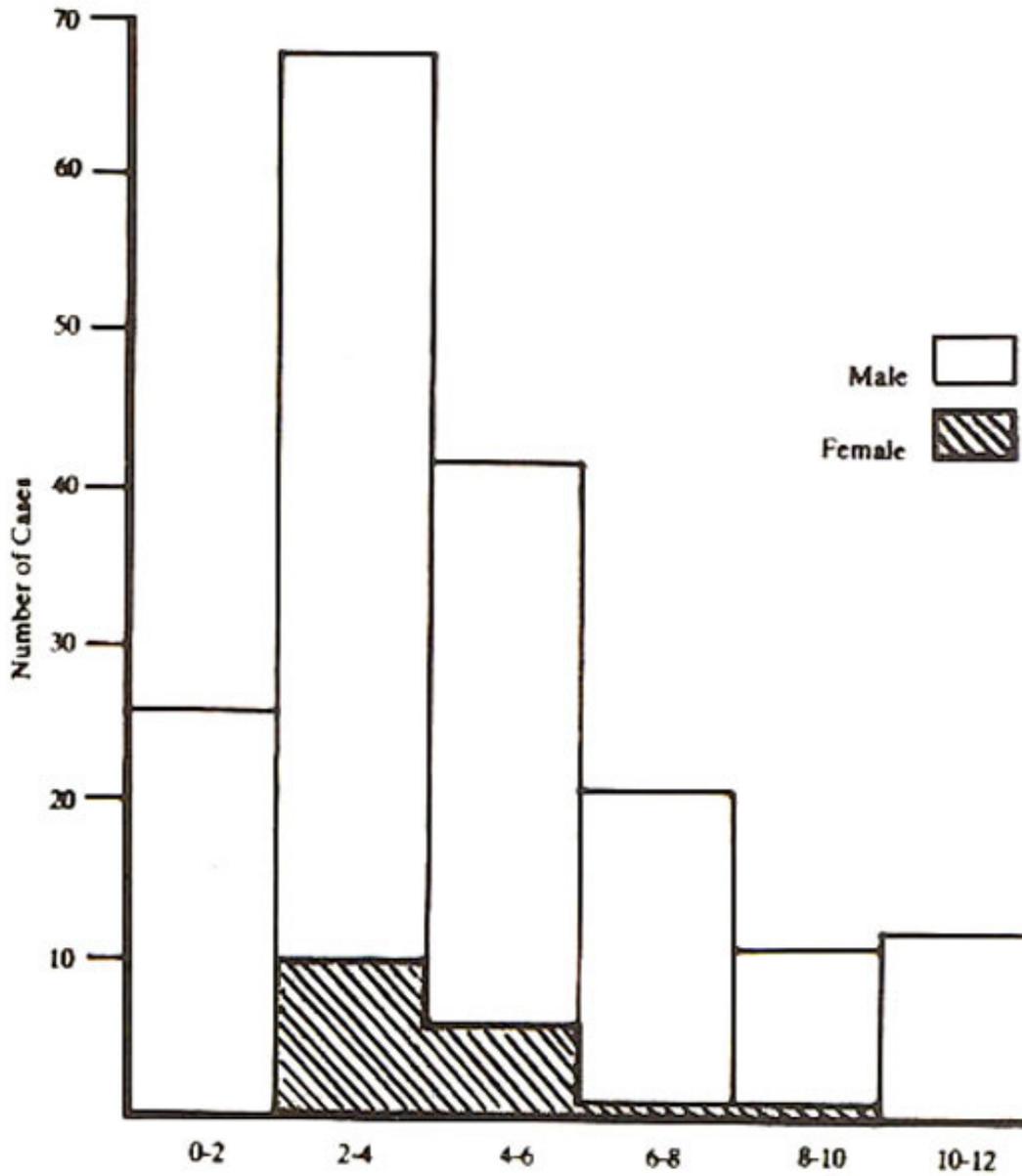
**AT UROLOGY UNIT CIVIL HOSPITAL  
BETWEEN JULY 1979 AND JUNE 1982**



Note: Total Urological admissions during period of study were 1140

There were 162 male and 18 female stone formers in the study ranging from one to twelve in age. The peak age group in stone formers was between 2 - 4 years and male to female ratio was 9:1 (fig 2).

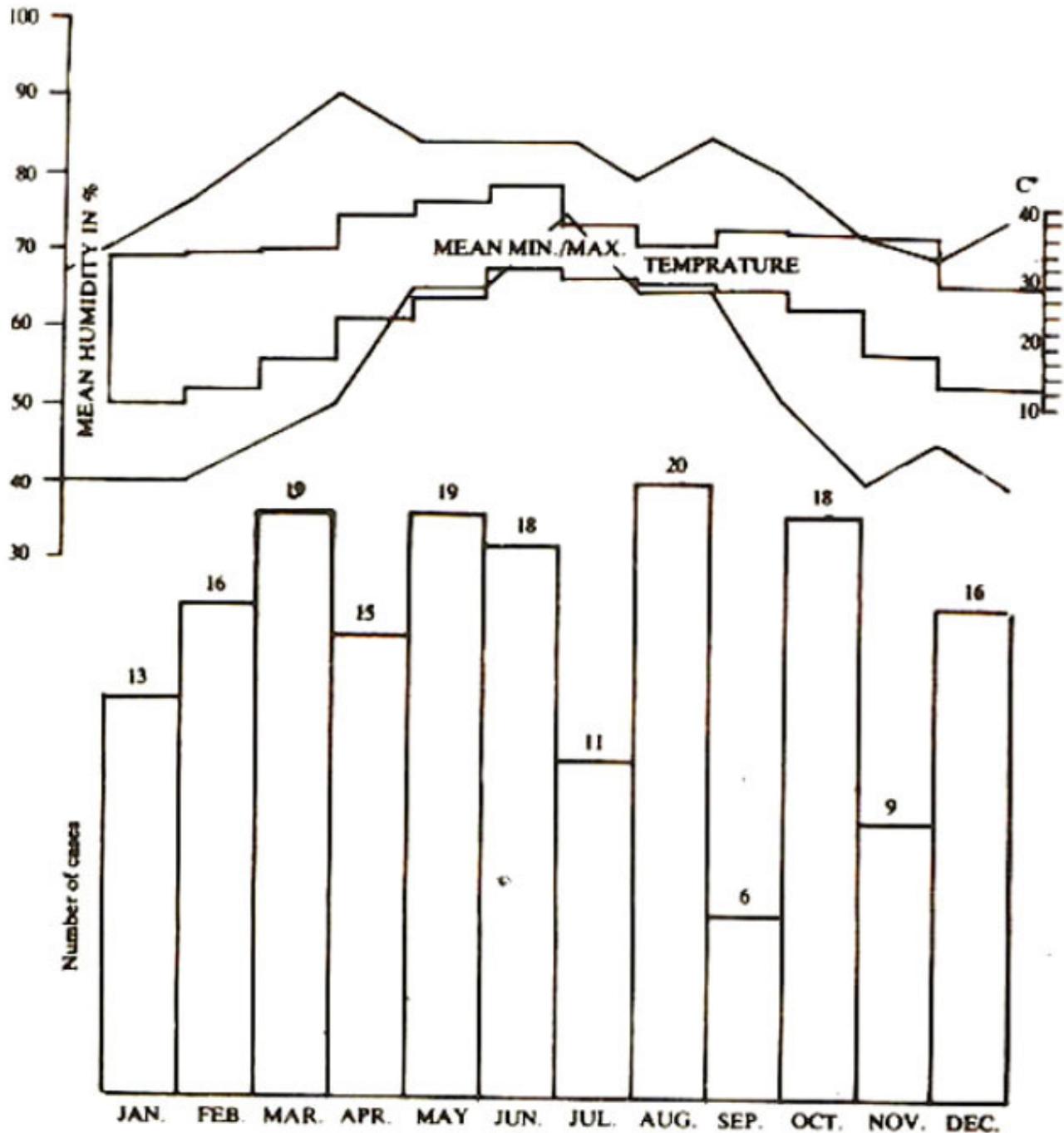
## AGE AND SEX DISTRIBUTION



The total number of urological admissions during this period were 1140.

Most of the children were from families belonging to lower socio-economic group (88.4%) and only 11.6% stone formers were from middle or upper income group. August was the month of peak reporting of stone formers to the hospital (20 children ) while only 6 children were admitted in September. There was no significant relationship between monthly admission and either the mean monthly temperature or the mean monthly humidity (fig. 3).

## MONTHLY HOSPITAL ADMISSIONS



Painful micturition was the commonest clinical presentation (71.7%) while macroscopic haematuria was seen in 24.4% cases. Milking of penis was most frequently seen in males below the age of 6 and in older children this symptom was less frequent, the difference being highly significant ( $P < 0.001$ ) (table 1).

Table – 1

## Relationship of Symptoms of Stone Formers to Age Group.

Age in year	No.	Painful micturition	Frequency of micturition	Milking of penis	Suprapubic pain	Intermittent retention	Haematuria
0 – 6	136	100	78	107	40	42	31
6 – 12	44	29	39	6	12	7	13
Total	180	129	115	113	52	49	44

\*P &lt; 0.001

A significantly higher ( $P < 0.05$ ) occurrence of intermittent retention was seen in children where the duration of symptoms was 0-6 months compared to the group with duration of symptoms of more than 6 months. No correlation could be found between the occurrence of symptoms to the incidence of urinary tract infection or urinary pH in the stone formers.

On clinical examination suprapubic tenderness was positive in 73 (40.5%) stone formers (table II).

Table – II

## Physical Signs in Stone Formers.

	No. of Cases	%
Suprapubic tenderness	73	40.5
Palpable bladder	32	17.8
Stone palpable per urethra	12	6.6
Stone palpable per rectum	5	2.7
No physical finding	98	54.4

Stone was felt per urethra in 12 children and palpable per rectum in 2.7% cases. In 54.4% stone formers no physical signs attributable to stone disease could be found. Twenty children harboured other renal pathologies. Seven children on admission had evidence of renal failure (table III)

**Table–III**  
**Associated Renal Diseases Seen in Twenty Stone Formers.**

Associated disease	No. of Cases	%
Calculi in upper tract	6	3.3
Pelvi-uretric-junction (PUJ) obstruction	3	1.7
One kidney non functioning	3	1.7
Bladder neck obstruction	4	2.2
Meatal stenosis	3	1.7
Neurogenic bladder	1	0.6
Foreign body in bladder	1	0.6
Renal failure	7	3.9

Definitive diagnosis of stone in urinary bladder was made on plain X-ray or abdomen in 164 (89.4%) children intravenous pyelography in 5.5% and endoscopy in 3 children. Spontaneous passage of documented bladder stone was found to be the basis of diagnosis in 6 children.. Positive family history of lithiasis was found in 11 children (7 in siblings and 4 in parents). One hundred fifty formers underwent surgery (table IV).

**Table – IV Management.**

	No. of Cases	(%)
<b>Operative</b>		
. Suprapubic lithotomy	153*	85.0
. Urethrolithotomy	5	2.8
<b>Non-Operative</b>		
. Catheter/endoscopic manipulations	4	2.2
. Spontaneous expulsion	8	4.5
LAMA or not operated	10	5.5
<b>Total</b>	<b>180</b>	<b>100.0</b>

**\*2 children were re-operated for recurrence of stone.**

Two children recurrence of bladder stone. eight (87.8%) stone for removal of stones were reoperated for Suprapubic cystolithotomy was undertaken in 153 (85%) children and urethrolithotomy in 5 patients. In 8 children the stone passed out spontaneously. Ten stone formers either refused surgery, left against medical advise or were not operated.

Of 158 children who were operated, 52 (33%) showed complications. One child succumbed on the first post-operative day due to chest complication. Wound infection was the commonest complication (15.8%) followed by suprapubic leakage (8.8%). Thirty five patients with complications had positive urine culture against 19 children who had no complications but had positive urine culture, the difference being highly significant ( $P < 0.001$ ) (table V).

**Table – V**  
**Relationship of Post Operative Complications with Blood Serum Proteins and Urinary Tract Infection in Stone Former Children.**

Group	Blood urea > 35mg% (62)	Serum protein < 6mg% (50)	Urinary tract infection present
Complications absent (106)	37 (36.6%)	32 (35.2%)	19 (17.9%)
Complications present (52)	25 (48.1%)	18 (34.6%)	35* (67.3%)

\*P < 0.001

**Table – VI**  
**Probable Etiological Factors in Stone Formers.**

Group	No. of Cases	(%)
Metabolic	52	28.9
Stasis	9	5.0
Infective	8	4.4
Foreign body	1	0.5
Idiopathic	110	61.1

On correlating the complications with serum protein and blood urea level in stone formers, no significant relationship could be seen.

In 110 stone formers no predisposing factors for stone formation could be detected within the limits of the protocol of investigation (table V). Fifty two children showed some metabolic cause attributable to the formation of calculi. Urinary stasis was seen in 5% patients. One child had a foreign-body stone, formed on a piece of retained rubber catheter.

On follow-up none of the 12 children who passed stone spontaneously returned after treatment. Of the 158 children who underwent surgery, 35 were lost to follow-up. One hundred twenty three (68.3%) patients attended outpatients regularly. Two were operated for upper tract calculi. Seven patients showed urinary tract infection which settled on appropriate treatment. Two children on whom urethrolithotomy was done, were attending stricture clinic on the conclusion of the study.

## **Disaission**

In the present series the proportion of BSD children amongst the paediatric urolithiasis was 70.4% which was earlier reported to be 84.8% by Rizvi (1975) and 95% by Ilahi (1967). A similar proportion (77.6%) was reported in Egyptian children (Loutfi et al., 1972). In Iran the proportion of BSD cases among all paediatric urolithiasis appear to have shown a decrease from 69% to 58.8% over the last ten years (Gharib, 1970; Sadre et al., 1973; Halim et al., 1981). In India this proportion shows little change (from 85% to 87%) in Northern and Eastern regions (Andersen, 1962; Aurora et al., 1970; Singh et al., 1978). The pattern of childhood urolithiasis in Pakistan as well as in the neighbouring countries is derived from hospital based data whose bias in interpretation of the prevalence of disease is well known (Barker and Donnan, 1978; Williams, 1978; Scott et al., 1981). Nevertheless, the pattern of paediatric urolithiasis appears to be undergoing some change in developing countries as well, more so in urban areas (Sutor, 1980), which may be an expression of regional specificities. It remains to be seen if change in the face of childhood urolithiasis, as seen in the west at the turn of the century, can be anticipated in Afro-Asian countries, with a change in the socio-economic development in these countries.

The peak age group in BSD in the present study was between 2-4 years. Most of the workers from Egypt, Turkey, Iran, India, Thailand and Indonesia have reported similar findings (Eckstein, 1961; Valyasevi and Van Reen, 1968; Gharib, 1970; Aurora et al., 1972; Sadre et al., 1973; Thalut et al., 1976). This draws attention to the hypothesis that occurrence of bladder stones in these children may be a very early event (Haistead, 1977) and whether it relates to the age of weaning remains to be seen. The number of male children suffering from BSD was much higher than females with a male to female ratio of 9:1 in the present study. This is in agreement with the reports from Turkey (11.9:1), Thailand (10:1), Indonesia (12:1) and Pakistan (8.5: 1) (Eckstein, 1961; Haistead and Valyasevi, 1967; Thalut et al., 1976; Rahman and Van Reen, 1981). A much higher prevalence of bladder stone disease in males has been reported from Northern India and Egypt, with male to female ratio ranging from 15.6:1 to 31:1 (Andersen, 1962; Aurora et al., 1970; Aurora, 1977; Loutfi and Abdel-Hamid, 1977). The male to female ratio in childhood urolithiasis in series from western countries varies between 1.1 and 1:2 the predominance of childhood upper tract calculi in these countries being well documented (Myers, 1957; Ghazali et al., 1973; Malek, 1976; Churchill et al., 1980). Some workers have attempted to explain the male predominance on the basis of long tortuous urethra in male (Loutfi et al., 1972; Aurora, 1977). However, if it was only a question of passage of microlith the greater laxity and width of female urethra (Finlayson, 1977) may be of greater relevance than the length of urethra.

Many workers consider high environmental temperature and humidity to be important contributory factors in the occurrence of renal/ureteric colic (Prince and Scardino, 1960; Bateson, 1973; Elliot et al., 1975; Fujita, 1979). Although a greater number of cases (102) were seen from March to August as

compared to 78 cases seen between September and February, the difference was not statistically significant. This is in agreement with earlier reports which showed no significant seasonal relationship to the time of hospital reporting of BSD children (Andersen, 1962; Loutfi et al., 1974; Sastraomidjojo, 1977). There is need for further study of the relationship of temperature and humidity with the aggravation of symptoms to a degree that these children seek medical help, although the stones have been present for a long time.

Many workers have reported a similar over all pattern of presenting symptoms (table 1) as shown in the present study with painful micturition being the commonest (Aurora et al., 1970; Gharib, 1970; Khan, 1977; Teotia and Teotia, 1977). In younger age group (0-6 years) milking of penis was significantly more frequent than in older children while the intermittent obstruction was also significantly more common in the group with lesser duration of symptoms (table 1). Thalut and associates (1981) also found pulling penis to be the commonest symptoms in male children. It is probable that irritation of trigone by the smaller calculi together with its ball-valve action causes obstruction to the flow of urine and the child pulls at the penis to relieve both the obstruction and the irritation of the bladder neck. Older children with larger stones are less likely to face this situation.

Haematuria was seen in 24.4% cases which is in agreement with reports from Thailand, Indonesia and India (Haistead and Valyasevi, 1967; Thalut et al., 1976; Teotia and Teotia, 1977). However, this is in contrast to childhood renal lithiasis where the frequency of haematuria ranges from 55-80% (Gaches et al., 1975; Puga et al., 1977; Noronaha et al., 1979). Whether this is due to the much richer blood supply of the kidney or greater area of mucosal contact of the stone in case of renal calculi needs further clarification.

Evidence of associated renal disease was seen in 20 (15.6%) patients. The Occurrence of upper tract calculi in childhood during the period of study was 23.5% and the cases of concomitant upper and lower tract calculi were 10% of all upper tract calculi. The probability that these concomitant cases are incidental overlap is quite low ( $P < 0.01 > 0.05$ ). Thus the view that most of the bladder calculi have renal origin cannot be ruled out and there is still a need to consider BSD in the broader frame work of urolithiasis.

Majority of BSD cases (61.1%) in the present study showed no attributable cause for stone formation which agrees well with reports of idiopathic calculi in children from developing countries (Haistead and Valyasevi, 1967; Sadre and Ziai, 1977; Singh, 1977; Rahman and Van Reen, 1981; Brockis et al., 1981). In the present study stasis was shown to be a possible etiological factor only in 5% children, whereas some workers reported a higher percentage (Aurora et al., 1970; Taneja et al., 1970; DuPreez and Cremin, 1973; Loutfi et al., 1974).. This may be because intravenous pyelography was done only in equivocal cases where plain x-ray despite presumptive symptoms was negative for bladder stone. In the present study 52 (28.9%) patients showed some metabolic disorder which could predispose to stone formation. This is in contrast to low reported incidence of metabolic causes for vesical calculi in Indian children (Aurora et al., 1970). There is a need for an indepth investigation of metabolic causes in these children in our region.

There was a significantly higher frequency of post-operative complication in the presence of urinary tract infections. In view of this a preoperative urine culture and appropriate treatment is strongly advocated to avoid this situation. It is also important to note that a stone needs to be removed suprapubically because of the complications that ensues on its impaction in the urethra (Malek, 1976; Drach, 1978). Some workers (Loutfi 1977; Singh et al., 1968) have recommended closure of bladder leaving no urethral catheter postoperatively. However, in our experience a catheter in the immediate postoperative period (12-24 hours) was beneficial as the child was likely to retain urine due to postoperative pain. This increased the likelihood of producing pressure on bladder repair thereby increasing the frequency of suprapubic leakage of urine.

Low recurrence rate following surgery (1.2%) in the present study agrees well with other workers who have studied the problem of bladder stone disease in children (Valyasevi and Van Reen, 1968; Aurora et

al., 1970; Loutfi, 1977; Brockis et al., 1981). This is in contrast to a recurrence rate of upto 30% for renal calculi in children (Deaschner et al., 1960; Gaches et al., 1975; Malek and Kelalis, 1975). The low recurrence rate in childhood BSD appears to be attributable to some stone promoting events which have occurred in the remote past as an episode. Since the underlying factors do not persist, unlike renal stones, the stone forming process does not show the same activity as in upper tract calculi.

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