Kidney stones in children aged less than 5 years in Aden, Yemen

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Abstract

Background: Kidney stone disease is increasing in incidence and healthcare costs.

Objective: To describe the frequency, clinical profile and treatment of nephrolithiasis and to assess the effectiveness of extracorporeal shock wave lithotripsy and pyelolithotomy.

Patients and method: This was a retrospective study of all children aged less than 5 years who suffered from kidney stone seen at urology center in Aden during period of 2 years.

Results: The total number of patients was 50. They were 29 (58%) males and 21 (42%) females. The male to female ratio was 1.4:1, and the mean age was 2.86 ± 1.4 years.

The predominant age group involved was 1 – 3 years with 31 (62.0%), while the group 4 – <5 years was 19 (38.0%).

Most patients were from rural areas 31 (62.0%). The biggest stone size 44 (88.0%) was ≤ 20 mm. The mean size of stones was 14.2 ± 5.9 mm, (Range between 8 – 30 mm).

Forty four (88%) patients were treated by extracorporeal shock wave lithotripsy (ESWL) and 6 (12%) were treated by pyelolithotomy.

ESWL was performed for 44(88.0%) cases and their stone sizes more than 20 mm and pyelolithotomy for patients who had stones sizes ≤ 20 mm, (p = 0.000).

In ESWL, stone was removed completely in 39 (78.0%). Six patients were treated by pyelolithotomy and stone removed completely was in 5(10%).

Conclusion: Most patients were treated by ESWL and the stones were removed completely in (78.0%).

Key words: nephrolithiasis, extracorporeal shock wave lithotripsy, pyelolithotomy, children, Aden

Introduction

Whilst still rare, the incidence of nephrolithiasis in children is increasing in developed countries and is associated with significant morbidity [1,2,3]. It is especially important in children to understand the epidemiology of kidney stone disease in order to provide adequate treatment and to develop preventive strategies [4].

Nephrolithiasis in children has been increasingly recognized as a major source of morbidity and cost in the United States. The disease incidence has risen 6–10% annually over the last two decades [3,5] with accompanying increases in frequency of hospitalizations, emergency department visits, and surgical interventions [5-8].

Population-based observational studies have estimated contemporary incidence to range from 36 to 145 per 100,000 children [5-7]. One study noted a more than four-fold increase in incidence over a 12 year span [8]. Of note, one specific subpopulation of children that appears to be at particularly higher risk is adolescent females [5-7,9], though the etiology is not clear.

The type of urolithiasis in children has been changing in the past three decades from infectious to metabolic with hypercalciuria and hypocitraturia being the most common metabolic derangements. The incidence of stones in both adults and children has increased over the last decade with one single center experience showing a fivefold increase [8].

Objective

- To describe the frequency, clinical profile and treatment of nephrolithiasis.
- To assess the effectiveness of treatment procedures, extracorporeal shock wave lithotripsy (ESWL) and pyelolithotomy.

Patients and Method

This was a retrospective study of all children aged less than 5 years who suffered from kidney stone and were seen in a private Urology Center in Al-Mansoura, Aden over a two-year-period, from January 2017 to December 2018.

During this period, a total of 50 patients were found with nephrolithiasis.

All patients were diagnosed by: medical history, symptoms, family history of kidney stones, physical exam, laboratory (urinalysis, blood test) and imaging tests. The imaging tests were ultrasound, abdominal x-ray and computed tomography (CT) scans.

We retrospectively reviewed the records of all children up to age < 5 years in whose renal calculi was treated at a private Urology Center and we obtained information about sex, age, residency, stone size, diagnosis, treatment procedures and outcome.

The data was entered into a computer and analyzed using SPSS version 17 statistical package. For variables difference, chi-square tests, and P values were calculated, with differences at the 5% level being regarded as significant.

Results

A total number of 50 patients, who were seen at our clinic and admitted in a private Medical Center during the study period, were included in this study. Table 1 show that twenty nine (58%) were males and 21 (42%) were females. The male to female ratio was 1.4:1, and the mean age was 2.86 ± 1.4 years. The age of patients ranged between 1 to < 5 years.

The predominant age group involved was 1 – 3 years with 31 (62.0%), while the group 4 – <5 years was 19 (38.0%). Patients from rural areas were 31 (62.0%) while from urban areas were 19 (38.0%). The predominant diagnoses were single kidney stone 44 (88.0%), while multiple kidney stones were 6 (12.0%).

The biggest stone size 44 (88.0%) was ≤ 20 mm and only 6 (12.0%) were more than 20 mm. The mean size of stones was 14.2 ± 5.9 mm, and they ranged between 8 – 30 mm.

Table 2 and Figure 1 revealed the treatment procedures which were applied for the study patients, and their outcome. Forty four (88%) patients were treated by extracorporeal shock wave lithotripsy (ESWL) and 6 (12%) were treated by surgical intervention, pyelolithotomy.

Figure 2 shows the treatment outcome in which free stones were (88%), failure in ESWL (10%) and (2.0%) remnant.

Table 3 reveals the distribution of treatment procedures related to stone sizes. Extracorporeal shock wave lithotripsy (ESWL) was performed for all the patients 44(88.0%) who have stone sizes more than 20 mm and pyelolithotomy for the study patients who have kidney stones with the sizes ≤ 20 mm. The difference between values is statistically significant, (p = 0.000).

In Table 4 we illustrate the distribution of treatment outcome related to treatment procedures. In ESWL we found failure after 2 sessions in 5(10%) study patients, while stones were removed completely in 39(78.0%). Six patients were treated surgically. Stones were removed completely in 5(10%) patients and in 1(2.0%) study patient a remnant one stone was found. The difference between values is statistically not significant (p = 0.063).

Table 1: Distribution of variables among study patients

Variables	No	%	Mean
Sex:			
Male	29	58.0	
Female	21	42.0	
Age group(years):			
1 - 3	31	62.0	
4 – <5	19	38.0	
Mean age (years):			2.86 ±1.4
Residency:			
Urban area	19	38.0	
Rural area	31	62.0	
Diagnosis:			
Single kidney stone	44	88.0	
Multiple kidney stone	6	12.0	
Stone size (mm):			
≤ 20	44	88.0	
> 20	6	12.0	
Mean size (mm):			14.2 ±5.9

Table 2: Distribution of treatment and outcome

Variables	No	%
Treatment procedure:		
ESWL	44	88.0
Pyelolithotomy	6	12.0
Outcome:		
Free stones	44	88.0
Fail ESWL	5	10.0
Remnant	1	2.0

Figure 1: Proportions of study patients related to treatment procedure

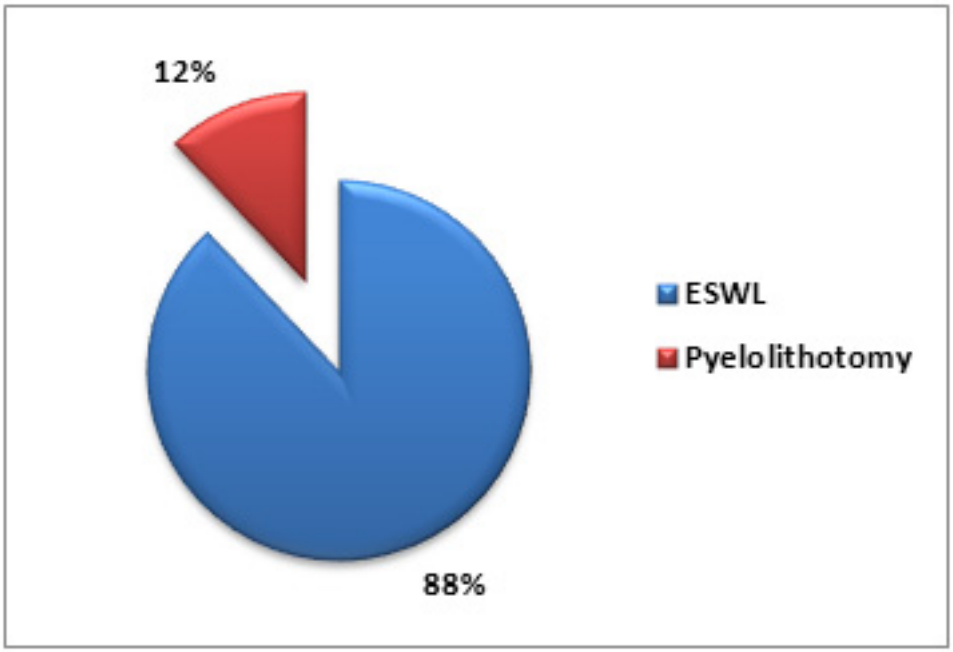

Figure 2: Proportions of treatment outcome

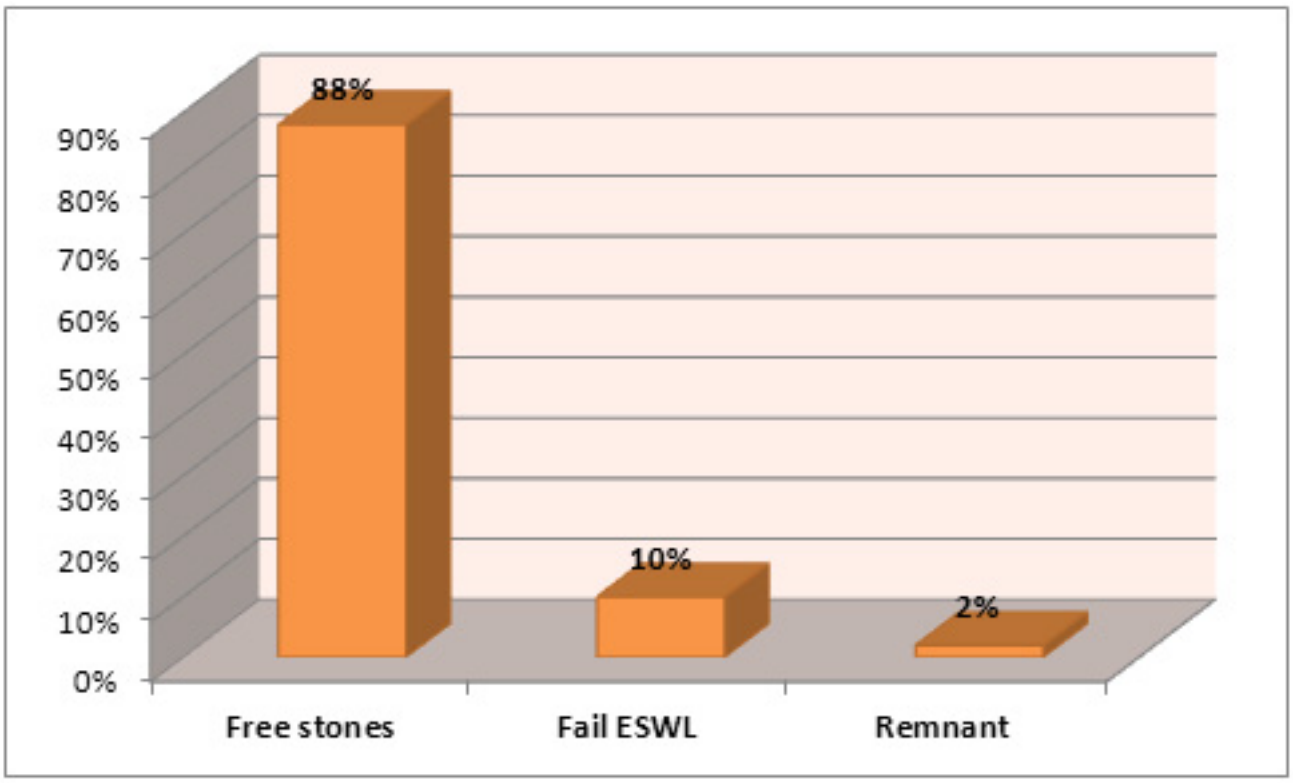

Table 3: Distribution of treatment procedures related to stone sizes

Variables	Stone size (mm)				Total		p-value
	≤ 20		> 20				
	No	(%)	No	(%)	No	(%)	
Treatment procedure:							
ESWL	44	(88.0%)	0	(0.0%)	44	(88.0%)	P=0.000
Pyelolithotomy	0	(0.0%)	6	(12.0%)	6	(12.0%)	
Total	44	(88.0%)	6	(12.0%)	50	(100%)	

Table 4: Distribution of treatment outcome related to treatment procedures

Variables	Treatment				Total		p-value
	ESWL		Pyelolithotomy				
	No	(%)	No	(%)	No	(%)	
Outcome:							
Failure ESWL in 2 sessions	5	(10.0%)	0	(0.0%)	5	(10.0%)	
Remnant one stone	0	(0.0%)	1	(2.0%)	1	(2.0%)	P=0.063
Stone Removed completely	39	(78.0%)	5	(10.0%)	44	(88.0%)	
Total	44	(88.0%)	6	(12.0%)	50	(100%)	

Discussion

Nephrolithiasis is an important cause of morbidity worldwide, while the exact incidence of kidney stone disease in children is unknown [10,11].

The strong male predominance [12-14] seen in the adult population is less clear in children, with more recent studies suggesting a roughly equal gender distribution [15,16], or even a female predominance [17]. While nephrolithiasis can occur in any pediatric age group, infants represent roughly 20% of pediatric stone cases and tend to have a distinct history and presentation [18].

In the present study the male patients were predominant with a ratio male to female of 1.4:1. Publications in developing countries registered a variable proportion between the male and female genders, of 1.2:1 to 4:1 [19].

In our study the mean age of children was 2.86 ± 1.4 years and their age ranged between 1 to <5 years. We found also, predominance of age group 1 – 3 years with 31(62.0%).

Guan et al [20] reported that kidney stone (nephrolithiasis) is a common disorder responsible for significant human suffering as per studies and surveys done over the last half century reporting steadily increasing cases.

Nephrolithiasis is a global problem affecting all geographical regions [21].

Hussain et al [22] mentioned this era of globalization is witnessing increased cases of acute renal injury and emerging epidemic of renal calculi among all age groups including children of East Asia, mainly Macau, Taiwan, Hong Kong and China due to the use of different type of milk and milk product, like milk powder, melamine-tainted milk, cookies, candies and chocolates.

In the year 2008 approximately 290,000 cases were diagnosed with renal stones, including children below age of 3 year [20]. A high incidence rate is reported in the Middle East (20-25%) due to the hot climate with increased chances of dehydration [23].

In our current study we found patients from rural areas were 31 (62.0%) while from urban areas were 19 (38.0%).

Alaya et al [24] reported in their study that patients were predominantly from the rural areas (107 patients, 79.8%) of the central coast of Tunisia.

In this study we found the biggest stone size 44 (88.0%) was ≤ 20 mm and only 6 (12.0%) were more than 20 mm. The mean size of stones was 14.2 ± 5.9 mm, and they ranged between 8 – 30 mm.

Badawy et al [25] reported in their study that the mean size of stones was 11.45 ± 5.16 mm and the size of the stones ranged between 3 – 36 mm.
Our study revealed that 44(88%) patients were treated by ESWL and 6 (12%) were treated by surgical pyelolithotomy. ESWL has long been considered as the first-line therapy for pediatric urolithiasis less than 20 mm [26]. The European Association of Urology guidelines state that ESWL is the first choice for treating most renal pediatric stones [27].
Pyelolithotomy is one option for treating complicated cases of large renal pelvic stones. It may be indicated in cases in which percutaneous nephrolithonomy (PCNL) is not available. It affords a high chance of complete stone removal even with large stones and corrects a concomitant ureteropelvic junction obstruction [28,29].

Pyelolithotomy was once frequently used and occasionally is still undertaken. There are limited functional data reported on this procedure [30].

Lifshitz et al [31] reported in their study that ESWL as a non-invasive technique becomes the most acceptable method of treatment for management of urinary tract calculi. However, its pediatric use has lagged behind the widespread use in adults, probably because of concerns over the potential adverse effects of ESWL on developing organ systems in children.

Bartosh [32] mentioned in 2004 that in recent years, pediatric urolithiasis has become a major health problem due to the high morbidity and high recurrence rate. Many reports showed its safety and effectiveness for stones in urinary tract of children and is considered a minimally invasive method.

Badawy et al [25] reported that (89.4%) of their study children in Egypt received only one session of ESWL and (10.6%) received more than one session of ESWL. They found in their study the overall success rate for renal stones was 86% for stones located in the renal pelvis.

We observed in this study there was a significant positive correlation between the size stone and the treatment procedures - ESWL and pyelolithotomy ($p = .000$).

We found in our present study the treatment outcome in ESWL found failure after 2 sessions in 5 (10%) study patients while stones were removed completely in 39 (78.0%).

In the current study we observed six patients were treated surgically. Stones removed completely in 5(10%) patients and in 1 (2.0%) patient a remnant one stone was found. The difference between values is statistically not significant ($p = 0.063$).

Abid et al [33] reported in their study, three (5.4%) patients non-responding to ESWL after three sessions were treated by another modality.

Conclusion

Nephrolithiasis is an important cause of morbidity worldwide. While the exact incidence of kidney stone disease in children is unknown.

Most patients were treated by ESWL and the stones removed completely in (78.0%). In pyelolithotomy stones were removed completely in 5 patients and in one patient a remnant one stone was found.

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