Scientific Research Publishing

Open Journal of Urology, 2022, 12, 519-526
https://www.scirp.org/journal/oju
ISSN Online: 2160-5629
ISSN Print: 2160-5440

# Aspects of Urolithiasis in Chadian Children: About of 191 Cases Collected at the Mother and Child University Hospital of N'Djamena (Chad)

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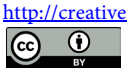
**How to cite this paper:** Adami, M.A., Ali, A.M.M., Olivier, N. and Nour, D.A.M. (2022) Aspects of Urolithiasis in Chadian Children: About of 191 Cases Collected at the Mother and Child University Hospital of N'Djamena (Chad). *Open Journal of Urology*, **12**, 519-526.
https://doi.org/10.4236/oju.2022.1210051

**Received:** August 22, 2022
**Accepted:** October 24, 2022
**Published:** October 27, 2022







## Abstract

**Introduction:** Urolithiasis in children is not sufficiently documented in Chad. **Objectives:** The aim of this work was to report the epidemiological, clinical and therapeutic aspects of urolithiasis in children in our environment. **Patients and methods:** This was a descriptive retrospective study of patients aged 0 - 15 years treated for urolithiasis between January 2015 and July 2020. The variables studied were age, gender, clinical, paraclinical and therapeutic aspects. **Results:** Among the 191 children, there were 164 boys (85.9%) and 19 girls (9.9%). The sex ratio was 8.63. The average age was 5.86 years with extremes (1 and 15 years). The symptomatology was dominated by dysuria. The ASP-ultrasound pair allowed the diagnosis in 183 cases (95.8%). The site of the calculus was bladder in 128 cases (67%). The average calculation size was 2.81mm. A supporting cause was found in only 1 case (posterior urethral valve). Treatment was surgical and dominated by cystolithotomy. The post-operative course was marked by 5 cases of parietal infections (2.6%) and 3 cases of vesico-cutaneous fistulas (1.6%). No case of death has been reported. **Conclusion:** Lithiasis is more common in boys in the lower urinary tract. Open surgery remains the only one practiced. Etiological research must be carried out to develop prevention strategies.

## Keywords

Urolithiasis, Child, Kidney, Bladder, Chad

## 1. Introduction

Urolithiasis is rarer in children than in adults [1]. Its incidence and its epidemiological and etiological profile vary according to the country [1] [2] [3] [4]. Contrary to what is observed in adults where the main causes of lithiasis are nutritional, lithiasis in children is secondary to urinary tract infections, metabolic and hereditary diseases and malformations of the urinary tract [1] [5]. The discovery of lithiasis in children must always lead to a thorough etiological investigation [6]. Calculus analysis is an essential part of this investigation, which the clinician must engage in to understand the causes of calculus and define the most appropriate prophylactic measures to prevent recurrences [6]. The treatment was shock wave lithotripsy, percutaneous nephrolithotripsy, ureterorenoscopy, open surgery and medical expeller treatment [7]. The aim of this work was to report the epidemiological, clinical and therapeutic aspects of childhood urolithiasis in our environment.

## 2. Patients and Methods

This was a retro-prospective cross-sectional monocentric descriptive study lasting 5 years and 7 months from January 2015 to July 2020 carried out in the pediatric surgery department of the University Hospital Center for Mothers and Children in N'djamena (Chad). The data was collected from hospital registers, operating room registers and patient files. It interested all children treated for radiologically proven urolithiasis. The variables studied were age, sex, etiological factors, history, clinical and paraclinical characteristics, location, therapeutic modalities and follow-up. Included were all the children who had been operated on for urolithiasis during the study period and who had usable files. Children whose parents did not consent were not included (for the prospective part) and patients who had incomplete records. From an ethical point of view, our study protocol received clearance from the ethics committee of the University of N'djamena. We obtained the agreement of the Dean of the Faculty of Human Health Sciences of the University of N'djamena and the authorization of the Director General of the University Hospital Center for Mother and Child of N'djamena before beginning of the study, as well as the informed consent of the parents of the children for the prospective part before any inclusion in this work. Data entry and analysis were performed using SPSS 10 software. Statistical significance was set at $p < 0.05$.

## 3. Results

During the study period, 4436 children were admitted, of whom 191 had urolithiasis, which corresponds to an incidence of 4.30%. The average age of the children was 5.86 years with extremes of 1 to 15 years. The distribution by age groups was reported in **Table 1**. Distribution by sex: Of the 191 children, there were 172 boys (90.1%) and 19 girls (9.9%). The sex ratio was 9.05. The history was dominated by the recurrence of the lithiasis in 3 children (1.6%). The asso-

ciated urinary malformations were one case of pyelo-ureteral junction syndrome (0.5%) and three cases of posterior urethral valve (1.6%). The notion of familial lithiasis was observed in one child (0.5%). The reason for consultation was represented by Table 2. Plain abdominal X-ray (ASP) performed in 183 children (95.8%) showed calcium tone opacities in the bladder area (Figure 1). Ultrasound coupled with abdominal radiography was performed in 178 cases (93.2%). Stone locations were shown in Table 3. Metabolic assessment: the dosage of creatinine and urea carried out in 3 of the children presenting with nephrolithiasis was normal. Phosphocalcium balance and plasma dosage of uric acid and parathyroid hormone were not performed. Urine cytobacteriological examination (ECBU) was performed in 26 patients (13.6%). It was positive in 7 cases (3.7%). The germs isolated were Proteus mirabilis in 3 cases (1.6%), *Escherichia coli* in 2

Table 1. Distribution of patients according to age groups.

| Age | Number (n) | Percentage (%) |
|---|---|---|
| 0 - 11 months | 0 | 0 |
| 1 - 4 years | 84 | 44% |
| 5 - 15 years | 95 | 49.7% |
| Not specified | 12 | 6.3% |
| **Total** | **191** | **100%** |

Table 2. Distribution of patients according to the reasons for consultation.

| Clinical manifestations | Number (n) | Percentage (%) |
|---|---|---|
| Dysuria | 85 | 44.5% |
| Urinary burning | 26 | 13.6% |
| Acute urinary retention | 47 | 24.6% |
| Renal colic | 1 | 0.5% |
| Not specified | 32 | 16.8% |
| **Total** | **191** | **100%** |

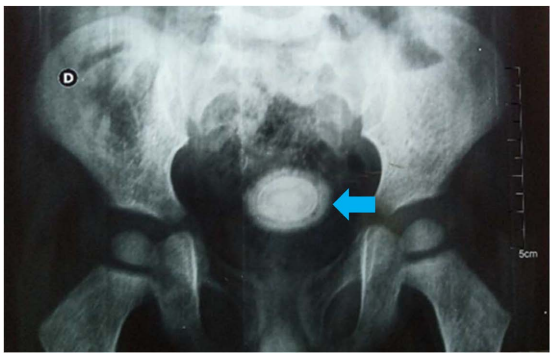



Figure 1. X-ray of the pelvis of a 3-year-old child showing a single bladder stone at the end of the arrow (source: image from the pediatric surgery department of the Mother and Child University Hospital Center of N'Djamena).

cases (1%), klebsiella and colibacillus in 1 case (0.5%) each. These pathogens were susceptible to quinolones and imipenem. The average stone size was 2.81 mm with extremes varying between 1 mm and 55 mm. We noted spontaneous elimination of stones in 3 children (1.6%). Treatment: Table 4 shows the different types of treatment. The cystolithotomy made it possible to extract 93.2% of the stones (Figure 2). Physico-chemical analysis of stones was not possible. Evolution:

Table 3. Distribution of patients according to the location of stones.

| Localisation | Number (n) | Percentage (%) |
|---|---|---|
| Kidney | 8 | 4.2% |
| Ureter | 1 | 0.5% |
| Urinary bladder | 128 | 67% |
| Urethra | 51 | 26.7% |
| Not specified | 3 | 1.6% |
| **Total** | **191** | **100%** |

Table 4. Distribution of patients according to type of treatment.

| Treatement | Number (n) | Percentage (%) |
|---|---|---|
| Néphrolithotomy | 8 | 4.2% |
| Ureterolithotomy | 1 | 0.5% |
| Cystolithotomy | 178 | 93.2% |
| Méatolithotomy | 1 | 0.5% |
| Not specified | 3 | 1.6% |
| **Total** | **191** | **100%** |

Figure 2. Bladder stone with a long axis of 30 mm extracted (source: image from the pediatric surgery department of the Mother and Child University Hospital Center of N'Djamena).

The postoperative course was simple in 183 children (95.8%). Wall infections were reported in 5 children (2.6%). Vesicocutaneous fistulas were observed in 3 cases (1.6%). No death cases were recorded. No case of recurrence has been reported.

## 4. Discussion

The limitations of our study are related to its monocentric nature, as well as its relatively small duration and sample. This obliges us to remain modest for the generalization of our results. However, the prospective collection of data is strength, most other African studies on the subject being retrospective. Epidemiology: The incidence of urinary stones in children is variously assessed by the authors [3]. In our series, urolithiasis represents 4.30% of all pathologies recorded during the study period. As noted in our series, urolithiasis in children affects boys more often than girls with a sex ratio of 8.63. In Mauritania Sow [3] reported a ratio of 19:1. The other authors have reported a sex ratio varying between 1.3 and 3.5 [1] [2] [4] [6]. This observation can be explained anatomically by the resistance to urine flow which is higher in boys because of the greater length [6] and the tortuosity [8] of the urethra, whereas the brevity and largesse of the urethra in girls can easily pass a small stone [4]. The predominance of the male sex does not seem to be influenced by the delay in circumcision [4]. The average age of our children of 5.86 years is superimposed on that of the literature which varies between 5.4 years and 7.86 years according to the authors [2] [3] [5] [9]. Clinically, the symptomatology depends on the location of the stone [3]. In the upper urinary tract, the most common manifestations are pain, urinary tract infection and hematuria [3]. Localization in the lower tract can be revealed by dysuria or even urinary retention [3]. acute urinary retention is due to spasm of the bladder sphincter, the stone becoming embedded in the bladder neck or its migration into the urethra [4]. Diagnosis is based primarily on the radio-echography pair, which provides information on the number, location, size of stones and whether or not there is dilatation upstream [3] [10]. In our series, the radiological examinations made it possible to visualize single stones in 183 children (95.8%) of the patients, double stones in 3 children (1.6%) and triple stones in 1 child (0.5%). A single stone was found in 99% of patients [9], while Alaya [6] reported multiple stones (1 to 25) in 62.5% of cases. According to Shah *et al.* [11], a urethral calculus in children is rare and its association with the posterior urethral valve is even rarer with a few cases reported worldwide. Associated urinary malformations were found in 6 cases: 2 posterior urethral valves, 1 pyelo-ureteral junction syndrome, one mega-ureter, one pyelic bifidity and one ureteral bifidity [4]. On the imaging level, the association ASP-ultrasound has a sensitivity of 90% and a specificity between 75-100% in the diagnosis of urolithiasis [10]. The phosphocalcic balance and the plasma dosage of uric acid and parathyroid hormone were not carried out taking into account the purchasing power of the patients.

Biologically, the results of the cytobacteriological examination of urine (ECBU) are consistent with those of other authors. The most isolated germs were *Escherichia coli*, Proteus mirabilis and Staphylococcus aureus [2] [4] [6] [9]. These germs were isolated in proportions varying between 14.48% and 26.2% [2] [4] [6] [9]. This low positivity rate can be explained by laboratory difficulties because 39% of ECBU are sterile despite the clinical signs of urinary tract infections [4] and by self-medication with street drugs in our context. The bladder localization mainly found in our series corroborates the findings of authors from the south of the Sahara [3] [9] [12] unlike some other North Africans [1] [2] [6] [10] [13] who reported a predominant localization at the level of the upper Urinary System. Etiological research is essential to avoid recurrences and deterioration of renal function, especially in the case of metabolic causes [3]. In children, several lithogenic factors have been cited: infections, urinary malformations, metabolic and genetic abnormalities, recurrent episodes of diarrhea and/or dehydration [1] [3] [5]. Struvite remains the best marker of lithogenic infections [4]. Due to the absence of a specialized urolithiasis laboratory, the chemical examination of stones was not performed as reported by Tfeil *et al.* [4]. According to the literature, the morpho-constitutional analysis reveals that calcium oxalate monohydrate is the major component of lithiasis in the order of 47 to 85% according to the authors [1] [6] [12] [13] [14]. The maximum size of 55 mm observed in our series is greater than that of the authors between 1 and 40 mm [2] [7] [14]. The frequency of stones expelled spontaneously is low in children, unlike what is observed in adults [1]. Our rate of 1.6% in 3 children is close to the 4% reported by El Lekhlifi [2] and clearly lower than the 25% established by Marrakchi [1]. TREATMENT: Unlike developed countries where conventional surgery is supplanted by minimally invasive surgical techniques, our study has shown that open surgery remains the only practiced in our environment in the absence of the technical platform. Our results are consistent with those of Tfeil (4) in Mauritania, Alaya [6] in Tunisia and Ali in Chad [4] [6] [9] who reported a cystolithotomy rate of 99% to 100%. Extracorporeal lithotripsy is indicated for small upper urinary tract stones [4] [7]. A balanced diet and plenty of fluids are recommended to prevent stone recurrence [12]. The physico-chemical analysis of calculus could not be done because of the insufficiency of the technical platform. Evolution: the postoperative course was simple in 183 children (95.8%) superimposable on the 97% reported by [4]. Wall infections were reported in 5 children (2.6%), comparable to the 2 and 3 cases cited by the authors [3] [4] [9]. They evolved favorably under antibiotic treatment. The vesicocutaneous fistula was noted in 3 cases (1.6%) against 2 cases (1.5%) reported by Ali [9] in relation to the size of stones. In our study, we observed that fistulas were related not only to stone size but also to the general condition of the patient. None of our patients was seen again in the long term. The loss of sight suggests a good evolution [4]. The relative rarity of recurrence in children is recognized by most authors [4]. El Lekhlifi [2] reported a recidivism rate of 12% while in Mexico

velàquez-Forero [5] observed a rate of 16% - 67%. In our series, no case of death was noted against 1 case of death reported by Sow [3].

## 5. Conclusion

Lithiasis is more common in boys aged 2 to 8 and is often found in the lower urinary tract. Diagnosis is easy and confirmed by radio-echography. Treatment depends on the location and size of the stones. Open-air surgery remains the only practice in our environment. Etiological research should be conducted to develop prevention strategies.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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