

RESEARCH ARTICLE

Epidemiology of Patients with Urolithiasis in Burkina Faso: A Five-Year Retrospective Study

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Abstract

Objectives: To determine the epidemiological characteristics of patients treated for urinary lithiasis, as well as the clinical manifestations of this condition, at the Urology Department of CHU-YO.

Methods: We retrospectively reviewed all patients managed for urinary stone disease at the Department of Urology and Andrology, Yalgado Ouédraogo University Hospital, Ouagadougou, Burkina Faso, from January 2018 through December 2022. Patients younger than 15 years, managed in the pediatric surgery department, were not eligible. Data were extracted from medical records using a structured questionnaire and analyzed with Epi Info. Quantitative variables are reported as mean and standard deviation, categorical variables as frequencies; age was compared between groups using the Mann-Whitney U test, significance set at $p < 0.05$.

Results: Of 6,477 patients managed during the study period, 976 had urolithiasis, a hospital frequency of 15.1%, with a rising trend in case numbers. Mean age was 44.9 ± 17.1 years; women presented significantly younger than men (41.8 ± 15.5 versus 46.6 ± 17.7 years, $p < 0.001$). Pain was the presenting complaint in 86.8% of patients. Upper urinary tract stones predominated (81.0%, $n = 791$); lower urinary tract stones were more frequent in men (odds ratio 4.57, 95% confidence interval 2.77 to 7.53). An obstructive uropathy or malformation coexisted in 12.1% of patients ($n = 118$), and 30.1% ($n = 264$) already had a complication at diagnosis.

Conclusions: Urolithiasis is a substantial and growing burden on urological services in Burkina Faso. Its profile, dominated by upper urinary tract, adult-onset disease, increasingly resembles that of high-income countries, and nearly one in three patients had a complication at diagnosis, underscoring the need for earlier detection and prevention.

Keywords: Burkina Faso, Epidemiology, Kidney Calculi, Retrospective Studies, Urolithiasis.

1. Introduction

Urolithiasis is among the oldest and most widespread diseases in human history, and its epidemiology has evolved alongside human civilization [1,2]. Its etiology is multifactorial, encompassing genetic, environmental, dietary, anatomical, metabolic, and infectious factors, and because environmental

determinants contribute substantially to disease expression, its epidemiology varies markedly across time and geography [3]. The lifetime risk of urinary stone disease in adults ranges from 5% to 9% in Europe, 12% in Canada, and 13% to 15% in the United States, and reaches 20% in some Asian countries, the highest rates reported worldwide [1,4].

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Epidemiological patterns therefore cannot be extrapolated from one region or era to another. In Africa, reported rates come exclusively from hospital-based studies, yet these studies consistently identify urolithiasis as a leading cause of urological hospitalization [5,6]. Data on stone disease remain particularly scarce in Burkina Faso: the only prior study, by Kaboré et al., is now more than a decade old and was based on a cohort of 450 patients [7], leaving the current burden and epidemiological profile of the disease in this setting poorly characterized.

We conducted this study to characterize the epidemiology of urolithiasis in a Burkinabe urology department, including its hospital frequency, demographic and anatomical profile, and complication burden, and to describe temporal trends over a five-year period, with the aim of informing earlier detection and improved clinical management.

2. Methods

We conducted a retrospective, descriptive study of all patients managed for urolithiasis at the Department of Urology and Andrology, Yalgado Ouédraogo University Hospital (Ouagadougou, Burkina Faso), between January 1, 2018, and December 31, 2022. We used exhaustive sampling, enrolling every patient managed for urinary stone disease during the study period. Patients younger than 15 years are managed

in the pediatric surgery department of our institution and were therefore not eligible for this study; no other exclusion criteria were applied. Data were extracted from medical records and consultation registers using a structured questionnaire built in KoboCollect (KoboToolbox, Cambridge, MA, USA), covering sociodemographic characteristics, presenting complaints, stone location, associated urological conditions, and complications present at diagnosis. Data were analyzed using Epi Info (version 7.2.6.0; US Centers for Disease Control and Prevention, Atlanta, GA, USA). Quantitative variables are presented as mean $\pm$ standard deviation, and categorical variables as frequencies and proportions. Mean ages were compared between groups using the nonparametric Mann-Whitney U test. We used the chi-square test, together with odds ratios and 95% confidence intervals, to assess the association between patient sex and stone location within the urinary tract. Statistical significance was set at $p < 0.05$.

3. Results

During the study period, 6,477 patients were managed in the Department of Urology and Andrology at Yalgado Ouédraogo University Hospital. Among them, 976 presented with urolithiasis, a hospital frequency of 15.1%. The male-to-female sex ratio was 1.87. Table 1 summarizes the sociodemographic characteristics of the study population.

Table 1. Sociodemographic characteristics of the study population (N=976)

Characteristic	n	%
Age (years)		
<20	25	2.6
20-29	181	18.5
30-39	225	23.1
40-49	168	17.2
50-59	147	15.1
60-69	116	11.9
≥ 70	114	11.7
Sex		
Male	637	65.3
Female	339	34.7
Residence†		
Urban	655	68.1
Rural	264	27.4
Other countries	43	4.5

N=976 unless otherwise noted. †Residence was missing for 14 patients (1.4%); percentages for this variable are calculated among patients with recorded residence (n=962).

An average of 195 patients were treated annually for urinary stone disease, with a rising trend in case numbers over the study period (Figure 1).

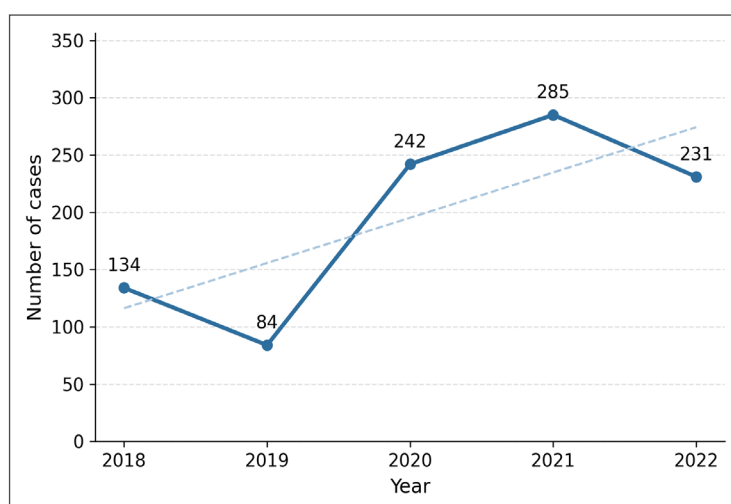


Figure 1. Annual frequency of urinary stone cases managed in the Department of Urology and Andrology, Yalgado Ouédraogo University Hospital, 2018-2022 (n=976). The dashed line represents the linear trend over the study period.

The mean age of patients was 44.9 ± 17.1 years. Mean age was 46.6 ± 17.7 years in men and 41.8 ± 15.5 years in women, a statistically significant difference indicating earlier stone onset in women ($p < 0.001$).

Pain was the presenting complaint in 86.8% of patients (Table 2).

Table 2. Distribution of presenting complaints (N=976)

Presenting complaint	n	%
Pain	847	86.8
Renal colic	408	41.8
Low back pain	333	34.1
Pelvic pain	47	4.9
Flank pain	24	2.5
Diffuse abdominal pain	17	1.7
Iliac fossa pain	11	1.1
Perineal pain	7	0.7
Lower urinary tract symptoms†	233	24.0
Hematuria	40	4.1
Incidental finding	23	2.3

N=976. Categories are not mutually exclusive; some patients presented with more than one complaint. Pain subtypes sum to the total pain count. †Lower urinary tract symptoms.

By anatomical location, 81.0% of patients (n=791) had stones confined to the upper urinary tract, with a male-to-female ratio of 1.53. Table 3 presents the sex ratio for upper urinary tract stones across age groups; this ratio reached 2.0 after 60 years of age. The mean age of these patients was 42.2 ± 15.7 years, with mean ages of 42.9 ± 16.0 years in men and 41.1 ± 15.3 years in women, a statistically significant difference ($p < 0.02$).

Table 3. Frequency of upper urinary tract stones by age group and sex

Age group (years)	Male (n=479)	Female (n=312)	Sex ratio (M/F)
<20	13	9	1.4
20-29	91	73	1.2
30-39	127	80	1.6
40-49	89	58	1.5
50-59	71	49	1.4
60-69	50	25	2.0
≥ 70	38	18	2.1

Upper urinary tract stones only (n=791). M/F, male-to-female.

Among patients with lower urinary tract stones, the mean age was 58.1 ± 18.2 years in men and 53.1 ± 16.6 years in women, a difference that was not statistically

significant ($p=0.19$). The risk of lower urinary tract stones was higher in men than in women (odds ratio, 4.57; 95% confidence interval, 2.77-7.53; Table 4).

Table 4. Association between stone location and sex

Location	Male, n (%)	Female, n (%)	OR (95% CI)	p
UUT	479 (60.6)	312 (39.4)	0.26 (0.17-0.40)	<0.001
LUT	136 (87.7)	19 (12.3)	4.57 (2.77-7.53)	<0.001

UUT, upper urinary tract ($n=791$); LUT, lower urinary tract ($n=155$); OR, odds ratio; CI, confidence interval. UUT and LUT together account for 946 of 976 patients with urolithiasis (96.9%); the location of stones in the remaining 30 patients (3.1%) is not further specified in the source data and should be clarified by the authors.

Urinary schistosomiasis, recurrent bacterial urinary tract infection, and prior stone recurrence were the leading personal medical histories, reported in 9.4% ($n=92$), 5.4% ($n=53$), and 3.5% ($n=34$) of patients, respectively.

Obstructive uropathies or urinary tract malformations were identified in 12.1% of cases ($n=118$, Figure 2).

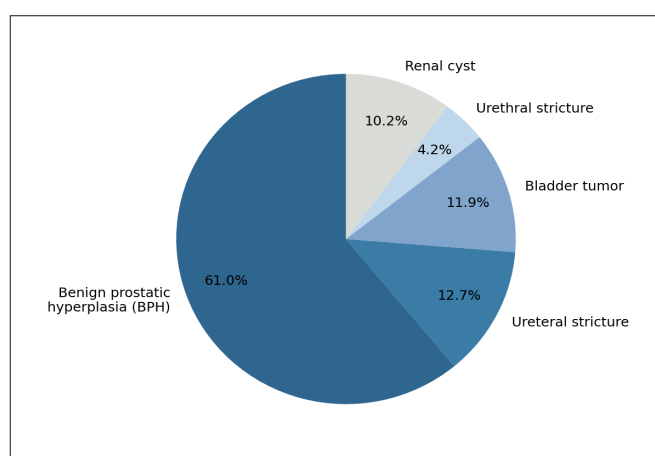


Figure 2. Associated obstructive uropathies and urinary tract malformations among patients with urolithiasis ($n=118$). BPH, benign prostatic hyperplasia.

Stone-related complications were observed in 30.1% of cases ($n=264$); their distribution is shown in Figure 3.

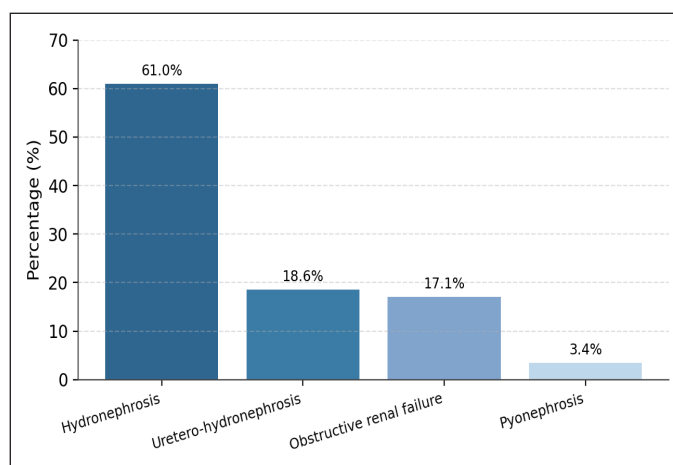


Figure 3. Distribution of stone-related complications at diagnosis among patients with urolithiasis ($n=264$).

4. Discussion

In this five-year retrospective study of 6,477 patients managed in a tertiary Burkinabe urology department, 976 patients presented with urolithiasis. Upper urinary tract stones predominated, the disease most often affected adults in their fourth decade with a modest male predominance, and nearly one in three patients

already had a stone-related complication at the time of diagnosis.

Hospital prevalence is a reliable indicator of the burden that urolithiasis places on a urology service. The prevalence observed here exceeds that reported a decade earlier in the same department [7] and approaches the rate reported by Diangienda et al. in

Kinshasa, Democratic Republic of the Congo [8]. Hospital prevalence varies widely across African case series [5], yet these studies agree on a progressive rise over time [5,9], a trend also reported elsewhere and confirmed by our findings [10,11]. Several factors likely contribute to this increase, including greater diagnostic accuracy and availability, as well as environmental change: each 5°C rise in daily ambient temperature is estimated to increase the risk of urolithiasis by 10% [12], and temperature extremes have become increasingly frequent across all continents in recent years.

The peak frequency occurred among adults aged 30 to 39 years, and the mean age was 44.9 years. Recent African series similarly identify urolithiasis as a disease of the fourth decade [8,9,13], consistent with global data showing the highest rates between the fourth and sixth decades [11]. Women in this study presented with urinary stones at a younger age than men, and this difference persisted when the analysis was restricted to upper urinary tract stones, likely reflecting a contribution from lower urinary tract obstructive causes that predominantly affect older men. Urolithiasis remains more common in men than in women [4,7,13]; the sex ratio in this study was 1.87, relatively stable up to age 60 and reaching 2.0 thereafter. This shift suggests that sex-specific lithogenic or protective factors emerge after age 60. The role of sex hormones remains controversial and may act indirectly, through their influence on lithogenic metabolic conditions such as diabetes and obesity [14,15].

Until recently, up to 90% of urinary stones in developing countries were located in the bladder, a pattern frequently encountered in young boys [16,17]. In the present study, 81.0% of patients had upper urinary tract stones, a pattern that mirrors industrialized countries, where urolithiasis is predominantly a renal disease of adulthood [18]. This finding is consistent with stone composition analysis performed in the same department, which similarly demonstrated a predominance of calcium oxalate stones, as seen in European countries [19]. The higher risk of lower urinary tract stones in men than in women likely reflects the higher frequency of bladder outlet obstruction in men.

Pain was the leading presenting complaint in this study, consistent with several African series [5]. Although pain is nonspecific, it should prompt rapid investigation for urinary stones to help prevent the complications observed in our series. At diagnosis, 30.1% of patients already had a complication

of variable severity. Despite being a common urological condition, urolithiasis carries a real risk of complications even in more medicalized settings, and it remains a leading cause of renal and perirenal suppuration in our department [20]. In England, an average of 130 deaths per year between 1999 and 2013 were attributed to urinary stone disease [21].

This study's principal strength lies in its five-year, exhaustive sampling of every patient managed for urolithiasis at the country's leading tertiary urology referral center, which limits the selection bias inherent to smaller or single-year case series and allowed us to detect a temporal trend that a shorter study could not have captured. Consistent, structured data collection across the entire study period also supports the internal reliability of the reported proportions.

This study has several limitations. Its retrospective design prevented us from capturing risk factors linked to the metabolic syndrome, such as diabetes and obesity, which have been associated with urolithiasis in other cohorts, and it did not include systematic stone composition or metabolic work-up for the whole population. As a single-center study, even at the country's principal urological referral center, our findings may not generalize to community-based or rural populations who do not reach tertiary care. Age was compared between groups using a nonparametric test without a formal assessment of the underlying distribution; reporting median values with interquartile ranges alongside means would strengthen future analyses of this cohort.

Urolithiasis is a common and increasingly frequent urological condition in Burkina Faso, and its epidemiological profile increasingly resembles that observed in high-income countries. Pain remains the principal presenting sign, and nearly one third of patients already have a stone-related complication when first diagnosed, which underscores the need for earlier detection and timely referral. Further prospective studies incorporating metabolic and dietary risk factors are warranted to clarify the etiological drivers of stone formation in this population and to guide preventive strategies.

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Disclosure

Conflict of Interest

The authors declare no conflict of interest.

Approval of the Research Protocol

This study was approved by the Comité d'Éthique pour la Recherche en Santé (CERS), Burkina Faso (approval no. 2026-03-0050), and authorized by the General Directorate of the Yalgado Ouédraogo University Hospital Center (CHU-YO), Ouagadougou, Burkina Faso (authorization no. 2022-MSH P/SG/CHU-YO/DG/DSP), and conforms to the provisions of the Declaration of Helsinki.

Registry and Registration Number

Not applicable. This is a retrospective, descriptive study and not a prospective clinical trial.

Animal Studies

Not applicable.

Data Availability

The dataset analyzed during the current study is available from the corresponding author upon reasonable request, subject to institutional approval given its derivation from patient medical records.

Author Contributions

Brahima Kirakoya: Conceptualization, Methodology, Formal analysis, Investigation, Writing (original draft), Writing (review and editing).

Ouima Justin Dieudonné Ziba: Investigation, Data curation, Writing (review and editing).

Ouedan Idogo: Investigation, Data curation, Writing (review and editing).

Abdoul Moutalé Kiemtoré: Data curation, Investigation.

Abdoul Karim Ouattara: Data curation, Investigation.

Clotaire Alexis Marie Kiemdiba Donega Yaméogo: Investigation, Writing (review and editing).

Fasnewinde Aristide Kaboré: Conceptualization, Supervision, Validation, Writing (review and editing).

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