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Clinical characteristics and short-term outcomes of adult patients with urolithiasis: first report from Somalia

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Abstract. – OBJECTIVE: This study aimed to investigate the data of adult patients admitted to the only tertiary care center in Somalia with the diagnosis of urolithiasis and to present the first report from this Sub-Saharan African country.

PATIENTS AND METHODS: This study was designed as a retrospective single-center study conducted in Somalia Turkiye Training and Research Hospital. Adult patients who received the diagnosis of urolithiasis and who were admitted to the urology department constituted the target population. Reviewed data included demographic parameters, stone features, type of surgical procedure, intraoperative and early postoperative complications, and inpatient mortality.

RESULTS: Overall, 3,680 patients were admitted during the study period. Among these, 620 (17%) patients were admitted due to urolithiasis. There was a significant male predominance with a male-to-female ratio of 3.4:1. Urinary bladder was the most common stone location (n=253, 40.8%), followed by the kidney (n=223, 35.9%). The mean stone diameter was 22.41 (5-64); most (39.4%) of the patients had a stone diameter between 20 and 30 mm, while 27.5% had stones with diameters between 10 and 20 mm. Minimally invasive procedures were the primary surgical modality in 52.6% (n=326) of our patients. However, 45.9% (n=285) of the patients underwent open surgery.

CONCLUSIONS: The rate of adults with urolithiasis is relatively high in Somalia, as in many other African countries, with a significant male predominance. Although open surgery is rarely used for treating adult urolithiasis in industrialized countries, this approach is still commonly used in Somalia, similar to other parts of Africa.

Key Words:
Urolithiasis, Adult, Stone, Outcomes.

Introduction

Urolithiasis is the third leading urological illness affecting the urinary tract after infections and prostate disease[1]. Its prevalence varies between 2 and 20% worldwide and appears related to geographic and socioeconomic factors[1]. Its prevalence ranges between 7-13% in North America, 5-9% in Europe, and 1-5% in Asia[1].

Age, gender, dietary habits, fluid consumption, climate, occupation, education level, and socioeconomic status affect the variances between countries[2,3]. In addition, urolithiasis has been linked with several risk factors, including but not limited to age above 60, male gender, diabetes or insulin resistance, obesity, and various dietary and urinary factors[4].

Although it is known[5] that the annual incidence of urolithiasis in the industrialized world is between 1,500 and 2,000 cases per million, the epidemiology of urolithiasis has been poorly investigated in most parts of Africa and Asia. Due to lacking follow-up data, most studies from African countries based their incidence and prevalence data on hospital admissions. Urolithiasis is known to be more common in the tropical and sub-Saharan African countries located in the "Afro-Asian stone-forming belt" due to the rising temperatures caused by global warming. Also, it was reported[1,6] that urinary tract stone disease accounts for 40 or 50% of all urological cases in this region. However, the exact incidence of urolithiasis in Sub-Saharan Africa remains to be discovered due to the scarcity of reported data from these countries. In the last three decades, reports[7] from Kenya, Ethiopia, and the surrounding East African regions revealed a significant increase in the incidence of urolithiasis.

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Although Somalia is an East African country close to the Afro-Asian stone belt, there are no national data regarding urinary tract stone disease prevalence. Therefore, this is the first study evaluating the rate of adult urolithiasis and analyzing the data, including clinical and radiological characteristics, management methods, and early complications in patients presenting to the only tertiary care hospital in Somalia.

Patients and Methods

Adult (i.e., age>18) patients who received the diagnostic code of urolithiasis according to the International Classification of Diseases (ICD-10) system and were admitted to the Urology Department of Somalia Training and Research Hospital between July 2017 and Jun 2022 constituted the target population of this study.

This study's ethical approval was received from the Somalia Turkiye Training and Research Hospital's institutional Ethical Review Committee (MSTH 29.08.2021/7132). In addition, informed consent to participate was obtained from all patients. All methods were carried out in accordance with relevant guidelines and regulations.

The study was designed as a retrospective cross-sectional study. All adult patients diagnosed with urolithiasis and admitted to the Urology Department during the study period were included. Patients with incomplete data were excluded.

Electronic medical records of the urolithiasis patients were retrospectively reviewed to collect demographic data, including age, gender, and symptomatology.

Urolithiasis features, including the number, size, and location of the urinary tract stones, were also retrieved from the records. These data were based on urinary system ultrasonography (USG) and non-contrast computerized tomography scan (NCCT) results. The unenhanced computerized tomography (CT) kidney-ureter-bladder (KUB) protocol was the standard conventional CT scan, and the results were reviewed using Picture Archiving and Communication System (PACS). Axial (with 1 mm cross-section), coronal and sagittal planes were used during NCCT to determine the stone size and localization. Because renal scintigraphy was unavailable, CT urography or intravenous urography was used to assess split renal functions.

Data regarding the type of surgical procedure, intraoperative and early postoperative complications, and inpatient mortality were also reviewed.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for Social Sciences software (SPSS v25, IBM Corp., Armonk, NY, USA). Continuous variables were given as means, while categorical data were presented as percentages. The Chi-square test and cross-tabulations were used to determine the association between the variables. A p-value lower than 0.05 was considered a statistical significance.

Results

Our analysis revealed that 3,680 adult patients were admitted to the Urology Department during the study period. Among these, 620 (17%) patients were admitted due to urolithiasis. The mean patient age was 47.5±22.6 [18-100] years. Most patients were older than 60 (n=263, 42.4%) (Table I).

Regarding gender distribution of the patients, there was a significant male predominance: while 480 (76.4%) were males, 140 (23.6%) were females, leading to a male-to-female ratio of 3.4:1. Male patients had a significantly higher mean age than females (52.8±21.7 *vs.* 425±16.2, $p<0.001$).

About half of the patients (49.8%) were incidentally diagnosed with urolithiasis while evaluating other medical conditions. On the other hand, among the symptomatic patients, the most common symptom was non-colicky flank pain (n=155, 25%), followed by suprapubic pain (n=93, 15%) and hematuria (n=74, 12%). Urinary tract USG was the initial imaging modality used for the diagnostic work-up of all patients. The NCCT was performed in 59.9% (n=371) of the cases as an adjunct imaging method.

In the entire cohort, the urinary bladder was the most common stone location (n=253, 40.8%), followed by the kidney (n=223, 35.9%) and ureters (n=144, 23.2%).

Analysis regarding gender distribution in patients with urinary tract stones at different locations revealed that 90.5% (n=229) of the bladder stone patients were elderly males. Among female patients with urolithiasis, 54% (n=76) had ureteral stones ($p=0.001$) (Figure 1).

Concomitant stones at different locations were detected in 8.7% (n=54) of the cohort. The most common combination was urinary bladder and ureteral stones (n=26), followed by urinary bladder and kidney stones (n=18). Most (87%, n=539) patients had a single stone. While 82.6% (n=512) of the patients had unilateral stones, bilateral involvement was detected in 17.4%.

Table I. Demographic and clinical characteristics and stone features of the patients.

Variables	Number of patients	Percentage (%)
Age groups		
18-29 years	91	14.7%
30-39 years	92	14.8%
40-49 years	68	11.0%
50-59 years	106	17.1%
>60 years	263	42.4%
Gender		
Male	480	77.4%
Female	140	22.6%
Stone location		
Kidney	223	35.9%
Upper calyx	16	7.2%
Mid calyx	44	19.4%
Lower calyx	69	31.1%
Renal pelvis	94	42.3%
Ureter	**144**	**23.2%**
Proximal	27	19%
Mid	19	12.6%
Distal	64	44.7%
Ureterovesical junction	34	23.7%
Bladder	**253**	**40.8%**
Stone size		
1-10 mm	143	23.1%
11-20 mm	171	27.5%
21-30 mm	244	39.4%
>30 mm	62	10.0%
Grade of hydronephrosis		
Number of patients	270	43.5%
Grade 1	152	24.5%
Grade 2	60	9.7%
Grade 3	124	20.0%
Grade 4	14	2.3%

The mean stone diameter was 22.41±6.1 [5-64]. Classification of the stones based on the size showed that most (n=244, 39.4%) of the patients had a stone diameter between 20 and 30 mm, while 27.5% (n=171) had stones with diameters between 10- and 20-mm. Staghorn stones were detected in approximately 4.5% (n=10) of the patients.

Minimally invasive procedures (MIPs), including rigid ureteroscopic lithotripsy (URSL), retrograde intrarenal surgery (RIRS), percutaneous nephrolithotomy (PCNL), and endoscopic cystolithotripsy were the primary surgical modalities in 52.6% (n=326) of our patients. Endoscopic cystolithotripsy was performed in 13.4% (n=83) of patients with bladder stones, while URSL in 13.2% (n=82), RIRS in 10.8% (n=67), and PCNL in 15.3% (n=95) of the patients. On the other hand, 18.5% (n=115) of the patients underwent open pyelolithotomy, and 27.4% (n=170) went through open cystolithotomy (Table II).

Eight patients underwent nephrectomy due to the diagnosis of a non-functioning kidney. In addition, simultaneous transurethral prostate resection and pneumatic cystolithotripsy procedures were performed in 6 patients, while 12 cases underwent simultaneous open suprapubic prostatectomy and cystolithotomy.

The analysis regarding perioperative complications revealed that 18.9% of the patients necessitated a second procedure, such as repeat URS or PCNL. The blood transfusion rate was 4.8%, and all these cases underwent PCNL. Three patients developed urosepsis following an MIP; ureteral perforation occurred in two cases during

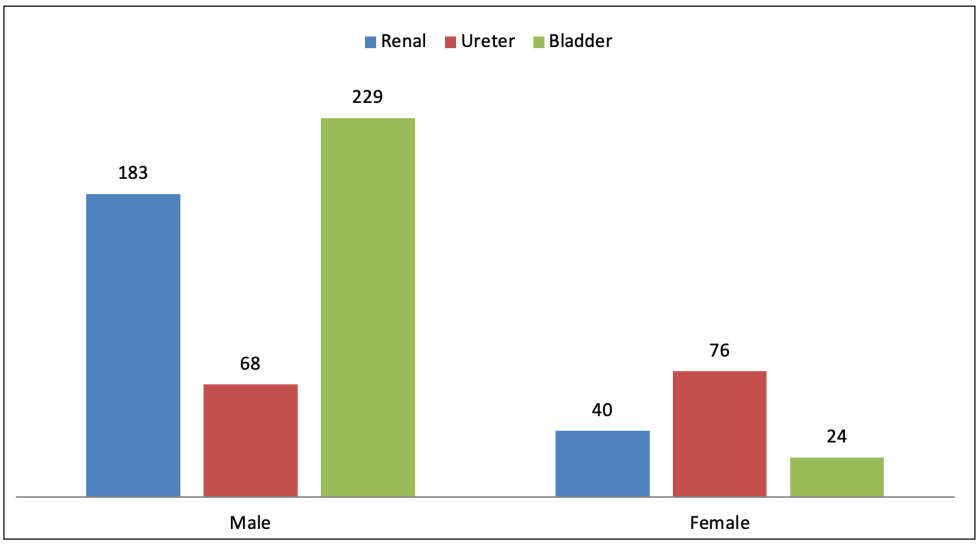

Figure 1. Patient distribution based on gender and stone locations.

rigid URSL, and bladder perforation occurred in one patient during pneumatic cystolithotripsy. On the other hand, four patients had prolonged urine leakage following open pyelolithotomy. These patients had surgical drains and ureteral stents and were managed conservatively. The surgical site infection rate was 2.8% in open cases; these cases were treated by antimicrobial therapy and conservative wound care.

The inpatient mortality rate was calculated as 0.97% (n=6): three patients underwent open cystolithotomy and developed suspected pulmonary embolism. In addition, two patients who had end-stage renal disease and underwent open pyelolithotomy developed surgical site infection and sepsis. The sixth patient was a patient who underwent PCNL, which was complicated by duodenum injury and subsequent sepsis.

Table II. Data regarding surgical management of the patients.

Management	Number of patients/ Percentage (%)
URSL	82 (13.2%)
FURS	67 (10.8%)
PCNL	95 (15.3%)
Endoscopic cystolithotripsy	83 (13.3%)
Pyelolithotomy	115 (18.5%)
Cystolithotomy	170 (27.4%)
Nephrectomy	8 (1.5%)

URSL: Ureteroscopic lithotripsy, FURS: Flexible ureteroscopy, PCNL: Percutaneous Nephrolithotomy.

Discussion

Somalia is an East African country close to the Afro-Asian stone belt. Despite this, no previous studies analyzed this country's data on adult urolithiasis. The present study investigated the data of adult patients admitted to the only tertiary care center in Somalia with the diagnosis of urolithiasis. Our analysis showed that urolithiasis accounted for 17% of all urological admissions. A retrospective cross-sectional study from Ethiopia – another country close to the Afro-Asian stone belt – conducted by Mohammed et al[1] reported that 13.6% to 33.6% of all urologic inpatients were admitted due to urolithiasis. This finding is in line with ours. A study[8] from Sudan reported that the incidence of urolithiasis was 15.3%. A similar study[9] from Nigeria reported a prevalence rate of 13.4/1,000. On the other hand, an observational cross-sectional study[10] conducted with 2,173 patients from Jeddah revealed a prevalence rate of 11.2%.

Well-established risk factors for urolithiasis include hot climate, high humidity, unhealthy dietary habits including high sodium intake, low socioeconomic status, and male gender[11-13]. In addition, it is known that inadequate fluid intake or high fluid loss directly raises the risk of stone formation by increasing the urinary saturation of stone-forming salts[12]. Somalia is notorious for its hot and humid climate, and the male-to-female ratio of the adult patients we admitted due to urolithiasis was approximately 3:1. These findings are consistent with the previously published data[11-13].

Our analysis also revealed that most of our patients were 60 or older. This finding is also in line with the literature[14,15]. For example, Chen and Chen[14] analyzed the prevalence of urolithiasis in Canada and reported that patients over 65 had the highest rate of urolithiasis[14]. Furthermore, Cervellin et al[15] noted that advanced age was a significant risk factor for urinary tract stone formation, as well as urinary tract abnormalities and metabolic syndrome. In addition, they stated that elderly patients were relatively more susceptible to dehydration for various reasons, including a reduction of total body water due to a gradual decrease in lean body mass, decreased perception of thirst with aging, and functional changes in the aging kidney.

It is widely accepted that the most common presenting symptoms of urolithiasis are flank pain, hematuria, and dysuria[16]. We encountered a similar symptom profile in our cohort. Therefore, given the abovementioned risk factors and that almost half of our patients were diagnosed incidentally, it is prudent to carefully screen all patients living in sub-Saharan African countries and presenting with one or more of these symptoms.

Imaging is critical for diagnosing urolithiasis. The non-contrast-enhanced CT scan (NCCT) is the preferred diagnostic imaging method for urolithiasis, with a sensitivity and specificity of 93.1% and 96.6%, respectively[1]. In our study, 59.9% of the patients necessitated NCCT after the initial assessment with urinary USG. Although USG has lower sensitivity and specificity for detecting urinary stones than NCCT, it is the initial radiological imaging of choice due to its easy accessibility, cost-effectiveness, and safety[16]. In line with this, we performed urinary USG as the first imaging modality in our cohort.

In our study, the urinary bladder was the predominant stone location, and 90.5% of these patients were elderly males (i.e., age>60). It is known[17,18] that these patients are prone to develop lower urinary tract obstruction, which facilitates stone formation in the urinary bladder. In line with this finding, Muslumanoglu et al[19] noted that urolithiasis was relatively more common in the fifth and sixth decades of life. In addition, it is known[20] that benign prostate hyperplasia is the most common disease in elderly male patients and can cause lower urinary tract obstruction, predisposing the patient to urinary tract infection and urolithiasis.

The MIPs became the gold-standard surgical management for stone disease, particularly in the industrialized world[5,21]. However, due to inadequate endourological expertise and instruments, open surgery remains the procedure of choice for managing urolithiasis in most developing countries[22]. In our cohort, the rate of open stone surgery was 47.4%, which is in line with the rates reported[5,23-25] in other African countries such as Senegal, Liberia, Chad, and Ethiopia. On the other hand, in industrialized countries, the rate of open surgery is less than 5% since the open approach is reserved for cases with complex stone disease, urogenital anatomical abnormalities that necessitate concurrent open surgery, and disabilities such as ankylosis of the hip preventing proper patient positioning in the lithotomy position.

Limitations

This study has some limitations that must be considered while evaluating its findings. First, it is a single-center study with a retrospective design. Second, stone analysis results were not included due to the lack of equipment to perform these tests. Third, this study did not include stone-free rates and additional follow-up data since most patients had financial restrictions due to financial reasons, lived in rural areas, and could not present for follow-up imaging. However, we believe that the data presented in this study are significant since the rate of adult urolithiasis and the very short-term patient outcomes have not been reported from Somalia to date.

Conclusions

In conclusion, the study findings revealed that the rate of adult urolithiasis was relatively high in Somalia, as in many other African countries, with a significant male predominance. It is one of the primary causes of urological admissions in Somalia. Although open surgery is rarely used for treating adult urolithiasis in industrialized countries, this approach is still commonly used in Somalia, as in most other parts of Africa.

Ethics Approval

This study was approved by the Institutional Ethical Review Board of Somalia Turkiye Training and Research Hospital (MSTH 29.08.2021/7132).

Informed Consent

The research objective was explained to the participants; all patients gave oral and written informed consent to participate in this study.

Conflicts of Interest
The authors declared no competing interest.

Authors' Contributions
SC, BB and AED conceived, analyzed and finalized the manuscript. AHM, SK and FSU did data collection, transcription, analysis and manuscript writing. AIM and AK collected and analyzed data. AE and MG analyzed and interpreted data, did the literature search, revised the manuscript.

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Availability of Data and Materials
All study data and materials can be obtained from the corresponding author.

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