SCIENTIFIC ARTICLE

Urolithiasis: a descriptive study in a single urological unit at a tertiary care hospital

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Abstract

Introduction

Urolithiasis is the most prevalent surgical disorder of urinary tract in Asia. The prevalence of urolithiasis varies with demographic factors. There are many treatment options feasible. The specific treatment approach depends on composition, location, size of the stones and preferences of the patients and hospital capability.

Objctive

The aim of the study was to assess the demographic details, clinical presentation, and management of patients with urolithiasis in a single urological unit at a tertiary care hospital.

Methods

A descriptive cross-sectional study was conducted in a total of 247 diagnosed urolithiasis patients in a single urological unit at a tertiary care hospital from August 2021 to July 2022. Data were collected from patients' records; demographic details, clinical presentation and management of urolithiasis were retrieved. Collected data were analyzed with SPSS 26.0.

Results

Among the 247 patients, the majority were males (n=159, 64.4%). Patients ranged from the age of 13-83 years, with a mean age of 48.8 (SD: 15.2) years. The most common presenting symptom was pain (n=150, 60.7%). In 45.3% (n=112) comorbidities such as diabetic mellitus (n=64), hypertension (n=77), hyperlipidemia (n=29), chronic kidney disease (n=15) and ischemic heart disease (n=12) were seen. The majority had single stones (n=171, 69.2%). The commonest site of stones was on the left urinary tract (n=101, 40.9%) followed by right (n=95, 38.5%), and bilateral (11.3%), Bladder (8.5%) and urethra (0.8%) were the other sites. The ureteric stones (n=125, 50.6%), and a mean size of 14.8mm (SD: 11.7) were more common than renal stones (n=74, 30.0%), and a mean size of 19.9mm (SD 11.8). The majority (n=186, 75.3%) were treated surgically.

Conclusion

Urolithiasis was more commonly seen in males. The commonest presentation was pain, and the site was ureter. Nearly half of the patients had at least one non-communicable comorbidity, and the majority were treated surgically.

Introduction

Urolithiasis is the most prevalent urological disorder in Asia, and it is described as the formation or occurrence of stones at any level of the urinary tract [1]. The prevalence of urolithiasis varies with geographical area, race, age, occupation, and gender [1,2]. The occurrence of urolithiasis rises between 4th and 6th decade of life and symptoms vary from, being a symptomatic to mild to moderate infections, life-threatening sepsis, and obstructive renal failure [2].

Patients may be asymptomatic but typically present with acute renal colic, ureteric colic, loin pain, abdominal pain, groin pain, genital pain, dysuria, haematuria, urinary tract infection (UTI), vomiting and occasionally fever [3]. When ureteral stones obstruct the urinary system or transit through the ureter, acute renal or ureteric colic commonly occur. Urolithiasis can also be associated with medical conditions such as diabetes mellitus, hypertension,hyperparathyroidism, gout,recurrent UTI, neurogenic bladder, and congenital anomalies of urinary tract [1]

Various treatment options are available for urolithiasis: watchful waiting, medical expulsive therapy, and surgical intervention such as ureterorenoscopy (URS), Percutaneous Nephrolithotomy (PCNL), laparoscopy, extracorporeal shockwave lithotripsy (ESWL) and rarely open surgery. However, the exact therapy is determined by multiple factors: namely, stone factors (size, location, composition), patient factors (fitness, preference, anatomical anomalies) and

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resource factors (facilities, surgeon's experiences) [4,5].

The aim of the study was to assess the demographic details, clinical presentation, and management of patients with urolithiasis admitted to the tertiary care hospital, Northern Province of Sri Lanka.

Methods

This study was conducted as an institutional-based descriptive cross-sectional study to assess the demographic details, clinical presentation, and management of urolithiasis in tertiary care hospital from August 2021 to July 2022. All patients who had urolithiasis treatment during the specified time and were diagnosed by USS (Ultrasound scan) or NCCT KUB (Non-contrast computerized tomography) were included. This study was approved by the ethical review committee of the institution. The convenient sampling technique was used to gather data. Data were collected including demographic details, clinical presentation and management of urolithiasis and recorded using a data extraction form based on patients' records. Collected data were explored with descriptive statistics of the statistical package for social sciences (SPSS) version 26.0.

Results

A total of 247 patients were admitted for treatment of urolithiasis during the study period. Among them, 64.4% (n=159) were males and 35.6% (n=88) females (**Figure 1**) with a male to female ratio of 1.81:1. The mean age was 48.8 (SD: 15.2) years with an age ranging from 13 to 83 years (**Figure 2**).

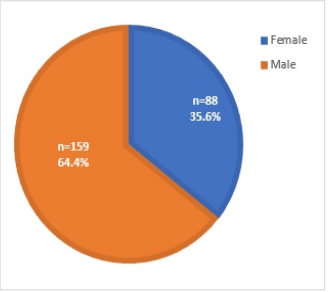

Figure 1: Pattern of urolithiasis with gender

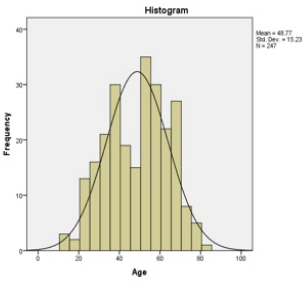

Figure 2: Age distribution of patients

The commonest presenting symptom was pain (both loin pain and ureteric colic, n=150, 60.7%) followed by dysuria (n=24, 9.7%) and lower urinary tract symptoms (n=24, 9.7%). Incidental diagnosis was made in 22 (8.9%) asymptomatic patients and visible haematuria was seen in 14 patients (5.7%) and obstructed infected kidney in 13 (5.3%) (**Table 1**).

Among the 247 patients, 45.3% (n=112) had comorbidities. Diabetes mellitus (n=64, 25.9%), hypertension (n=77, 31.2%), chronic kidney disease (CKD) (n=15, 6.1%) and ischemic heart disease (IHD) (n=12, 4.9%) were documented in the given frequencies. A single stone was identified in 69.2% (n=171) of patients, whereas 30.8% (n=76) had multiple stones.

The common sites of stones in the frequency of occurrence were, left side of urinary tract (n=101, 40.9%), followed by

Table 1: Clinical presentation of urolithiasis

	No	%
Presenting symptoms		
Pain	150	60.7%
Dysuria	24	9.7%
LUTS	24	9.7%
Incidental diagnosis with asymptomatic	22	8.9%
Visible haematuria	14	5.7%
Obstructed infected kidney	13	5.3%
Comorbidities		
Present	112	45.3%
Nil	135	54.7%
DM	*64*	25.9%
HT	*77*	31.2%
HL	*29*	11.7%
CKD	*15*	6.1%
IHD	*12*	4.9%
Single stones	171	69.2%
Multiple stones	76	30.8%
Site		
Left urinary tract	101	40.9%
Right urinary tract	95	38.5%
Bilateral	28	11.3%
Bladder	21	8.5%
Urethra	2	0.8%
Anatomical location of stone		
Ureter	125	50.6%
Renal	74	30.0%
Renal & Ureter	25	10.1%
Bladder	13	5.3%
Ureter & Bladder	5	2.0%
Renal & Bladder	3	1.2%
Urethra	2	0.8%
Location of ureteral stones		
Proximal ureter	84	55.3%
Mid ureter	18	11.8%
Distal ureter	50	32.9%

the right (n=95, 38.5%), bilateral (n=28, 11.3%). In 50.6% (n=125) of the patients' ureteric stone (mean size of 14.8mm, SD: 11.7) was seen and in 30.0% (n=74) of patients' renal stone (mean size of19.9mm, SD: 11.8) were seen. Concurrent renal with ureter stones (n=25, 10.1%), bladder stones (n=13, 5.3%), ureter with bladder stones (n=5, 2.0%), renal with bladder stones (n=3, 1.2%) and urethral stones (n=2, 0.8%) were also seen in the given percentages.

The ureteral stones were most located in the proximal ureter (n=84, 55.3%) followed by distal ureter (n=50, 32.9%) and mid ureter (n=18, 11.8%); the remaining cases were combinations of the above.

There was no definitive correlation between the size of stones and patients' age (**Figure 3**)

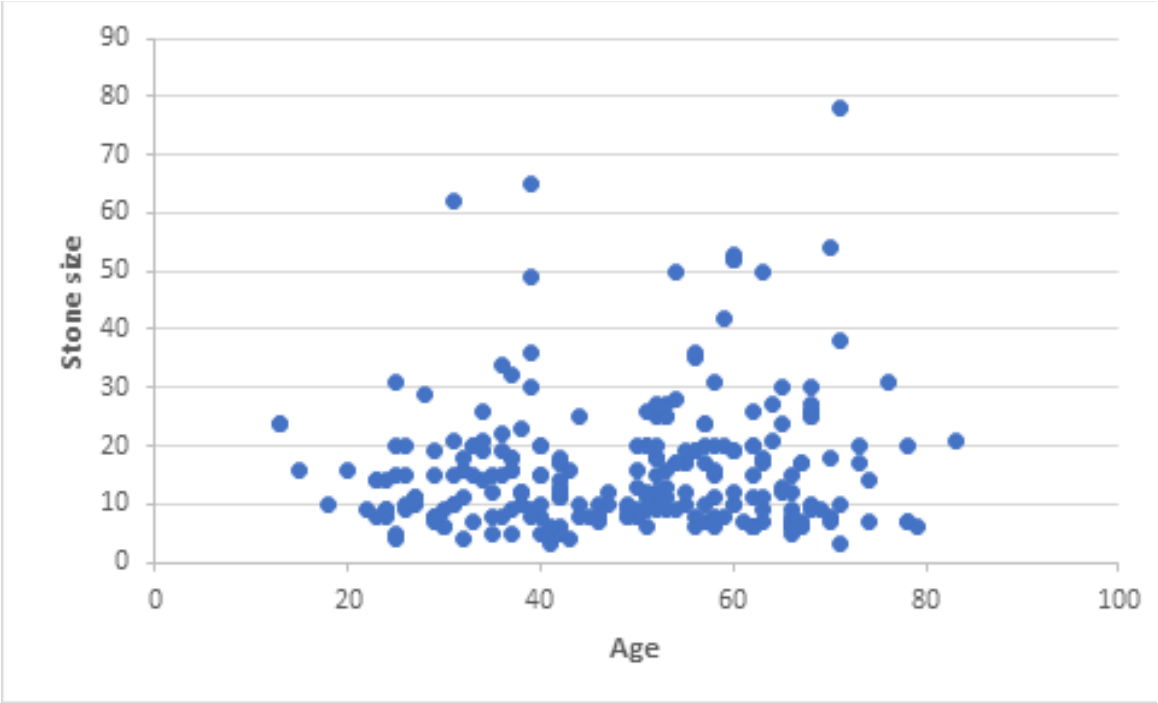

Figure 3 : Distribution of stone size with age

Table 2: Distribution of stone size with gender and treatment modalities

Stone size in mm	MET		MET Total	Surgical intervention		Surgical intervention Total	Grand Total	
	Female	Male		Female	Male			%
<5	2	2	4	1		1	5	2.0%
5-10	23	34	57	9	26	35	92	37.2%
11-20				35	65	100	100	40.5%
21-30				10	20	30	31	12.6%
>30				8	12	20	20	8.1%
Grand Total	**25**	**36**	**61**	**63**	**123**	**186**	**247**	**100%**

The percentage of stones of various sizes of urolithiasis ranged from 11 to 20 mm in 40.5% (n=100), followed by 5 to 10mm in 37.2% (n=92), 21 to 30mm in 12.6% (n=31), >30mm in 8.1% (n=20) and <5mm 2% (n=5). Nearly a half (49.8%, n=123) of male patients and 25.5% (n=63) female patients were treated surgically **(Table 2)**.

Among 247 urolithiasis patients, the majority (n=186, 75.3%) were treated with surgical intervention during the study period: rigid ureteroscopy with laser lithotripsy (n=110, 44.5%), percutaneous nephrolithotomy (PCNL)(n=41, 16.61%), cystolithalopaxy (n=18, 7.3%), flexible ureterorenoscopy (fURS) with laser lithotripsy (n=12, 4.9%), open surgery (n=3, 1.2%) and ESWL (n=2, 0.8%) were performed. Moreover, 24.7% (n=61) of patients were treated with medical expulsive therapy alone. The mean stone size of surgically treated and MET (Medical Expulsive Therapy) were 19.1mm (SD: 11.6) and 7.4mm (SD: 2.5) respectively. (**Table 3**). Except in one patient, all stones of < 5mm size were successfully expulsed with medical therapy. In the stone size 5-10mm group, major part (62%) passed with medical expulsive therapy alone.

Discussion

Males are more common to have urolithiasis. It could be related to occupation and lifestyle patterns. Generally, males work outdoors as manual workers, such as fishermen, masons, carpenters, plumbers, electricians, drivers, and construct workers than females which cause more dehydration in tropical countries like Sri Lanka. Super saturation is the major cause of urolithiasis [1] and males tend to consume excessive amounts of alcohol, coffee, and meat. Additionally, androgen plays a role in enhancing oxalate excretion and stimulating stone formation [1,4,5]. Furthermore, the anatomical variations in males due to benign prostatic hyperplasia and consequent urethral blockage can also increase the risk of stone formation [1,6]. However, male: female ratio varies depending on geography and culture [1]. According to some studies, the male: female ratio ranged from 1.7:1 to 3:1 [7,8,9]. In the present study, the male-to-female ratio was 1.8:1. These results reflect that males do more outdoor works and are exposed to more dehydration in our part of the world.

An Asian study reported that the incidence of urolithiasis peaked between the ages of 30 and 60 and it generally increased with age [1]. Another study reported that the occurrence of urolithiasis rises between 4th and 6th decades of life [2]. Likely the middle-aged population is more prone to dehydration, an unhealthy lifestyle and involvement in more strenuous work in outdoors. [1,2,6]. In the current study, the mean age was 48.8 (SD: 15.2) years. However, patients ranged in age from 13 to 83 years which is compatible with the prevalence pattern of urolithiasis in tropical countries.

A study reported that the most common symptom was loin pain (74% to 94%) [10]. Atypical stone symptoms can delay an individual without a history of stones from having prompt diagnosis and treatment. Additionally, haematuria and vague or absent pain symptoms may increase urolithiasis suspicion [10]. Furthermore, a random diagnosis of hydronephrosis, microscopic haematuria, urological x-ray examination and history of nephrolithiasis may had led to the diagnosis of asymptomatic calculi [3]. Another research revealed that most of the patients were asymptomatic at the time of presentation and were diagnosed by ultrasound scan (USS) [7,11]. However, this study statistically revealed that pain (both loin pain and ureteric colic) was commonest presenting

Table 3: Treatment modalities with urolithiasis

Treatment modalities	Female	Male	Grand Total	%	Mean stone size (mm) (±SD)
Surgical intervention	**63**	**123**	**186**	**75.3%**	19.1 ± 11.6
Rigid URS + Laser lithotripsy	33	77	110	44.5%	
PCNL	18	23	41	16.6%	
Cystolithalopaxy	3	15	18	7.3%	
Flexi URS + Laser lithotripsy	6	6	12	4.0%	
Open surgery	2	1	3	2.0%	
ESWL	1	1	2	0.8%	
MET	**25**	**36**	**61**	**24.7%**	7.4 ± 2.5
Grand Total	**88**	**159**	**247**	**100%**	

Several studies have implicated that associated medical conditions may be an additional risk factor for the development of urolithiasis, such as diabetes mellitus (DM), hypertension (HT), hyperlipidemia (HL), gout, obesity, and metabolic syndrome [2,5,10,12]. More than 30% of people with type II diabetes mellitus (DM) were more likely to have a history of nephrolithiasis which has been reported to increase the likelihood of stone formation. Women with DM have a 30-50% increased chance of developing stones [6,12]. In this study, 45.3% (n=112) of patients that were diagnosed to have comorbidities and DM, hypertension (HT), chronic kidney disease (CKD) and ischemic heart disease (IHD) were more prevalent. Furthermore, DM and impact of insulin resistance on ammonia genesis result in lower urine pH and greater rates of uric acid stone development. A dietary approach to stop hypertension (DASH) diet may lower the risk of kidney stone formation by raising citrate levels and volume of urine [2].

In the present study, ureter stones (50.6%, n=125) were the most prevalent site, whereas renal stones (n=74, 30%), renal with ureter stones (n=25, 10.1%), bladder stones (n=13, 5.3%), ureter with bladder stones (n=5, 2%), renal with bladder stones (n=3, 1.2%) and urethral stones (n=2, 0.8%) were recorded. The finding of this investigation closely paralleled with global trends [1].

Rigid and flexible ureterorenoscopy (URS) was commonly recommended as an invasive technique for all stone sizes and locations with good stone-free rates (SFR) and low morbidity, especially for ureteral stones [4,5]. Moreover, PCNL is a preferred treatment approach for all renal calculi more than 2cm according to European Association of Urology (EAU) guidelines [4]. URS and PCNL are safe and effective treatment modalities, and the stone clearance rates were higher. URS was associated with less morbidities compared to PCNL in the treatment of proximal ureteric and PUJ stones. Rigid URS with laser lithotripsy, PCNL and cystolithalopaxy were mostly used. In which, 44.5% of patients were treated with rigid URS and laser lithotripsy alone. URS modalities were more frequent in younger patients than in other stone-related procedures, which was associated with the lower stone size. Surgical intervention rates increased with age in both genders, especially in men like other studies [6,10]. Furthermore, it showed that the highest percentage of stones ranged from 11 to 20mm which indicates more stone burden akin other studies from tropical countries such as India, Pakistan, Middle East countries rather than non-tropical countries.

Limitation of this study

This study had some limitations. This study did not include long-term follow-up data such as stone recurrence rate and long-term complications. Moreover, it is a single unit data over a one-year period. Therefore, further multicentric studies are required over a long period and we plan to do a prospective study that includes a larger number of samples in the future. Though, patients included were treated and followed up for a brief period, most were diagnosed and treated according to a standard protocol despite limited resources and could considered as a strength of the study.

Conclusions

The highest prevalence of urolithiasis (64.4%) was of male predominance. The mean age was 48.8 (SD: 15.2) years. The pain (both loin pain and ureteric colic) was the most common presenting symptom (60.7%) with the common site being ureter. There were associated comorbidities in 45.3% of the patients. The majority (75.3%) of patients were treated surgically as this was a study done at a tertiary referral center. Medical expulsive therapy was successful in the majority of the patient with a stone size < 1cm and more so in < 5mm.

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