INTERNATIONAL JOURNAL OF SOCIAL HEALTH
https://ijsh.ph/index.php/rp
Volume 4 Number 8 August 2025
E-ISSN: 2984-7079

Description of the Incidence Urinary Tract Stones in Patients at the Teluk Kuantan Regional General Hospital Period January-December 2022-2024

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KEYWORDS
Urinary Tract Stones, Nephrolithiasis, Incidence, Medical Management, Teluk Kuantan Hospital

ABSTRACT
Urolithiasis, or urinary tract stones, is a condition in which stones form in the urinary tract, ranging from the renal pelvis (kidney stones or nephrolithiasis), ureter (ureterolithiasis), bladder (vesicolithiasis), and urethra (urethrolithiasis). There are various factors that can contribute to the formation of urolithiasis. Symptoms can vary widely, ranging from asymptomatic cases to renal colic, and may also include psychological, economic, and lifestyle-related issues. Management of urinary tract stones includes conservative and surgical approaches. The objective of this study is to determine the prevalence and patient characteristics of urolithiasis cases at Teluk Kuantan Hospital from January 2022 to December 2024. This study used a retrospective descriptive design with a sample of 397 new cases (incidence) of urinary tract stones at Teluk Kuantan General Hospital. Results: The incidence of urinary tract stones at Teluk Kuantan General Hospital from January 2022 to December 2024 was 397 cases. The distribution results showed that urinary tract stones occurred more frequently in males (63.7%) than in females (36.3%). There was an increase in the number of patients in the 40-60 age group over three consecutive years (54.0%, 54.8%, and 55.1%). The most common location of the stones was in the kidneys (70.3%). The most common management approach for urinary tract stones was medical treatment (38.8%). Conclusion: Based on the study results, it can be concluded that urinary tract stones are more common in males, aged 40–60 years, with the most common location being the kidneys (nephrolithiasis), and most common management approach being medical treatment.

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INTRODUCTION

Urolithiasis, or urinary tract stones, is a condition where stones form in the urinary tract. These stones can develop in the *pelvis renalis* (kidney stones or nephrolithiasis), ureter (*ureterolithiasis*), bladder (*vesicolithiasis*), or urethra (*urethrolithiasis*). Urolithiasis is the third most common disease in urology after urinary tract infections and benign prostate enlargement (Purnomo, 2023). In Indonesia, data show that urolithiasis is the second most common disease after urinary tract infections and is the most frequent condition requiring intervention in the field of urology (Permatasari & Sholihin, 2021).

Globally, the incidence of urolithiasis is around 14%, varying depending on age, gender, and ethnicity (Hughes et al., 2020). In the United States, it is estimated to be around 5%–10%, in Northern Europe 3%–6%, and in Southern Europe 6%–9%. The frequency of urinary tract stones is about 1–5% in Asia. Developing countries such as India, Thailand, and Indonesia have a high incidence of urinary tract stones, with an incidence rate of approximately

2–15% (Irawan et al., 2024). The prevalence of urinary tract stones is highest in the productive age population and is more common in men than in women (Prasojo et al., 2023).

Various factors can facilitate the formation of urolithiasis, including heredity, age, gender, insufficient water intake, high levels of calcium in drinking water, a high-protein diet, sedentary lifestyle, or lack of physical activity (Muzammil & Subkhan, 2024). Kidney stone formation occurs when there is an imbalance in the urine between lithogenic substances and inhibitors of crystal formation (Wagner, 2021).

Initially, stone formation does not cause any symptoms. Later, symptoms will appear in correlation with the location of the stone, including renal colic (severe cramping pain), pelvic pain, hematuria, urinary tract obstruction, infection, and hydronephrosis. Further effects of urolithiasis may even include psychological problems (such as depression and anxiety), economic, and lifestyle problems (such as decreased work productivity and financial burden from medical costs) (Taufiqurrahman et al., 2024).

Management of urinary tract stones consists of both conservative and surgical treatments. Conservative management includes increased water consumption, a balanced diet (calcium, sodium, protein), and limiting intake of oxalate-rich foods. Medical therapy is aimed at smaller stones of less than 5 mm in size, with the expectation that the stones can pass without medical intervention. Treatment for renal colic may include NSAIDs. Expulsion therapy to facilitate the passage of distal ureteral stones includes nifedipine (a calcium channel blocker), which works by relaxing smooth muscle fibers, and tamsulosin (an alpha blocker), which aids peristalsis (Kachkoul et al., 2023; Aussiana, 2020).

Surgical management has developed rapidly in the modern era, ranging from conventional open surgeries to minimally invasive, noninvasive, and even robotic procedures. One example of a noninvasive modality is ESWL (*Extracorporeal Shock Wave Lithotripsy*); using this method, the average success rate for kidney stones is 60%–80% and up to 80% for ureteral stones, depending on stone characteristics, size, and location. Minimally invasive therapies include URS-L (*Ureterorenoscopic-Lithotripsy*), aimed at removing stones lodged in the ureter or bladder, which can also evaluate stones in the upper urinary tract; vesicolithotripsy is the most commonly performed procedure for bladder stones (Bambang et al., 2018). Another minimally invasive surgery is PCNL (*Percutaneous Nephrolithotomy*), performed to break up and remove kidney stones larger than 2 cm in diameter (Kachkoul et al., 2023; Jung et al., 2023). The decision to treat urolithiasis depends on the size, location, and composition of the stone, as well as the patient's comorbidities and the healthcare provider's facilities and equipment (Jung et al., 2023).

Although treatment methods for urinary tract stones have improved, recurrence rates can be as high as 50% within five years and 70% within ten years. To prevent urinary tract stones, identifying the risk factors that cause urinary tract stones is important. Adequate and appropriate prevention can certainly be achieved if we can understand the characteristics of patients diagnosed with urolithiasis (Daniputra et al., 2024).

Several studies have focused on the prevalence and risk factors of urolithiasis but have not explored the specific characteristics of patients in particular hospitals, which this study

aims to address. For instance, Singh et al. (2020) conducted a study in India on the prevalence and risk factors of kidney stones, and found that dehydration and a high-protein diet were significant contributors to stone formation. However, this study lacked a detailed breakdown of patient characteristics at the hospital level, particularly regarding how demographic factors such as age, gender, and underlying health conditions influence the incidence of urolithiasis. Liu et al. (2021) conducted a similar study in China and concluded that obesity and metabolic disorders were prominent risk factors. However, they also did not evaluate how these factors interact within a specific hospital setting or how the local healthcare infrastructure addresses these conditions.

Therefore, this study was conducted to determine the prevalence and characteristics of patients with urolithiasis at Teluk Kuantan Hospital during the period January 2022–December 2024. The benefits of this research are twofold: first, it will help healthcare providers identify high-risk groups and customize preventive strategies for urolithiasis; second, it will contribute to improving the overall management of urolithiasis at the hospital level by offering insights into treatment efficacy and patient care. Additionally, the findings will assist in enhancing public health awareness regarding the prevention and management of urinary tract stones in the region.

METHOD

This study used a retrospective descriptive design with secondary data in the form of medical records of outpatients at the Urology Department of Teluk Kuantan Hospital for the period January 2022–December 2024. The variables collected consisted of gender, age, stone location based on diagnosis, and management actions taken. The sampling technique used in this study was a total sampling method, involving all patients who met the inclusion criteria during the study period.

The inclusion criteria were: medical record data of urinary tract stone patients (*new cases*) who visited the Urology Clinic at Teluk Kuantan Hospital from January 2022 to December 2024.

The exclusion criteria were as follows:

a. Incomplete medical record data regarding the variables studied
b. Data on control patients who received repeated treatment for the same disease
c. Medical record data that could not be found

RESULT AND DISCUSSION

This study used medical record data of patients with urinary tract stone diagnoses who came to the Urology clinic at Teluk Kuantan Hospital from January 2022 to December 2024. Retrospective data collection was conducted. Based on the research sample data, there were 397 new cases (incidents) of urinary tract stones in the three-year period at Teluk Kuantan Regional Hospital. When viewed from the aspect of gender, the distribution of urinary tract stone patients in men was 63.7% (253 cases) and in women was 36.3% (144 cases), as shown in the table below (Table 1).

Table 1. Distribution of Urinary Tract Stones Patients Based on Gender

Gender	(n)	(%)
Male	253	63.7
Female	144	36.3
Total	397	100.0

Based on age, the distribution of patients with urinary tract stones in Teluk Kuantan Regional Hospital is mostly in the age group 40-60 years, followed by the age group < 40 years, and the age group > 60 years is the least age group. Even in the period of three years there was an increase in the number of patients in the age group 40-60 years, as shown in table 2 below.

Table 2: Age Distribution of Patients with Urinary Tract Stones Based on Yearly Data

patient age	2022		2023		2024	
	n	%	n	%	n	%
< 40 years	29	23.0	42	31.1	38	27.9
40-60 years	68	54.0	74	54.8	75	55.1
> 60 years	29	23.0	19	14.1	23	16.9
Total	126	100.0	135	100.0	136	100.0

Based on the distribution of urinary tract stone cases based on the location of stones in the three-year period, where the most cases were kidney stones with a percentage of 70.3% (279 cases), followed by ureteral stones with a percentage of 20.4% (81 cases), and bladder stones with a percentage of 9.3% (37 cases), as shown in table 3 below.

Table 3. Distribution of Urinary Tract Stones Patients Based on Stone Location

Diagnose	(n)	(%)
Kidney stones	279	70.3
Ureteral stones	81	20.4
Bladder stones	37	9.3
Total	397	100.0

Based on the distribution of urinary tract stone management in the three-year period, the most frequently performed was the administration of Medicamentosa with a percentage of 38.3% (154 cases), followed by Ureterorenoscopy (URS) with a percentage of 31.2% (124 cases), Percutaneous Nephrolithotomy (PCNL) with a percentage of 16. 1% (64 cases), Vesicolithotripsy with a percentage of 8.1% (32 cases), Retrograde Intrarenal Surgery (RIRS) with a percentage of 4.0% (16 cases) and finally Extracorporeal Shock Wave Lithotripsy (ESWL) with a percentage of 1.8% (7 cases), as shown in table 4 below.

Table 4. Distribution of Management of Patients with Urinary Tract Stones

Management	(n)	(%)
Medicamentosa	154	38.8
URS	124	31.2
PCNL	64	16.1
Vesicolithotripsy	32	8.1
RIRS	16	4.0
ESWL	7	1.8
Total	397	100.0

URS: Ureterorenoskopi, PCNL: Percutaneous Nephrolithotomy, RIRS: Retrograde Intrarenal Surgery, ESWL: Extracorporeal Shock Wave Lithotripsy

The number of new cases of urinary tract stones in three years at Teluk Kuantan Hospital (January 2022-December 2024) was 397 cases. Based on the collected research sample data, the proportion of urinary tract stone cases based on male gender was 63.7% (253 cases) and in women was 36.3% (144 cases). From these data it can be concluded that men experience more urinary tract stones than women. The data collected from this study are in line with research (Altaseb, et al) that the incidence of urolithiasis is higher in men than women.[14] Testosterone levels in men cause increased endogenous oxalate production by the liver, in women testosterone levels are low, causing a low incidence of urolithiasis in women. The incidence of urolithiasis between men and women was 4.7: 1 (33 men and 7 women).[15,16] Research conducted by Zhang et al. in Tibet showed that of all individuals over 40 years of age who had their uric acid levels checked, men suffered more hyperuricemia than women with a percentage of 2.96% vs 0.75%. This is due to men having smoking habits, alcohol consumption, and the habit of eating foods with higher purine levels (Prasojo et al., 2023).

In the study sample, there was an increase in the number of patients with urinary tract stones in a span of three years in the age group between 40-60 years which was the largest number of patients with urinary tract stones for three years. This condition is in line with research conducted by Daniputra et al. (2024) at Sido Waras Mojokerto Hospital, where the results showed that the most urinary tract stone patients were in the age group of 40-59 years. This can occur because there are metabolic differences between age groups and the stability of different crystal structures. With increasing age, the amount of content in the kidneys will also increase so that the process of deposition in the henle arch will increase, so that the process of stone formation in the urinary tract will occur more easily. In addition, late adulthood is more susceptible to urolithiasis due to more activity than other age groups, so that fluid needs increase and often less fluid enters the body than needed (Taufiqurrahman et al., 2024).

Based on the location aspect of urinary tract stones, kidney stones were the urinary tract stones with the highest number of cases, with 279 cases. Ureteral stones were 81 cases and bladder stones were the urinary tract stones with the lowest incidence, which was only 37 cases in three years. The results of this study are in line with research conducted by Altaseb (2024) on the Prevalence and Clinical Pattern of Urolithiasis in sub-Saharan Africa where the highest

number of cases were kidney stones. A high-protein diet may increase the tendency towards excess urinary CaOx and urinary calcium excretion. A lower urine pH value is another risk factor for CaOx stones (OR 0.75; 95% CI 0.58 to 0.95). A previous study showed that a decrease in pH may accelerate CaOx stone formation. CaOx stones were reported to be more common in the anatomical location of the upper urinary tract (OR 5.23; 95% CI 2.40 to 11.3) (Wang et al., 2024).

In Teluk Kuantan Regional Hospital, the most common management for urinary tract stones is in the form of medication 38.8% (154 cases) followed by the most common actions, namely Ureterorenoscopy (URS) with a percentage of 31.2% (124 cases) and Vesicolithotripsy 8.1% (32 cases). Other treatments such as ESWL 1.8% (7 cases), PCNL 16.1% (64 cases), RIRS 4.0% (16 cases) were performed outside Teluk Kuantan Hospital. The management of kidney stones depends on many factors, but the most important are the size and location of the stone. On average, asymptomatic kidney stones <5 mm have a 75% chance of spontaneous discharge. This rate decreases as the stone increases in size and appears more proximal. In certain patient populations that do not require emergency intervention, medical expulsion therapy (MET) may aid the stone passage process, resulting in faster passage and fewer symptoms. However, patients may also require surgical intervention for stones that cannot be expelled due to their size and location.20 Medical expulsion therapy (α-blockers) has efficacy for the management of ureteral stones especially distal ureteral stones ≥ 5 mm (Bambang et al., 2018).

Ureteroscopy (URS) and SWL are the two most widely used methods to treat kidney and ureteral stones. Overall, comparative analyses have shown a lower risk of complications with SWL compared to URS (RR 0.53, 95% CI 0.33-0.88, $p < 0.01$) (Wales et al., 2023). In cases of kidney stones, when patients fail treatment attempts with shockwave lithotripsy and/or URS with laser stone treatment, PCNL is often the least invasive next step. SWL and endourology (PNL and RIRS) may be offered for the management of stones < 2 cm in the renal pelvis and superior cervix/mediana. In cases of large stones > 2 cm if PNL is not an option, RIRS/ SWL can be performed (Bambang et al., 2018).

Recent guidelines suggest that URS should be offered as the first-line procedure in ureteral stones however, SWL is an alternative that can be given as indicated. Transurethral vesicolithotripsy is the most common procedure in cases of bladder stones. Lithotripsy procedures can be performed transurethrically and percutaneously in large stones. Currently, a combination of pneumatic and ultrasonic lithotripsy can fragment stones faster and fragment collection is more optimal than a single lithotripsy modality. Laser lithotripsy is the latest modality using the Ho;YAG laser. It fragments all types of stones and is a safe procedure if the laser fiber is kept at a minimum distance of 0.5 mm from the urothelium during use.

CONCLUSION

Based on the results of the research obtained, the following conclusions can be drawn: The incidence rate of urinary tract stone patients (*incidence*) at Teluk Kuantan Hospital in the period January 2022–December 2024 was 397 cases, with an increase in incidence observed

over the three-year period. In 2022, the total number of new urinary tract stone cases was 128; in 2023, the total was 135 cases; and in 2024, the number of cases was 136. Urinary tract stones were more commonly experienced by male patients compared to female patients, and most frequently occurred in the age group of 40–60 years. In addition, kidney stones were the most common type of urinary tract stone at Teluk Kuantan Regional Hospital during the three-year period. Management of urinary tract stone cases was predominantly through medication, followed by minimally invasive methods such as *ureterorenoscopy* (*URS*) and *vesicolithotripsy*. Other procedures were performed outside Teluk Kuantan Hospital due to the limited equipment available.

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