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RISK FACTORS OF UROLITHIASIS: A HOSPITAL-BASED STUDY

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Abstract

Introduction; Urolithiasis, widely known as kidney stones, represents an important health challenge across the globe. It occurs when mineral and salt crystals accumulate and harden within the urinary system. These stones may trigger severe pain, infections, and various complications, resulting in notable morbidity and increased healthcare expenses. The global incidence of kidney stone disease is steadily rising, influenced by dietary patterns, climatic conditions, and underlying metabolic issues.

Objective: The primary aim of this study is to examine the dietary and lifestyle factors associated with stone formation in patients diagnosed with kidney stones at a tertiary hospital .

Methodology: A cross-sectional study was carried out among 30 patients admitted for the management of urolithiasis. The lifestyle habits and dietary practices of these patients were assessed to identify potential risk factors contributing to stone formation.

Result: In our study, half of the participants were above 50 years of age, and the majority (68.3%) were male. About 33.3% of the patients had a history of urinary tract infection, and 70% reported consuming a high-protein diet.

Ultrasound findings showed that 33.3% had stones located in the right ureter. Regarding pain management, 13.3% had not taken any treatment, while 56.7% relied on medication for symptom relief.

Conclusion: The results show that a significant number of participants experienced UTIs, affecting nearly one-third of the group. A large proportion also consumed protein-rich foods regularly. These observations point toward a possible association between diet and urinary health, emphasizing the importance of greater awareness and focused health education to encourage balanced eating habits and reduce the risk of UTIs.

Keywords: Urolithiasis; Risk Factors; Hospital

INTRODUCTION

Urolithiasis is defined as the stone in the urinary system. This is either formed in the urinary system or dislodged from the renal pelvis to any of the following urinary collecting system like ureters, bladder, and urethra. Many patients with urolithiasis can be managed with expectant management, analgesic, and anti-emetic medications; however, stones that are associated with obstruction, renal failure, and infection require further increasingly critical interventions.(1)

Human beings are being suffering from Urolithiasis globally since several centuries.
Among several diseases affecting the urinary tract, the urolithiasis is the major one producing morbidity. Stone formation is one of the painful urologic disorders that occur in approximately 12% of the global population and its re-occurrence rate in males is

70-81% and 47-60% in female. It is assessed that at least 10% of the population in industrialized part of the world are suffering with the problem of urinary stone formation(2).

The ratio of patients with urolithiasis living in high mountains to middle mountains was found to be 1:2.8. There was a predominance of men of working age living in the middle mountains (72.7%) and high mountains (80.7%). The average structural density of stones in patients living in highlands is 1.5 times less compared to patients in the middle altitude group. Analysis of the chemical structure of stones in patients operated on for urolithiasis revealed the presence of such chemical elements and compounds as: MgO, CaO, Na2O, SiO2 in all samples. The content of phosphorus ≥10 was 3.7 times more common in patients of the middle altitude group compared to patients in the high-altitude group.(3)

In Asia, a stone-forming belt has stretched across western Asia and South Asia, including South Korea and Japan, with prevalence rates ranging from 5 to 19.1%. In addition, the prevalence of kidney stones has also risen from 4 to 6.4% over the past 30 years in China owing to lifestyle and dietary changes. Recurrence of urolithiasis with in 5 years unfortunately was significantly higher, approximately meeting 30-50%. Several studies demonstrated that the recurrence rate of urinary calculi in cured patients increased annually after the initial stone event. These suggest that calculi formation, as a lifelong disease, should not only be treated but also prevented. (4)

Urolithiasis patients are usually asymptomatic. The common prsentation among the symptomatic patients is loin pain, dysuria, hematuria, sweating, pallor, vomiting, restlessness, and UTI or obstruction. Nowadays, with conservative management, most stones pass, and the rest are managed with minimal surgical interventions (5).

There are multiple risk factors for urolithiasis. Factors include age, gender, ethnicity, family history, past urinary diseases, dietary habits, physical activity, smoking and health conditions like obesity. Keeping the body well hydrated and produing the sufficient urine is an important for decreasing the risk factor of urolithiasis. However, sodium overconsumption through soft drinks and animal proteins increases the urolithiasis risk (6). During the diagnosis patients medical history, family history and dietary history should be considered importantly.

Medical history may unveil the medical conditions the patient is suffering from or any medication or medical therapy the patient is recently adhering to or underwent that might be the predisposing factors for urolithiasis. Any family history of renal stone disease and food habits of the patient may further help in revelation of the disease and determining the potential cause(7).

The composition of urinary tract stones varies widely depending upon metabolic alterations, geography, and presence of infection, and their size varies from gravel to staghorn calculi. The more common composition of stones include (more detail below):calcium oxalate +/- calcium phosphate: ~75%,struvite (triple phosphate): 15%, pure calcium phosphate: 5-7%, uric acid: 5-8%, cystine: 1%,lithogenic medications: 1%(8).

Method and Methodology:

A cross sectional study was used to conduct this study among total of 30 admitted patients in the City Hospital of Kyrgyzstan. Data was collected through recorded information of the patient from the hospital as well as from the healthcare providers. Ethical approval and consent were taken from the hospital administration for the uses of the patient information.

Result:

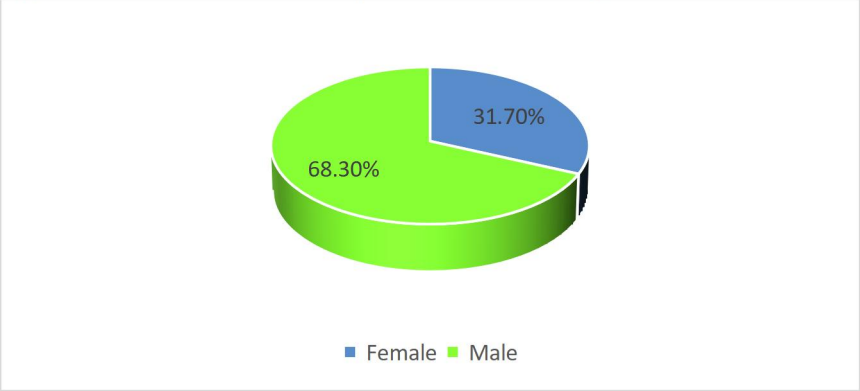
Our study aims to assess the risk factors of respondents who had urolithiasis diagnosis and came to hospital for the treatment.

Table 1: Distribution of respondents according to their age

Responses	Frequency	Percentage
Below 25	2	6.7
30 – 40 Years	9	30
40 – 50 Years	4	13.3
Above 50	15	50
Total	30	100

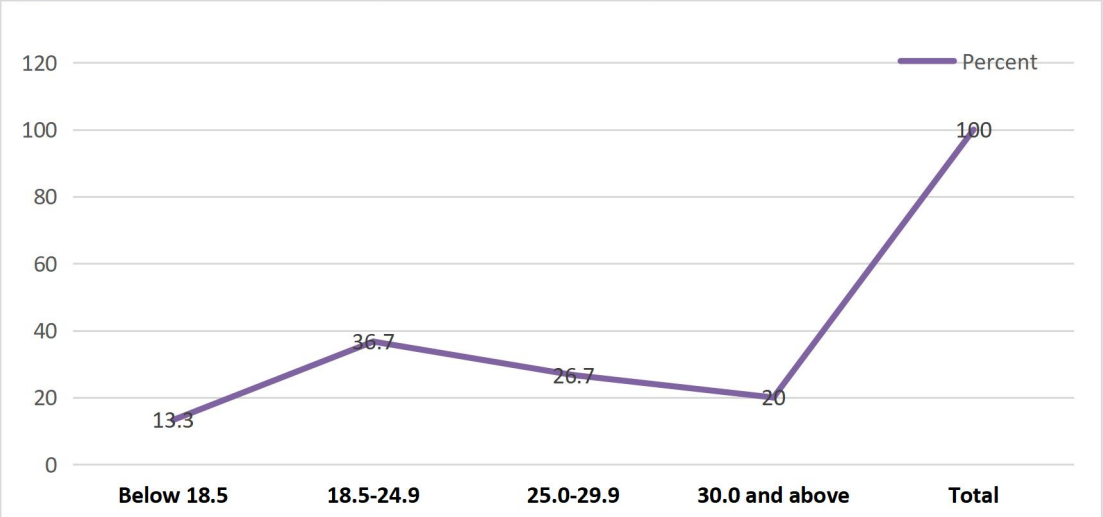
Above table shows that the distribution of respondents according to their age which shows the maximum 50% were from age group above 50 years.

Figure 1: Distribution of respondents according to their Gender



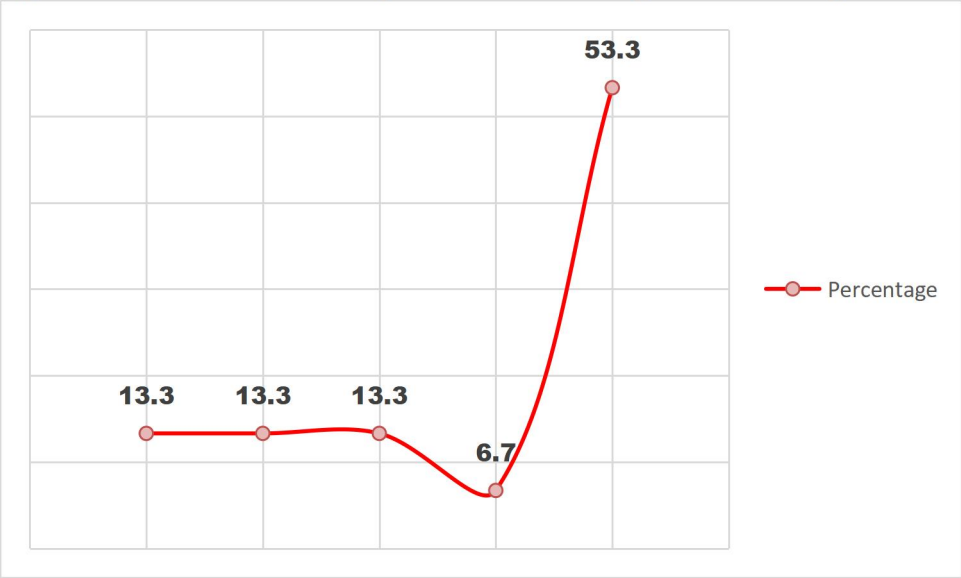
Above table shows that the distribution of respondents according to their gender which shows the maximum 68.30% were from male.

Figure 2 : **Distribution of respondents according to their BMI**



Above graph shows that the distribution of respondents according to their BMI which shows the maximum 36.7% between 18.5-24.9.

Figure 3 : **Distribution of respondents according to their occupation**



Above graph shows that the distribution of respondents according to their occupation which shows the minimum 6.7% were from agriculture.

Table 2 : Distribution of respondents according to their previous history of urolithiasis

Response	Frequency	Percentage
Yes	22	36.7
No	36	60.0

Above table shows that the distribution of respondent according to their past history which shows the maximum 60% weren't having urolithiasis previously.

Figure 3 : **Distribution of respondents according to their familial history**

Above graph shows that the distribution of respondents according to their familial history were the maximum 83.3% don't have urolithiasis in family

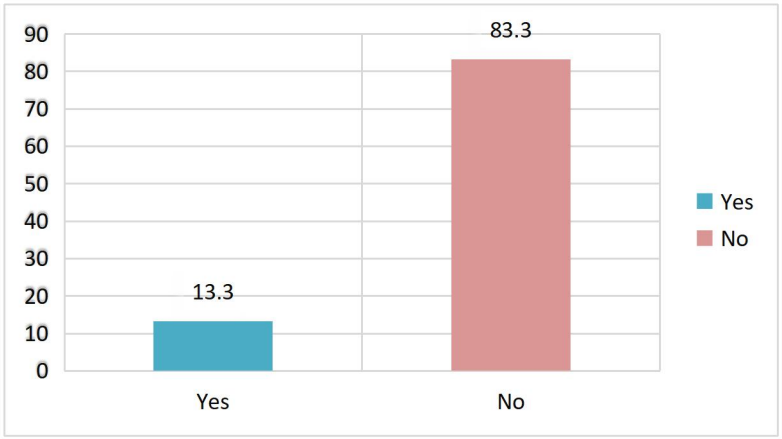


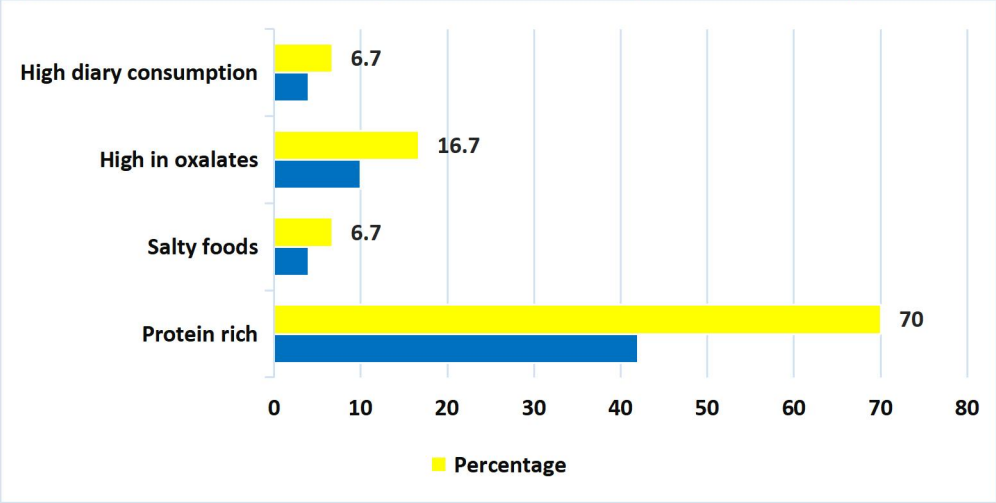
Table 3: Distribution of respondents according to their other associated medical conditions

Responses	Frequency	Percentage
Diabetes mellitus	4	6.7
BPH	10	16.7
HTN	10	16.7
UTI	20	33.3

Others	16	26.7

Above table shows that the distribution of respondents according to their other associated medical conditions which shows the maximum 33.3% were having UTI.

Figure 4 : **Distribution of respondents according to their dietary habits**



Above figure shows that the distribution of respondents according to their dietary habits which shows the maximum 70% were having high protein rich food.

Table 4 : **Distribution of respondents according to their sign and symptoms**

Responses	**Frequency**	**Percentage**
Abdominal flank pain	34	56.7
Hematuria	6	10.0
Fever	4	6.7
Others	16	26.7

Above table shows that the distribution of respondents according to their sign and symptoms which shows the maximum 56.7% were having abdominal flank pain and minimum 6.7% were having fever.

Figure 5 : **Distribution of respondents according to their duration of pain.**

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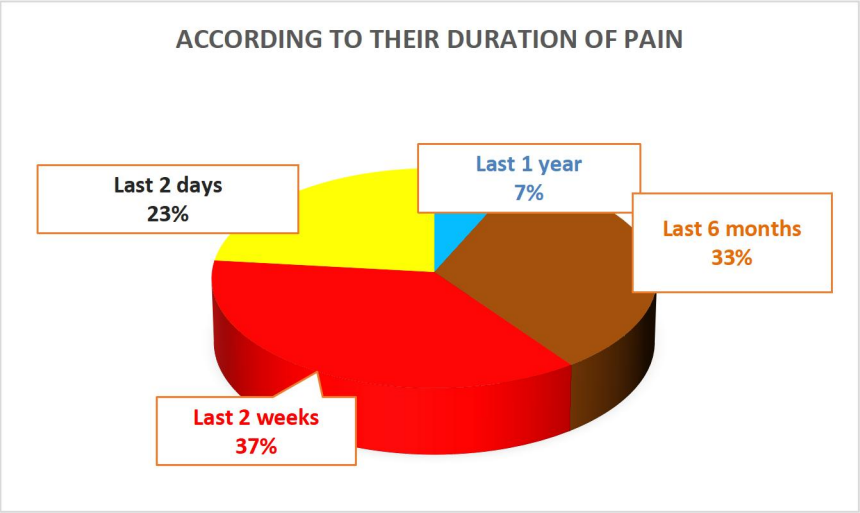


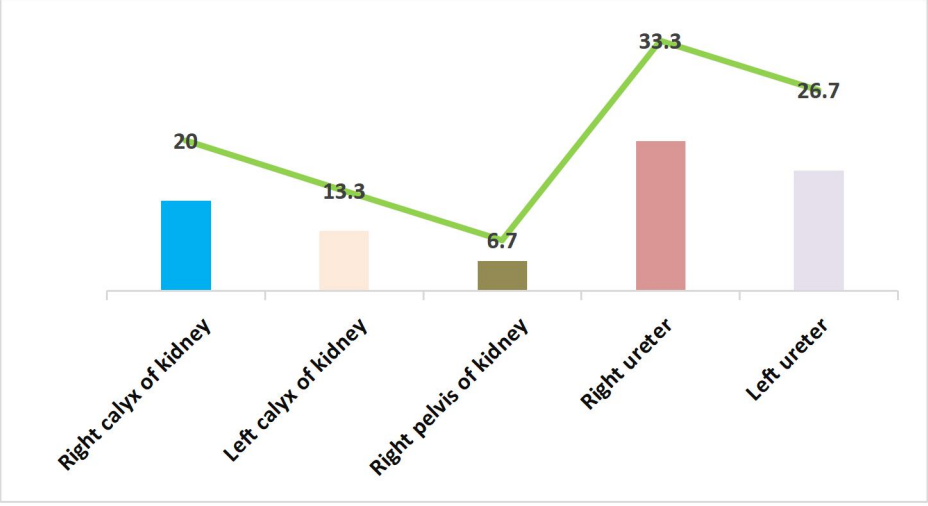
Above figure shows that the distribution of respondents according to their duration of pain which shows the maximum 37% were having pain for last 2 weeks.

Table 5 : Distribution of respondents according to their severity of pain

Responses	Frequency	Percentage
Mild	4	6.7
Moderate	12	20.0
Severe	42	70.0

Above table shows that the distribution of respondents according to their symptoms which shows the maximum 70% were having severe pain.

Figure 6 : Distribution of respondents according to their location of stone in ultrasonogram



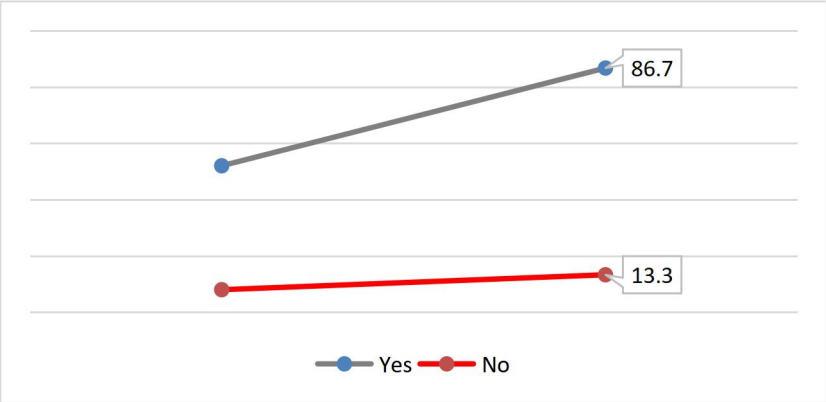
Above figure shows that the distribution of respondents according to their location of stone in ultrasonogram which shows maximum 33.3% were having at right ureter.

Table 6 : Distribution of respondents according to their kidney stones size

Responses	Frequency	Percentage
0.5-0.9mm	20	33.3
1-3mm	18	30.0
4-8mm	8	13.3
8-12mm	14	23.3

Above table shows that the distribution of respondents according to their size of the kidney stone in which maximum 33.3% were of 0.5 - 0.9mm

Figure 7 : Distribution of respondents according to their management



Above figure shows that the distribution of respondents according to their management of stones in which minimum 13.3% were not having any treatment.

Table 7 : Distribution of respondents according to their treatment

Responses	Frequency	Percentage
Drug	34	56.7
Open surgery	12	20.0
Conservative	2	3.3
Lithotripsy/ureteroscopy(URS)	2	3.3
Others	10	16.7

Above table shows that the distribution of respondents according to their treatment in which maximum 56.7% were using drugs.

DISCUSSION

In our study we found that the ratio of risk of developing urolithiasis is higher in male in comparison to female. Our study reported the awareness of urolithiasis among a total of 60 participants, consisting of male (68.3%) and female (31.7%) who have urolithiasis. Another retrospective study by Chien et al. have showed that although men have a significantly higher risk of developing urolithiasis, females have a higher chronic kidney diseases progression rate than their male counterparts.(9)

Our study found a higher incidence among those aged above 50, which in compared to Urolithiasis Symptoms and Risk Factors Among the General Population of Alahsa, Saudi Arabia

have higher incidence among those aged 35 to 50. The lowest incidence was seen in adolescence for both genders(6.7%) (10).

According to our study done on general population of Jalal-Abad, Kyrgyzstan people with BMI between 18.5 – 24.9 (36.7%) had higher risk to develop urolithiasis compared to BMI of 30.0 (20%). The incidence of urolithiasis, the composition and size of stone shows direct relationship with the body size, although the mechanisms involved have not been clarified. 0.5-0.9mm size stones are most commonly found in our patients of Kyrgyzstan. Multiple studies have been conducted in the past 2 decades to correlate the BMI with stone composition and size. Moreover, in view of the inconsistent findings of the studies reported to date, a meta-analysis was necessary to assess the evidence for a relationship between BMI and urolithiasis (11).

Previous studies have shown that having obesity increases stone risk. This goes for people with metabolically healthy obesity as well. That said, a 2023 study found that, stone risk was significantly higher when metabolic dysfunction occurred with obesity(12).

According to our data people without the family history had the higher occurrences (83.3%) of urolithiasis. A past history of kidney stones does increase the risk of developing, we found that the patients with no past history (60.0)% were not having urolithiasis before. Family history did not affect the inverse relation between the risk of stone formation and dietary calcium intake. The study Family history and risk of kidney stones suggests that dietary calcium restriction may increase the risk of stone formation, even among individuals with a family history of kidney stones(13) High blood pressure affects body's calcium metabolism increasing the risk of stones. Type 2 diabetes causes insulin resistance, and this resistance can increase calcium levels in urine. In addition, the inflamed narrowing of the ureter or injuries made by stones when moving down the ureter could easily cause infections.
The mean protein intake of the subjects was found to be higher(70.0%); high oxalates(16.7%) are adequate while the high diary consumption(6.7%) and salt foods(6.7%)are low. Several factors have been implicated in the occurrence of disease most important being high protein, calcium, sugar, dietary fiber and oxalate intake. Proteins are essential for correct nutrition and their unique properties influence also kidney stone disease. Increase dietary content of non-dairy animal proteins like poultry, meat, fish, eggs etc, together with low-alkali food are thought to be beneficial to kidney stone formers, causing a negative calcium balance, low urinary pH, and low urinary excretions of citrate, potassium, and magnesium.(14)
Urolithiasis is always accompanied by intense pain, which is mainly concentrated in the lumbar region. Depending on the location and size of the stone, the presence of obstruction and individual characteristics, the pain syndrome can be constant or intermittent, acute or dull. Most commonly occurring leading symptom is radiating colicky pain in the hypochondrium region of abdomen. The pain varies depending on the position of the stone in the ureter and may attain excruciate the intensity. The concretions located very high at costovertebral angle cause the worst pain. The pain from lower-lying stones is perceived in the hypogastric region, possibly radiating as far as the genitals(15).

The intensity and location of the pain may vary with stone size, stone location, degree of luminal obstruction, and the suddenness of the obstruction but flank pain is very common. In the later stage, the pain becomes continuous, steady and severe until it reach the peak. In contrast, some patient have acute paroxysms of increasingly intense pain. As per the data 70% of our patients have severe type of pain in connection with urolithiasis and only 6.7% were having mild pain.

Overall, patients have a relatively rapid onset and reach peak pain in 30 minutes or less. Pain in the untreated patient may last for 4 - 12 hours. The most patients have presented to the emergency room when the time the pain becomes continuous, usually by two hours into the colic. Associated symptoms maybe Anorexia, nausea, vomiting and gross hematuria commonly appear with the pain. Overall, we found that the patient who are having maximum pain (37)% were having pain for last two weeks(16).

Urolithiasis stones can develop in various part of the urinary tract , including the kidneys , ureters , bladder or urethra. In our research we found the location of the stone in ultrasonogram which shows maximum (33.3)% were having at the right ureter followed by left ureter (26.7)%, right calyx of kidney (20)% , left calyx of kidney (13.3%) , right pelvis of kidney (6.7) %. As per Table 6, the maximum size of stone we found in the study is 8-12mm for (23.3%) people and smallest size stone found was between 0.5 – 0.9mm for (33.3%), which was also the most among them. When managing urolithiasis, the approach varies based on factors like the size and location of the stones.

The treatment of urolithiasis is based upon the patient's acute presentation and includes both conservative medical therapies and surgical interventions. Often when patients present, pain control is an important intervention. Oral and IV anti-inflammatory medications (NSAIDs) are indicated as first-line treatments for pain. In our research we found that the patients who did their management of stones by having treatment was more (85.7) % . They take medications such as Acetaminophen , Thiazide diuretics like hydrochlorothiazide , alpha blockers etc. How ever there were some patients who were not taking any management was (13.3) %.(17) As mentioned in Table 7., 56.7% of our patients were taking drugs only as treatment. If treatment with drugs didn't work as we expected 20% of them were asked to go under surgical treatment options. A watchful waiting approach for treating urethral calculi is Medical expulsive therapy (MET) which is successful in a considerable number of patients. Commonly used medication is cyclic phpsphodiesterase-5 inhibitor which relax the ureteral smooth muscle and reduce the contraction, thereby enhancing the expulsion. Another common medication used in expulsion is Tamsulosin which is an alpha-adrenergic blocker commonly used in treating Benign Prostatic Hyperplasia has shown the similar result.

Among the group of drugs used in medical therapy of urolithiasis, thiazide has been usd succesfully in preventing the calcium stone formation. Another drug famously used in the past for the prevention of calcium oxalate stine formation was Allopurinol. Comparison to open surgery in extracting stones from urinary tract in 1980s, the modern advancement in minimally invasive technique are being more popular nowadays. Currently the modern technique replacing the long and risky technique of open surgery are percutaneous nephrolithotomy (PCNL), extracorporeal shock wave lithotripsy (ESWL),, retrograde intrarenal surgery (RIRS) and laparoscopic uretero-lithotomy.

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