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MANAGEMENT PATTERN OF NEPHROLITHIASIS IN MILITARY HOSPITAL OF NEPAL

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ABSTRACT

The primary objective of this study was to analyze the types of kidney stone, its treatment pattern, frequency of recurrence and its prevention methods in Nepal. Nephrolithiasis is a common clinical disorder affecting large amount of population worldwide. About 10% of people will experience nephrolithiasis in their lifetime and about 50-70% of those will have recurrences. In Nepal, Kidney stone is also a major health problem. A prospective observational and descriptive study was conducted in Military hospital of Nepal: Shree Birendra Hospital, Chhauni, Nepal involving patients with nephrolithiasis over a period of three months (June-September 2015). A total of 146 patients were selected for study. Male (99) patients were significant in number than female (47). Incidence of stone disease is predominant in the age group of 30-39. Calcium stone was the most common renal calculi which covered 71.2% of all types of stone. Alpha blocker and thiazide diuretics were mostly prescribed drugs. Hyperparathyroidism, diabetes, hypertension, gout and urinary tract infection were the major risk factors for nephrolithiasis. In this study, diabetes was present in most of the patients. PCNL treatment was mostly preferred because most of the stones were present in lower pole and also due to presence of staghorn stone. The result of my study has demonstrated that frequency of recurrence rate was higher.

KEYWORDS: Nephrolithiasis, Calcium stone, ESWL, Tamsulosin.

INTRODUCTION

Nephrolithiasis is a condition in which one or more stones form within the kidney. It may be present in the pelvis or calyces of the kidney. Kidney stones are pieces of a stone or crystal

like material. These stone form inside the kidney or urinary tract. Kidney stones result when urine becomes too concentrated and substances in the urine crystallize to form stones. About 10% of people will experience nephrolithiasis in their lifetime and about 70% of those will have recurrences.[1] The recurrence rate after formation of an initial stone is reported to be as high as 50% at 5 years and 80–90% at 10 years.[2] It is anticipated that there will be an increase in kidney stones in the future due to global warming, lifestyle changes, diet and obesity. People who form stones are more likely to have urinary metabolic abnormalities compared to a healthy population while patients who form recurrent stones tend to have more significant metabolic abnormalities than those with a single stone episode.[3] The incidence of urinary calculi is increasing worldwide and calcium oxalate is the predominant component of most stones, followed by struvite, cystine, uric acid and other compound. The overall probability of forming stones differ in various parts of the world, and is estimated at 1-5% in Asia, 5-9% in Europe and 13% in North America. The recurrence rate of renal stones is 40%-75%.[4] Out of recurrence rate of the renal stone, calcium containing renal calculi was found to be 26-53%.[5] Different diseases also helps to promote the developing nephrolithiasis including gout, diabetes, hypertension, hyperparathyroidism, Chron's disease, etc.[6] Treatment for kidney stones usually depends on their size and what they are made of, as well as whether they are causing pain or obstructing the urinary tract. Treatment may include shock wave lithotripsy, percutaneous nephrolithotomy (PCNL) and surgery. Certain medications help to prevent the kidney stones based on the type of stone formed or conditions that makes a person more prone to form stones. Initial treatment includes pain medication and oral or IV fluid to help the stone pass through the urine. Medications generally used are Tamsulosin, Allopurinol, Thiazide Diuretics,[7] Potassium citrate, Potassium-magnesium citrate[8] and Antibiotics.[9] Kidney stones may be prevented through changes in life style such as Drink plenty of fluids, especially water[10], Continue eating calcium-rich foods, but use caution with calcium supplements, Choose a diet low in salt and animal protein, Limit excessive intake of vitamin c rich supplements and Limit food high in oxalate. Because the removal of an existing calculus does not prevent further stone formation, patients should be thoroughly evaluated and educated on stone prevention. The aim of this review is to clarify the need and describe a method for evaluation of patients with first-time and recurrent stone formation.

METHODS

Research method

It is a prospective, observational and descriptive study. The information was collected with the help of a questionnaire and also the patient medication record was evaluated.

Study site

The study was conducted at Shree Birendra Hospital, Chhauni, Kathmandu, Nepal from June 2015 to September 2015.

Target population

The case patients were taken from urology department of Hospital. About 150 patients were enrolled. All patients with newly diagnosed, relapsed cases and histopathologically confirmed kidney stone were eligible for the study. After written informed consent was obtained from the subjects, an interview was directed through structured questionnaire to collect detailed information on demographic data and risk factor of kidney stone.

Data collection tools and techniques

Questionnaire and the prescription report was the main tool of the study.

Sampling technique

The sampling method was simple purposive sampling, structured questionnaire was used to collect data from the patient and those who fall in inclusion criteria were taken for the study during data collection period.

Institutional Consent

Approval from Shree Birendra Hospital and permission from the concerned authorities was taken before the study. Written consent was taken from the patient for the study. Each patient was explained about the objective and purpose of the study well before recording the data from his or her prescription. All the research activities were carried out under the close guidance of the respective physician.

Inclusion criteria

Patients diagnosed with nephrolithiasis.

Exclusion criteria

Pregnant women and Cystolithiasis.

Plan for data management and analysis

Entry of data, checking, compiling and editing was done manually and data analysis was done as per the objectives of the study. Data analysis was done in statistical package for social sciences (SPSS) software version 21.

RESULT AND DISCUSSION

Age and Sex classification

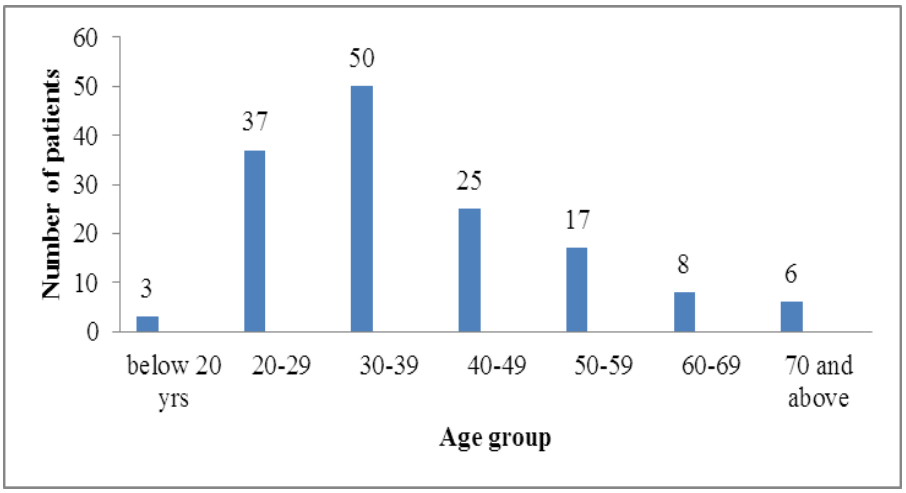

Figure 1: Age wise distribution of the patients.

Among 146 patients screened, 99 were males (67.8%) and only 47 were females (32.2%). The kidney stone was found to be dominant in male. The mean age of the patients was found to be 38.70 ± 3.907 years. The maximum number of patients fell in the age group of 30-39 years (34.2%) followed by age group of 20-29 years (25.3%) patients. The lowest percentage was in the age group of below 20 years (2.1%) patients. A majority of the nephrolithiasis subjects were from the productive age group and the finding of the present study correlate with those previously reported by Ansari et al (2003).[11]

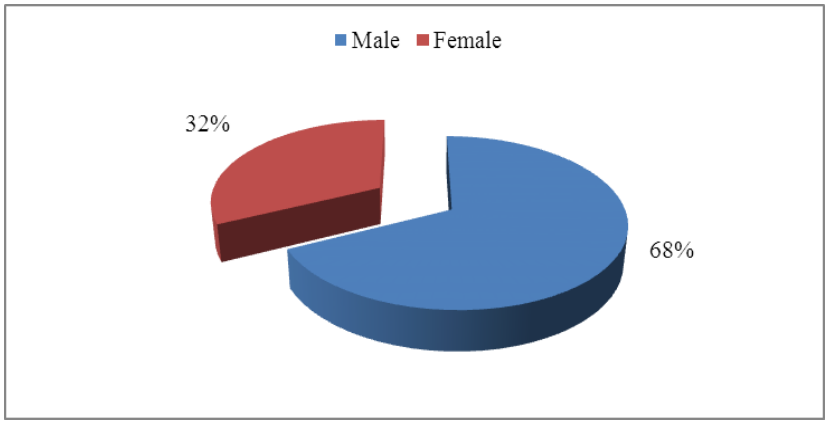

Figure 2: Sex wise distribution among study population.

In present study, kidney stones were found to be more common in men than women. This may be because of the larger muscle mass of men as compared to women.

Anatomical position of kidney stone

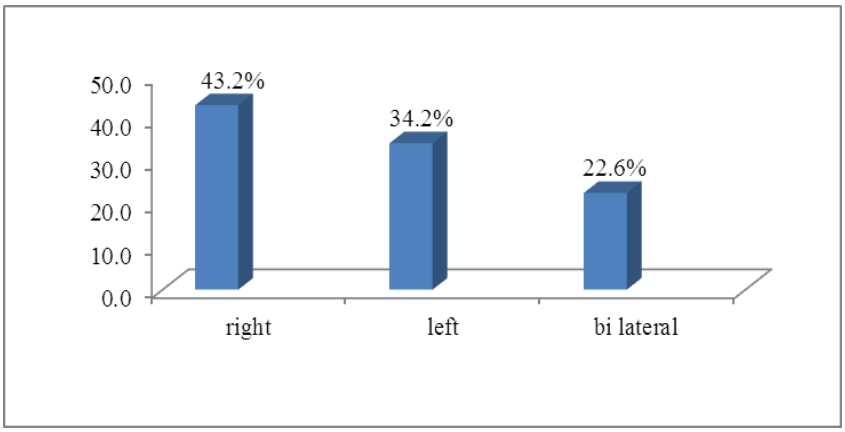

Figure 3: Anatomical position of kidney stone.

Anatomical site of the kidney

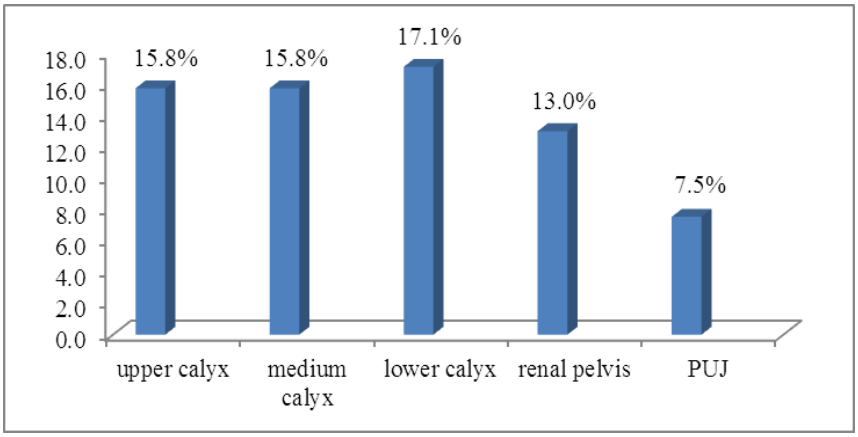

Figure 4: Anatomical site of right kidney stone.

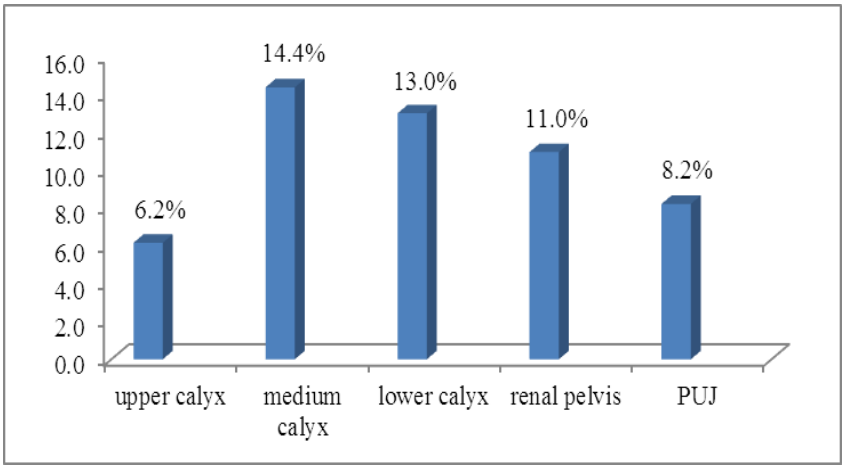

Figure 5: Anatomical site of left kidney stone.

Treatment of kidney stone depends on the anatomical site of kidney.

Size of the kidney stone

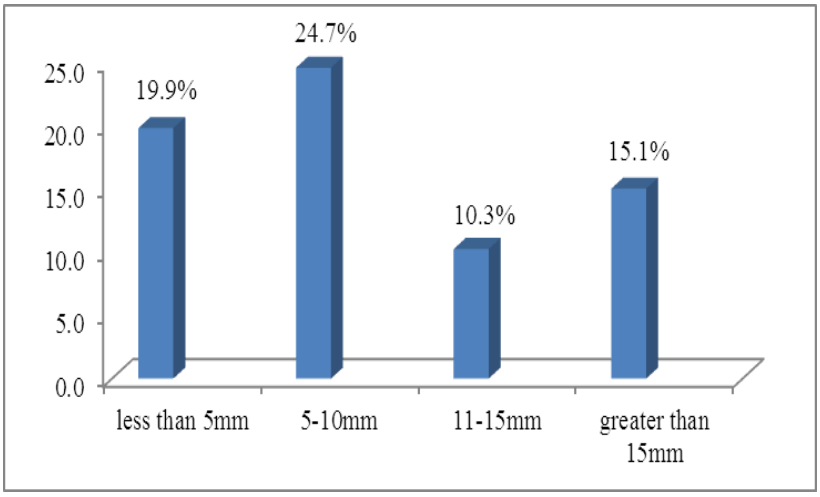

Fig 6: Size of right kidney stone.

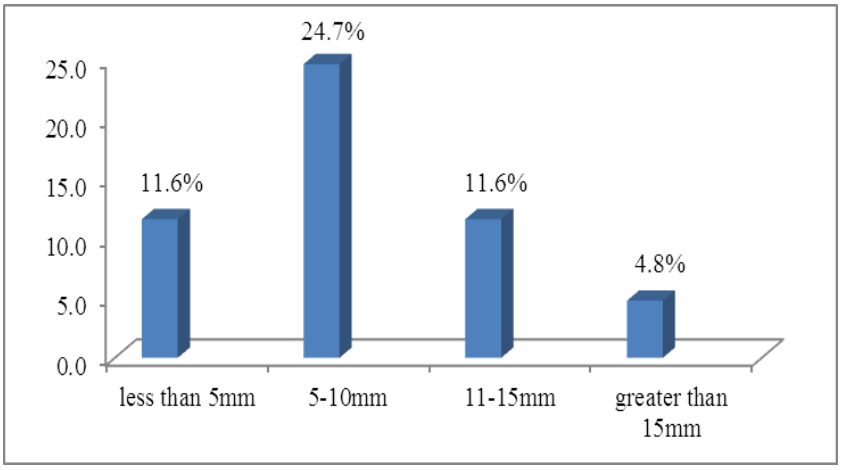

Fig 7: Size of left kidney stone.

Size of kidney stone affects the treatment pattern. Generally stone size of less than 5mm does not require special treatment. But staghorn stone, if even in size of less than 5mm, requires surgical treatment.

Types of kidney stone

Calcium stone was the most common kidney stone in my study (71.2%). This was followed by uric acid (17.1%), staghorn (7.5%) and struvite (4.1%). No cystine stone was found in this study. In this study, the incidence of calcium stones in my study was on the higher side. This might be due to increase intake of vegetables and cereals by the low socioeconomic status of

the patients. The incidence of uric acid stone was found to be 17.10% may be due to consumption of protein diet and purine metabolism.

Fig 8: Types of kidney stone.

Table 1: Comparison of my results with other countries.

Type of kidney stone	My study	Iran 2008[2]	Saudi Arabia 2004[3]	Japan 2003[4]	Pakistan 2010[4]	Nepal 2010[39]
Staghorn stone	7.5%	3.2%	_	5.1%	1.69%	3.8%
Calcium stone	71.2%	80.2%	78%	81.6%	87.5%	85.8%
Uric acid stone	17.1%	16.2%	19%	9.6%	6.5%	6.6%
Struvite stone	4.1%	0.4%	3%	3.7%	4.31%	3.8%
Cystine stone	Nill	0.6%	Nill	Nill	Nill	Nill

Presence of comorbid condition

The patients were also suffering from other comorbid conditions. The maximum number of patients had diabetes with the frequency of 16(11%) followed by hypertension, gout and hyperparathyroidism constituting of 15(10.3%), 9.6% patients had history of urinary tract infection. The result of the present study was supported by the study conducted by Michel et al.[12]

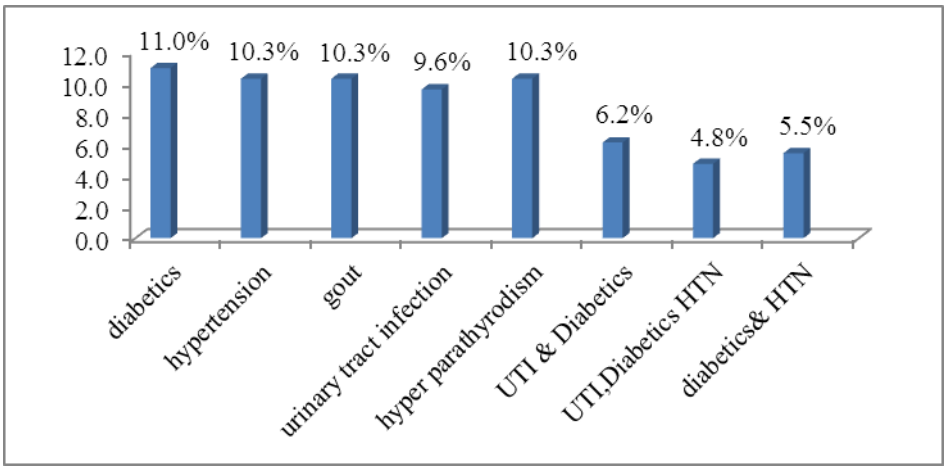

Fig 9: Co-morbid Condition.

Non drug treatment

Treatment depends on the size of stone. Small stone i.e. stone size of less than 5mm generally does not require the surgical treatment. These stone may pass through urine by drinking of enough water and medical expulsion therapy (MET). MET after Extracorporeal Shock Wave Lithotripsy (ESWL) for ureteral or renal stones can expedite expulsion and increase stone free rates, along with a reduction in additional analgesic requirements. Tamsulosin therapy,

as an adjunctive medical therapy after ESWL, is more effective than lithotripsy alone for the treatment of patients with large renal stones and is equally safe. In addition, my results also indicated that adjunctive treatment with tamsulosin could decrease the use of analgesic drugs after ESWL. In my study, less than 5mm size required 3.9% of ESWL treatment. Sometime ESWL treatment may also fail to expel the stone. In this case, PCNL was better treatment choice. In present study, 3.9% patients used PCNL treatment for right kidney and 8.6% patients for left kidney of stone size less than 5mm.

Larger stones > 20 mm should be treated by PCNL primarily, because ESWL often requires multiple treatments and has the risk of renal obstruction (colic) with the need for adjunctive procedures.[13] Percutaneous nephrolithotomy (PCNL) has proved to be a reliable method to establish access to the collecting system of the kidney.[14]

Table 2: Size of right stone vs non drug treatment.

Size of stone	Non drug treatment			
	Shock wave lithotripsy	PCNL	Surgery	No
<5mm	3.9%	3.9%	0.0%	21.1%
5-15mm	16.7%	13.7%	3.9%	1.3%
16-25mm	0.0%	8.8%	5.9%	1.0%
>25mm	0.0%	3.9%	14.7%	0.0%
Total	20.6%	30.4%	25.5%	22.5%

Table 3: Size of left kidney stone vs non drug treatment.

Size of the stone	Non drug treatment			
	Shock wave lithotripsy	PCNL	Surgery	No
<5mm	3.9%	8.6%	0.0%	19.5%
5-15mm	19.5%	24.7%	2.6%	1.6%
16-25mm	1.2%	10.4%	7.8%	0.0%
>25mm	0.0%	3.9%	14.7%	0.0%
Total	24.6%	39.0%	18.2%	18.2%

Medication

Medical expulsion therapy has been shown to be a useful adjunct to observation in the management of kidney stones. Alpha blockers promote stone passage in patients receiving shock wave lithotripsy. Drugs used to expel stones are thought to act by relaxing ureteral smooth muscle through either the inhibition of calcium channel pumps or alpha-1 receptor blockade. Medical expulsive therapy should only be used in patients who are reasonably comfortable with this therapeutic approach and when there is no obvious advantage from immediate active stone removal. Alpha-1-adrenergic receptor antagonists have been studied

in this role. Tamsulosin therapy, as an adjunctive medical therapy after ESWL, is more effective than lithotripsy alone for the treatment of patients with large renal stones and is equally safe.[15] Thiazide diuretics used in my study were lower than the study conducted by Kramer et al in which 24% diuretics were extensively used.[16] Alkalizining agents i.e potassium citrate reported a significantly reduced recurrence rate by about 73.23%.[17] Alkaline citrates are used for: correction of hypocitraturia; urine alkalinisation; inhibition of growth and aggregation of calcium oxalate and inhibition of agglomeration of calcium phosphate.[18] There is evidence from RCTs that alkaline citrates are effective in preventing calcium stone recurrences.[19]

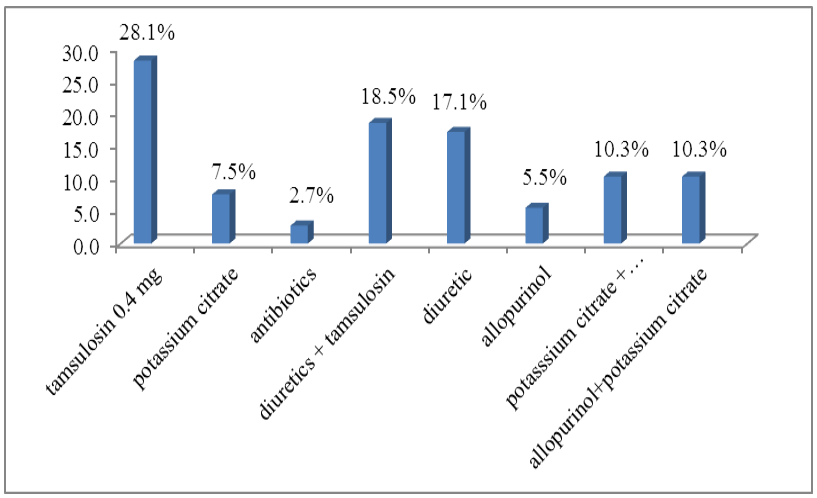

Figure 10: Frequently used medication.

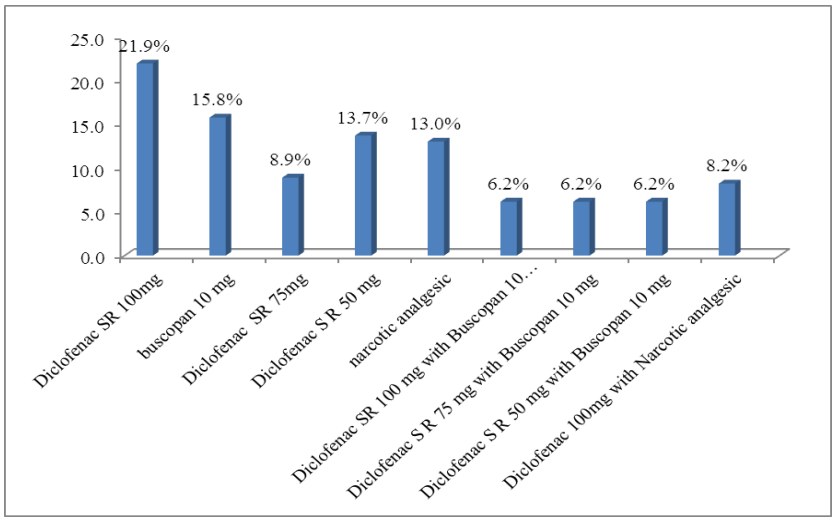

Figure 11: Frequently used pain medication.

Talble 4: Types of stone and its drug treatment.

Type of stone	Tamsulosin 0.4mg	Potassium citrate	Antibiotics	Diuretics + tamsulosin	Diuretics	Allopurinol	Potassium citrate+ Antibiotics	Allopurinol + potassium citrate
Staghor	1.4%	1.4%	0.7%	1.4%	1.4%	-	0.7%	0.7%
Calcium	24.7%	3.7%	0.7%	17.1%	15.1%	0.7%	7.5%	1.4%
Uric acid	2.1%	2.1%	-	-	-	4.8%	-	8.2%
Struvite	-	-	1.4%	-	0.7%	-	2.1%	-
Total	28.2%	7.2%	2.8%	18.5%	17.2%	5.5%	10.3%	10.3%

Frequency of recurrence

The recurrences rate of this study was lower to the study conducted by Patel et al found that, approximately 12% of the global population and its recurrence rate in males is 70-81% and 47-60% in female.[20] Recurrence rate was higher in male than female. This is due to the enhancing capacity of testosterone and inhibiting capacity of estrogen in stone formation in male.

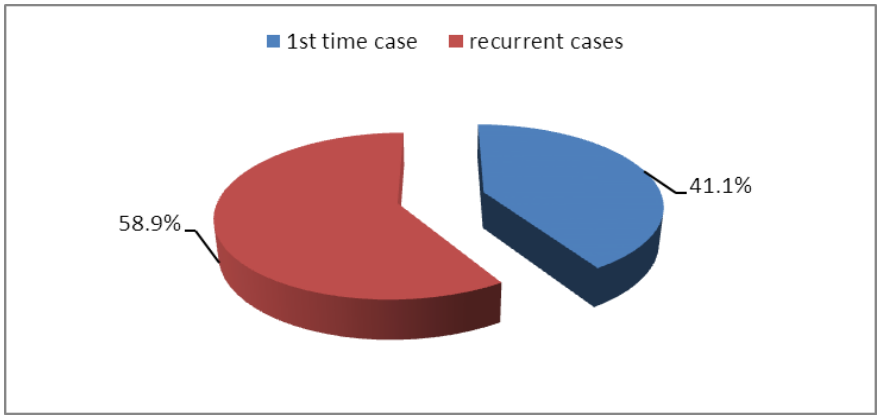

Figure 12: Recurrence status of Kidney stone.

Table 5: Sex of the patient and 1st time or reccurence cases of stone.

		1st time case	recurrent cases	Total
Male Female	Count	37	62	99
	% of Total	25.3%	42.5%	67.8%
	Count	23	24	47
	% of Total	15.8%	16.4%	32.2%
Total	Count	60	86	146
	% of Total	41.1%	58.9%	100.0%

Outcome Measurements

A three month follow up study showed that stone free rate was 30.8%. Out of them 12.3% stone free after a shock wave lithotripsy. Stone size of less than 5mm did not need surgical treatment. Most of these stone may be passed through drinking of enough water. In my study 18.5% of patients had removal of stone through water.

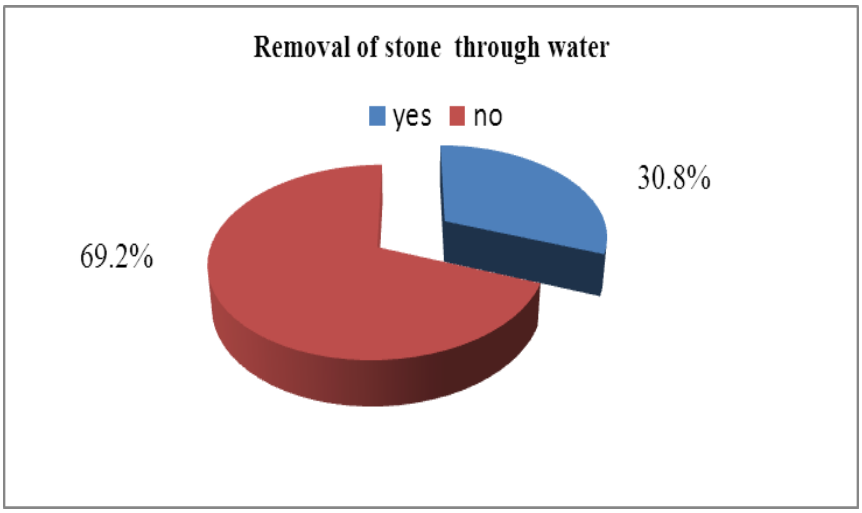

Figure 13: Removal status of stone through water.

CONCLUSION

Kidney stones present as an important and challenging clinical problem. Medical therapy, when used judiciously in conjunction with dietary measures, can help in preventing recurrence and in expulsion of small size (<10 mm) stones. In this study, higher occurrence was seen in male patients. The significant age group was found to be 30-39 years. Calcium stone was mostly seen in most of the patients. In this study, diabetes was present in most of the patients. PCNL treatment was mostly preferred because most of the stones were present in lower pole and also due to presence of staghorn stone. Alpha blocker and thiazide diuretics were the most prescribed drug. The result of my study has demonstrated that frequency of recurrence rate was higher. Out of them 30.8% of cases of stone free rate,12.3% stone free

after a shock wave lithotripsy and stone of less than 5 mm free at the rate of 18.5% after taking water. Treatment of stone was depends upon the anatomical site, size and types of stone. Medical expulsion therapy was adjuvant therapy for expulsion of stone. Dietary intervention on large scale and health education in this regard may be helpful as a preventive measure. In patients with stone, increased fluid intake reduced recurrence risk. Addition of thiazide, citrate, or allopurinol further reduced risk. Similarly surgical intervention includes ESWL, PCNL, open surgery. Awareness of the advantages and limitations of different modalities of medical therapy is necessary in order to provide the correct treatment to patients.

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