

**A Clinical Study on the Presentation and Management of Urolithiasis****N. Dinakar<sup>1</sup>, Akram Shaik<sup>2</sup>, Nareddy Rajeev Reddy<sup>3</sup>, Mannem Swathi<sup>4</sup>**<sup>1,2,3,4</sup>Assistant Professor, Dept. of Surgery, ACSR Government Medical College, Nellore

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Conflict of interest: Nil

**Abstract:**

**Background:** The treatment of urinary stones has undergone a remarkable evolution in the last 15yrs. Open surgeries have given way to minimal invasive procedures which have considerably decreased patient morbidity and mortality. With the advent of various Endourological and percutaneous technique the management of Urolithiasis has become much easier.

**Aim:** The Aim of the study is to know the different ways of clinical presentations & complications of Urolithiasis, to know the incidence of Urolithiasis at different anatomical levels in the urinary tract, the outcome of the different modes of management of Urolithiasis.

**Methodology:** prospective observational study in patients with Urolithiasis attending Surgical OPD and/or getting admitted under the Department of Surgery at PESIMSR between September 2013 and August 2015, satisfying the inclusion and exclusion criteria.

**Results:** Out of 130 cases, 45 (35%) were female and 85 (65%) were male (ratio of 1:2). Nearly 70% cases were between ages 15-50. Pain Abdomen was the most common symptom, presenting symptom. Right sided calculus was more common than the left. The lower 1/3 of ureter/ vesico-ureteric junction was the most common site of calculus affecting in 73 (56.1%) cases. The size of the calculus ranged from 6mm to 50mm (mean 10.5mm). Diabetes Mellitus was the most common co-morbidity among the study patients, seen in 31 (23.8%) patients. Urine culture showed growth in 36 (27.6%) patients. Most common organism was E. coli seen in 21 (16.1%) cases, followed by Staphylococcus in 8 (6.1%), Klebsiella species in 5(3.8%), and Streptococcus in 2 (1.5%) cases. Ureterscopy was done in 95 (73.1%) cases, PCNL in 18 (13.8%) cases and both URSL+PCNL/DJ in 1case (0.8%), CLT done in 14(10.8%) cases. 1 vesical stone was extracted by open cystolithotomy and 1(0.8%)case extracted by PB CLT in urethra.

**Conclusion:** In the past the urinary stone disease used to affect the lower urinary tract more commonly. This trend has also changed in the past few decades with higher number of cases presenting with renal and upper ureteric stones. Urolithiasis presents most commonly as abdominal/loin pain. This may be associated with vomiting, nausea, fever, burning micturation etc. A huge number of predisposing factors affect the formation of urinary calculus.

**Keywords:** Renal stone, PCNL, URSL, DJ.

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**Introduction**

Urolithiasis is a common multi-factorial disease that has been recognized and documented in medical literature since the Greek and Roman physicians. Urolithiasis encompasses both renal and ureteric stones. It is estimated that up to 5% of the world population is affected by this disease and the lifetime risk of getting urinary stone is 8- 15%. Fifty percent of patients will have recurrent stone disease within 5 years, so it can be considered a disease for life. [1]

Hereditary relationship of urinary stones was shown during the genetic studies performed by Resnik (1968) and McGeown (1960). Familial renal tubular acidosis is associated with nephrolithiasis and nephrocalcinosis in almost 70%

of patients.2 Increased testosterone levels in men causing increased endogenous oxalate production by the liver and protective increased urinary citrate concentrations in women have been postulated as causes for the same.

Urolithiasis commonly presents as pain abdomen. In renal stones, fixed renal pain (flank pain) is common. In the ureteric stones, pain radiates to the perineum, inner aspect of the thigh, iliac fossa. Pain may present at tip of penis - according to localization of stone. Beside pain, vomiting, nausea, fever, increased frequency of urination, oliguria, dribbling of urine, and hematuria may be seen. The treatment of urinary stones has undergone a remarkable evolution in the last 15

years. Open surgeries have given way to minimal invasive procedures which have considerably decreased patient morbidity and mortality. With the advent of various Endourological and percutaneous technique the management of Urolithiasis has become much easier. However, urinary stone disease is notorious for high recurrence rates even with modern medicine and surgery. Hence, it becomes imperative to study in great details about this disease. Frere Jacques, the famous lithotomist, of Middle Ages has rightly exclaimed that —I have removed the stone but God will cure the patient.

**Objectives of the Study:** The aim of the study is to know the different ways of clinical presentations & complications of Urolithiasis, to know the incidence of Urolithiasis at different anatomical levels in the urinary tract, the outcome of the different modes of management of Urolithiasis.

**Methodology:** Source of Data: All cases of Urolithiasis from Surgical OPD and patients admitted in surgical wards of PESIMSR Hospital.

**Method of Collection of Data:** Definition of study subject: Patients with Urolithiasis attending Surgical OPD and/or getting admitted under the Department of Surgery at PESIMSR between September 2013 and August 2015, satisfying the inclusion and exclusion criteria of the study as stated below

The method of study consists of: Detailed history taking and a thorough physical examination as per

a structured pre-prepared proforma, Routine blood and urine investigations, and Specific investigations to confirm the diagnosis of Urolithiasis.

**Inclusion criteria:** Patients with clinical features of Urolithiasis with radiological and sonological confirmation of calculus disease. Exclusion criteria: Patients unwilling to undergo the necessary investigations and pregnant women with Urolithiasis. Depending on the size and site of the calculus, the appropriate treatment for the patient will be decided. The treatment includes percutaneous nephrolithotomy (PCNL), Therapeutic ureteroscopy and Cystoscopic removal of bladder calculi.

### Observation and Results

In the present study between September 2013 and August 2015, 130 cases of Urolithiasis fulfilling the study parameters were admitted and subsequently operated in PESIMSR, Kuppam. In the present study, out of 130 cases, 45 (35%) were female and 85 (65%) were male (ratio of 1:2).

Out of the 130 cases in the study, 28 cases (21.5%) were between 18-30 years of age, 29 (22.3%) between 31-40 years, 34 (26.2%) between 41-50 years and 22(16.9 %) between 51-60 years of age. And above 60 years 17cases (13.1%) The mean age of the study group was 37.3 years.

**Table 1: Distribution of Urolithiasis between the two genders**

Gender	Number of patients	Percentage (%)
F	45	34.6
M	85	65.4
Total	130	100.0

**Table 2: Distribution of the study cases according to age**

Age group (in years)	No of patients	Percentage (%)
15-30	28	21.5
31-40	29	22.3
41-50	34	26.2
51-60	22	16.9
>60	17	13.1
Total	130	100.0

**Table 3: Presenting complain and its distribution according to age**

	Age of the Patient in Years					P value	Total
	<30	31-40	41-50	51-60	>60		
No of patients	28	29	34	22	17	-	130
Pain	28	29	34	22	17	0.9	130
Vomiting/nausea	03	06	15	05	02	0.9	31
Fever	05	04	07	04	02	0.9	22
Burning micturation	11	13	09	08	12	0.09	53
Haematuria	05	04	05	03	-	0.9	17

**Table 4: Distribution of calculus depending upon the side**

	No of Patients	Percentage (%)
BLA	16	12.3
L	51	39.2
L&R	9	6.9
R	53	40.8
Urethra	1	.8
Total	130	100.0

**Table 5: Various sites of urinary stone disease and its age wise distribution**

Site of calculus	Age of the patient in years					P value	Total
	<30	31-40	41-50	51-60	>60		
Upper pole kidney	01	-	04	-	01	0.16	06
Lower pole kidney/pelvis/ PU-junction	-	02	04	01	03	0.2	10
Upper 1/3 ureter	01	02	01	01	-	0.8	05
Middle 1/3 ureter	04	02	06	04	03	0.7	19
Lower 1/3 ureter/vu-junction	21	21	17	11	03	<0.01	73
Vesical	01	01	02	05	07	<0.01	16
Urethral	-	01	-	-	-	-	01
Total	28	29	34	22	17		130

**Table 6: Anatomical distribution of stone disease in both the genders**

Anatomical Site	Sex of The Patient	
	Male	Female
Upper Pole Kidney	04	02
Lower Pole Kidney/Pelvis/Pu-Junction	08	02
Upper 1/3 Ureter	01	04
Middle 1/3 Ureter	12	07
Lower 1/3 Ureter/Vu- Junction	44	29
Vesical	15	01
Urethra	01	-
Total	85	45

**Table 7: Size of the calculus and its distribution by site**

Site of Calculus	Size Of Calculus			P Value
	<10mm	10-19mm	>20mm	
Upper Pole Kidney	02	03	01	<0.01
Lower Pole Kidney /Pelvis /PU-Junction	0	09	01	0.7
Upper 1/3 Ureter	0	05	0	0.5
Middle 1/3 Ureter	0	19	0	0.1
Lower 1/3 Ureter / Vu-Junction	05	65	01	<0.01
Vesical	0	05	11	<0.01
Urethra	0	01	0	0.9
Total	07	107	14	

**Table 8: Surgeries performed among study group.**

Surgeries	No Of Cases	Percentage (%)
URSL+DJ	95	73.1%
PCNL+DJ	18	13.8%
URSL+PCNL/DJ	01	0.8%
CLT	14	10.8%
Open CLT	01	0.8%
PB CLT	01	0.8%
Total	130	100%

**Table 9: Table showing surgeries performed divided according to the site of calculus**

Site Of Calculus	Surgeries Performed						Total
	URSL+DJ	PCNL+DJ	URSL+PCNL/DJ	CLT	OPENCLT	PBCLT	
Upper Pole Kidney	0	06	01	0	0	0	07
Lower Pole Kidney/Pelvis/ PU-Junction	0	09	0	0	0	0	09
Upper 1/3 Ureter	02	03	0	0	0	0	05
Middle 1/3 Ureter	20	0	0	0	0	0	20
Lower 1/3 Ureter/ Vu-Junction	73	0	0	0	0	0	73
Vesical	0	0	0	14	01	0	15
Urethral	0	0	0	0	0	01	01
Total	95	18	01	14	01	01	130

**Table 10: Surgical details classified based upon site of the calculi.**

Anatomical Site	Surgery Done	No of Cases	Percent Age	Post-Operative Complications			
				Pain	Fever	BUR.MICTU	Haematuria
Upper Pole Kidney	PCNL	07	5.3%				
Lower Pole Kidney/Pelvis/ PU-Junction	PCNL	09	6.9%	15(11.5%)	01(0.7%)	03 (2.3%)	08(6.1%)
Upper 1/3 Ureter	URSL/PCNL	5	3.8%	01(0.7%)	-	-	-
Middle 1/3 Ureter	URSL	20	15.3%				
Lower 1/3 Ureter/ Vu-Junction	URSL	73	56.1%	27(20.7%)	01(0.7%)	12(9.2%)-	43(33%)-
Vesical	CLT	15	11.5%	-	-	-	-
Urethral	PBCLT	01	0.7%	-	-	-	-
Total		130	100%	43(33%)	02(1.5%)	15(11.5%)	51(39.2%)

**Table 11: Summary of the various surgeries performed**

Procedure	No Of Cases	%	Average Duration Of Hospital Stay (Days)	Post-Operative Complications			
				Pain	Fever	BUR.MICTU	Haematuria
URSL	95	73%	05	27	01	12	43
PCNL	18	13.8%	08	15	01	03	08
URSL+PCNL	01	0.7%	10	01	-	-	-
CLT	16	12.3%	01	-	-	-	-

## Discussion

Urolithiasis commonly presents as pain abdomen. In renal stones, fixed renal pain (flank pain) is common. In the ureteric stones (according to localization of stone): If in the upper one-third of the ureter - pain radiates to the perineum, if at the pelvic brim - pain radiates to the inner aspect of the thigh, if present in the middle one-third of ureter - pain radiates to the iliac fossa.

If the stone is localized in the bladder neck or urethra - pain may present as tip of penis. Besides pain, vomiting, nausea, fever, increased frequency of urination, oliguria, dribbling of urine & hematuria may be seen. In the present study

between September 2013 and August 2015, 130 cases of Urolithiasis fulfilling the study parameters were admitted, investigated, subsequently operated and followed up in PESIMSR, Kuppam.

About 30-40 years ago, the male: female ratio was approximately 6:1- 8:1. But over a period of time this ratio has decreased to 2:1 worldwide. This is even lower in western countries.

It has been theorized that the relative increase in number of females inflicted with Urolithiasis in western countries is due to modern day dietary habits and lifestyle.[6] In the present study the male: female patient ratio was approximately 2:1, similar to global trends.

**Table 12: Sex wise ratio of urolithiasis in various studies from different parts of the world**

Study by	Country	Male: female ratio
Lieske JC [3]	USA	1.3:1
Safarinejad MR et al [4]	Iran	1.15:1
Tanathanuch M [5]	Thailand	1.6:1
Qaader DS [6]	Iraq	2.5:1
Khan AS [5]	Saudi Arabia	5:1
Knoll T [6]	Germany	2.6:1
Lancina Martin JA [7]	Worldwide	2:1
Present study	Kuppam ,AP, India	2:1

Several authors have demonstrated that urolithiasis usually occurs between the third and fourth decades of an individual's life, and that the prevalence rate varies considerably according to age, while the peak incidence of urinary calculi is from the twenties to the forties. [8]

Our study showed similar results with nearly 70% of the study patients between ages 15 -50 yrs. It is a matter of concern that the age of presentation of urolithiasis has gradually decreased over the past few decades. Whereas the mean age for urolithiasis was 46.1 in a study done by Hiatt et al in 1982, [9] the mean age in our study was 37.3 years. Morse and Resnick (1991), in a series of 378 cases of urolithiasis, reported 87% patients had loin pain, 17% patients had vomiting and 3% presented with fever.

In the present study, pain was the most common symptom, presenting in 130 (100%) patients. This was followed by burning micturition in 53 (40.7%), vomiting/nausea in 31 (23.8%), fever in 22 (16.9%) and haematuria in 17 (13.0%) patients. Vomiting/nausea, burning micturition and fever were more common in older age group.

Morse and Resnick (1991) showed in the same series, 200 patients had stone on the left side. Most of other studies found calculi with equal frequency on either side. In the present study however, in 40.7% the calculus was on right side and in 39.2%

on the left side. And in 12.3% vesical calculus, 6.9% in both left & right side and 0.8% had urethral calculus. In the same study Reid Morse et al reported incidence of 17% in the upper 1/3rd of the ureter, 11% in the middle 1/3rd of the ureter and 72% in the lower 1/3rd of the ureter. [10] David J et al in his series of 292 patients reported an incidence of 45% renal calculi and 55% ureteric calculi. Among the ureteric calculi, 27% of calculi were seen in the upper 1/3rd of the ureter, 12% in the middle 1/3rd of the ureter and 61% in the lower 1/3rd of the ureter. [11] Rizvi et al 2002 reported incidence of 33% of renal calculi and 66% of ureteric calculi. Among the ureteric calculi 31% in the upper 1/3rd of the ureter, 14.9% in the middle 1/3rd of the ureter and 53.7% in the lower ureter. [12]

In the present study - the lower 1/3 of ureter/ vesico-ureteric junction was the most common site of calculus affecting in 73 (56.1%) cases. Middle 1/3 ureter 19 (14.6%) was the second most common site, seen in 19 (14.6%) cases. 16 (12.3%) cases had vesical calculus, lower pole kidney & PUJ 10 (7.6%) and upper pole kidney 06 (4.6%), Upper 1/3 ureter 05 (3.8%), 01 (0.7%) case had calculus impacted in penile part of the urethra. Male: female ratio for renal stone was 1.13: 1. While in ureteric stones 43.8% in male, 30.7% in female patients. The observations in this study matched the world wide trends.

**Table 13: Comparison of literature: distribution of urolithiasis at various sites.**

Location of calculus	Mangera A et al [13] (%)	David J et al [11] (%)	Rizvi et al [12] (%)	Present study (%)
Kidney	40	45	33	34
Upper ureter	08	15	20	12
Mid ureter	12	07	10	11
Lower ureter	35	33	37	37.5
Bladder	05	-	-	04

It is seen that patients with daily average urine output 500-1000 ml have 8 times more risk of developing urinary stone disease as compared to patients with daily average urine output 1500- 2000 ml. To account for this various studies recommend daily intake of water in average male and female should be more than 2000ml and 1800ml respectively. [14,15]. In the present study, the daily average fluid intake was only 975ml.

Water intake significantly affects recurrence rates as well. Borghi et al in his study demonstrated that high fluid intake decreased the recurrence rate of urolithiasis to 12% compared to 27% in the control group. Fink et al concluded high water intake lowered long-term risk of urolithiasis recurrence by approximately 60%. [16]

High protein diet has been found to increase the risk of urolithiasis. Borghi et al in his study demonstrated that there was 20% chance of recurrence in patients taking low protein diet as compared to 38% in control group. [17] Many similar studies have firmly established that a low protein diet (especially animal protein) significantly decreases the chances of urolithiasis.

Type 2 diabetes and several other coronary heart disease risk factors, including hypertension and obesity are associated with nephrolithiasis. Insulin resistance, characteristic of the metabolic syndrome and type 2 diabetes, results in lower urine pH through impaired kidney ammoniogenesis so promoting uric acid stone formation. Insulin resistance (and predisposition to uric acid stone formation) can precede the diagnosis of diabetes by decades; in fact the risk of incident diabetes in participants with a history of kidney stones was increased. [18]

In the present study -Diabetes Mellitus was the most common co-morbidity among the study patients, seen in 31 (23.8%) patients. 19 (14.6 %) patients were hypertensive and 8 (6.1%) patients had benign hypertrophy of the prostate. The obesity epidemic can be a cause of the increasing numbers of patients with stone disease. The greater incidence of kidney stones in the obese may be due to an increase in uric acid nephrolithiasis. Obesity and weight gain increase the risk of kidney stone formation.

The magnitude of the increased risk may be greater in women than in men. In particular a body mass index (BMI) of 30 or greater was associated with a greater risk of kidney stone formation. Waist circumference was also positively associated with risk. [19] Subjects with greater BMIs excreted more urinary oxalate, uric acid, sodium, and phosphate than those with lower BMIs and there was an inverse relation between BMI and urine pH. In the present study, obesity (defined as Body mass index > 30) was seen in 7 (5.3%) cases. The most

common urease-producing pathogens are Proteus, Klebsiella, Pseudomonas, and Staphylococcus species, [20] with Proteus mirabilis the most common organism associated with infection stones. [21] Although Escherichia coli are a common cause of urinary tract infections, rare species of E. coli produce urease. [22] In our study - Urine culture showed growth in 36 (27.6%) patients. Most common organism was E. coli seen in 21 (16.1%) cases, followed by Staphylococcus in 8 (6.1%), Klebsiella species in 5(3.8%), and Streptococcus in 2 (1.5%) cases. In examining the efficacy of PCNL in treatment of patients with renal calculi, passage of stone debris and removal of stone fragments is the primary limiting factor.

There is general agreement that stone free is the most rigorous definition of successful outcome of any stone removal procedure, and complete stone clearance should be the preferred goal. [23] For renal stones, treatment failure was due to a failure to clear stone fragments. Failure to clear stone fragments resulted in a higher retreatment rate as well as a higher number of ancillary procedures. Clayman and associates (1989) suggested that the results of PCNL with different lithotripters, the parameters of stone-free rate, retreatment rate, and the effectiveness quotient may express better treatment results Clayman et al found the clearance rates for renal calculi to be 92% with PCNL.

The present series had similar results with PCNL having 95.3% clearance rates. Netto and associates (1991), a study –effectiveness of PCNL for patients with lower pole calculi, reported overall stone-free rates of 93.6% for PCNL.

However, the effectiveness quotients for PCNL are 93.7%. [24] Park and associates (1998) analyzed the outcomes of patients with ureteric calculi treated by ureteroscopy and found that the stone-free rate for ureteroscopic treatment was unaffected by size. The present study had similar results with 85% success rates with ureteroscopy in calculi >1cm size. [25]

**Table 14: Microscopic Appearance of Common Urinary Calculi**

Chemical Type	Appearance
Calcium oxalate monohydrate	Hourglass
Calcium oxalate dihydrate	Envelope, tetrahedral
Calcium phosphate–apatite	Amorphous
Brushite	Needle shaped
Magnesium ammonium phosphate (struvite)	Rectangular, coffin-lid
Cystine	Hexagonal
Uric acid	Amorphous shards, plates

### Conclusion

There has been a shift in the age distribution of Urolithiasis in recent times. Whereas, earlier this was considered a disease of middle age, there is an increased number of patients suffering from this

condition in younger age group. There is a shift in gender distribution of urolithiasis as well. In the past 40 years the incidence of urolithiasis has increased drastically, probably due to modern lifestyle and dietary habits. In the past the urinary

stone disease used to affect the lower urinary tract more commonly. This trend has also changed in the past few decades with higher number of cases presenting with renal and upper ureteric stones. Urolithiasis presents most commonly as abdominal/loin pain. This may be associated with vomiting, nausea, fever, burning micturition etc. A huge number of predisposing factors affect the formation of urinary calculus. However, dietary habits, fluid intake, local climate and comorbidities like diabetes mellitus and obesity play a very important role in its etiopathogenesis. Depending upon the pathological process in action, the stone may be formed of various metabolic substances like calcium, oxalate etc. a detailed study of composition of stone and metabolic evaluation of the patient becomes significant here in not only preventing urolithiasis but also its management.

With the advent of minimal invasive surgeries, the definitive treatment of urolithiasis has become far easier than before. The overall morbidity of this disease has drastically come down. For renal calculi, PCNL is the best treatment modality as of now, but it is associated with greater post-operative morbidity and has poor clearance rate. For ureteric calculi, and ureteroscopy have given good results. And vesical calculi are treated by cystolithotripsy, with success rate of 100%. Depending on the size and site of the calculus, the appropriate treatment includes- Renal Calculi: For non-lower pole renal calculi - >1cm- PCNL, Lower pole renal calculus irrespective of size- PCNL; Ureteral Calculi: For proximal ureteral calculi >1cm- Ureteroscopy, For distal ureteral calculi- Urteroscopy; Vesical Calculi: Cystoscopic removal of bladder calculi.

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