

## A Urolithiasis Clinical Assessment and Analysis

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### Abstract

To evaluate all patients with calculus disease of the urinary tract with special reference to the clinical epidemiology including: Age and Sex, Heredity / metabolic diseases, Environment. Urinary infection, Dietary factors, Distribution of calculi within the urinary tract. To clinically evaluate all patients with thorough clinical examination, their common modes of presentation, associated urological problems and by investigating them to arrive at a decision making process. To study various modalities of treatment offered at different levels of calculus impaction and finally the stone analysis.

**Keywords:** Urolith; Pelvis; Ureter; Bladder Urethra; Nephro / Pyelo Lithotomy.

### Introduction

By analyzing the various sites common etiology, sex and age distribution *clinically* we can assess the treatment modality to be followed in places where the investigation facilities are not available at hand.

#### *Aim of Study*

To identify the ideal management with regards to age and sex and etiology common site, of urinary stone.

### Materials and Methods

The present study involves a total of 112 patients with calculus disease of the urinary tract observed during the period of 2 years, from Feb 2014 to March 2016. The study was conducted both by prospective as well as by retrospective methods. All patients of prospective study were followed up in specialty department, where they were subjected to a detailed clinical epidemiological workup. Complete hemogram, urinalysis, urine culture, serum biochemistry, were performed in all cases. Chemical analysis of stones were performed in 39 cases postoperatively after stone retrieval by open surgeries. Radiological investigations included plain x-ray KUB, ultrasound IVU series, CT, depending on clinical situation.

#### *Inclusion Criteria*

30-50 years of both male and female patients.  
Associated urological problems / Stricture urethra.

#### *Exclusion Criteria*

Paediatric urolithiasis was excluded as they were referred directly to children's hospital. Cases directly attending to the speciality outpatient department were not included in the present study.

#### *Distribution of Calculi*

Upper urinary tract / lower urinary tract, Site / Side of Stone impaction.

#### *Clinical Presentation*

Pain (Colic), Palpable mass, Hematuria, Fever, LUTS.

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*Associated Urological Problem*

HUN / BPH / GUTB / Stricture Urethra.

*Method of Diagnosis*

USG, X-ray (KUB), IVU, AUG, CT Scan, Sr. Biochemistry and 24 hrs urinalysis.

*Mode of Treatment*

Endoscopic / open stone surgery Stone Analysis:

*Observations*

*Age & Sex Incidence*

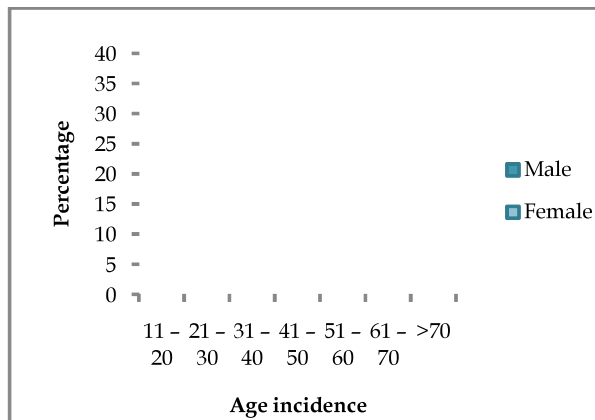
*Upper Urinary Tract Stone Disease (Renal, Ureteral, Multiple Stones)*

Age: Age incidence (37%) for upper urinary tract stone disease was observed in between 30-40 years. 75% of total cases observed were found during 2<sup>nd</sup> and 5<sup>th</sup> decade. Only 5 cases were found <20 years.

**Table 1:** Age and Sex incidence

Age	Male	%	Female	%	Total	%
11- 20	2	4	3	8	5	6
21- 30	12	24	7	21	19	22
31- 40	18	35	13	38	31	37
41- 50	6	12	8	24	14	16
51- 60	9	17	0	0	9	11
61- 70	3	6	2	6	5	6
>70	1	2	1	3	2	2
Total	51	100	34	100	85	100

**Graph 1:**



Male: Female ratio observed is 1.5: 1

*Lower Urinary Tract Stone Disease (Vesical, Urethral stones)*

*Age*

Max. age incidence (52%) for vesical and urethral stones was observed to be within 40 – 60 years.

20% of cases were found in between 20 – 30 years.

Only one patient of teen age was found to have vesical calculus.

*Sex*

Of the 27 cases of lower urinary stones, only one female patient was found to have bladder stone.

96% male predominance observed

**Table 2:** Lower Urinary Tract Stone Disease

Age (Yrs)	Male	%	Female	%	Total	%
11 - 20	1	4	0	0	1	4
21 - 30	5	19	0	0	5	19
31 - 40	4	15	0	0	4	15
41 - 50	6	23	1	100	7	26
51 - 60	7	27	0	0	7	26
61 - 70	1	4	0	0	1	3
>70	2	8	0	0	2	7
Total	26	100	1	100	27	100

*Distribution of Calculi*

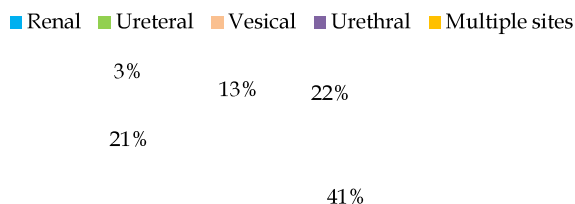
Of the 112 cases studied, it was observed ureteral stones were the commonest (46 cases).

25 cases of Renal stones and 24 cases of bladder stones observed. 3 cases of urethral stones found.

Stones at multiple sites accounts 14 cases.

**Table 3:** Distribution of Calculi

Site	No	%
Renal	25	22
Ureteral	46	41
Vesical	24	21
Urethral	3	3
Multiple sites	14	13
Total	112	100



**Graph 3:** Distribution of Calculi

*Distribution of Renal Calculi*

Most common site of stone impaction was the renal pelvis (63%).

Stones on right kidney were found to be more frequent (60%) than the left.

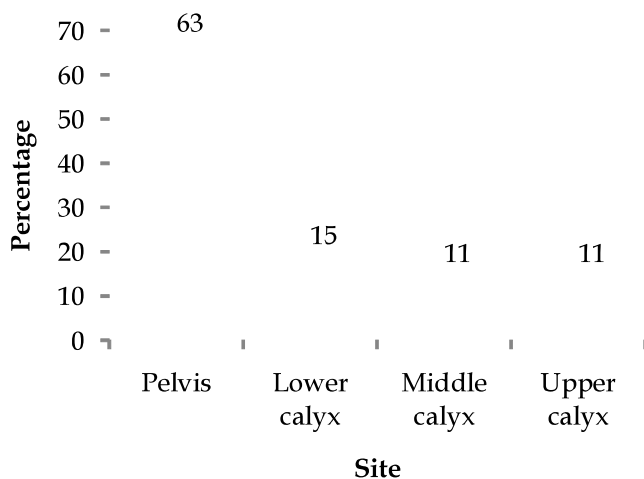
B/L renal stones were found in 6 cases of 35.

*Distribution of Ureteral Calculus*

It was observed that stones in the lower third ureter and vesico ureteric Jn. were more common than upper ureteric stones. Stones above pelvic brim constitutes 40% and below pelvic brim constitutes 60%. Ureteral stones were found to have almost equal incidence on right (52%) as well as on left (45%) side. B/L ureteral stones found in 2 cases of 56.

**Table 4:** Distribution of Renal Calculi

Site	No	%
Pelvis	22	63
Lower calyx	5	15
Middle calyx	4	11
Upper calyx	4	11
Total	35	100



**Graph 4:** Distribution of Renal Calculi

**Table 5:** Distribution of ureteral calculus

Site	No	%
Above pelvic Brim (U/3+M/3)	22	40
Below pelvic Brim (L/3+VUJ)	34	60
Total	56	100



**Graph 5:** Distribution of ureteral calculus

*Distribution of Urethral Calculi*

3 cases of male urethral calculi observed during the study where the site of blockage were one at fossa naysularis and the other 2 at posterior urethra. Stones at multiple sites observed includes

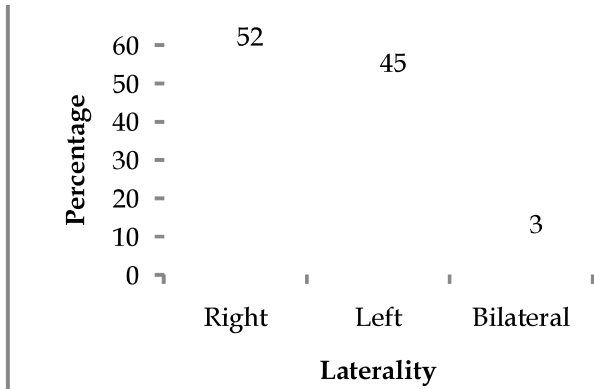
Either B/L renal or B/L ureteral or Multiple renal on the same side or renal with Ureteral or vesical with urethral stones. One case of post ESWL steinstrasse was noticed.

*Epidemiology*

Only 2 cases with metabolic disorder was found. Both cases have primary hyperoxaluria. Climatic influence on stone disease found in 20% cases, 23 cases presented during summer season (March-June). Only 8 cases showed diet / fluid influence on stone disease. Urinary infection was observed in 19% of cases. Patients with multiple stones and bladder stones were found to have urinary infection. The most common organism in urinary c/s was E. Coli.

**Table 6:** Distribution of Urethral Calculi

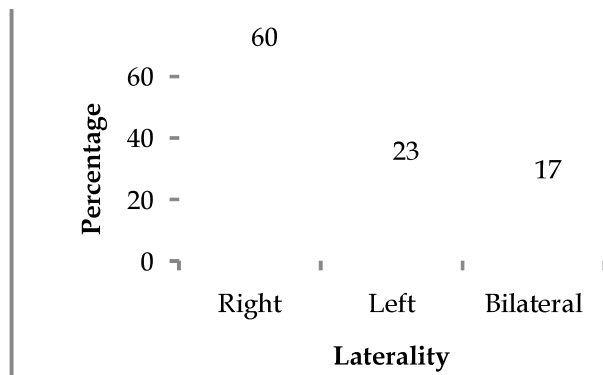
Laterality	No	%
Right	29	52
Left	25	45
Bilateral	2	3
Total	56	100



**Graph 6:** Distribution of Urethral Calculi

**Table 7:** Laterality

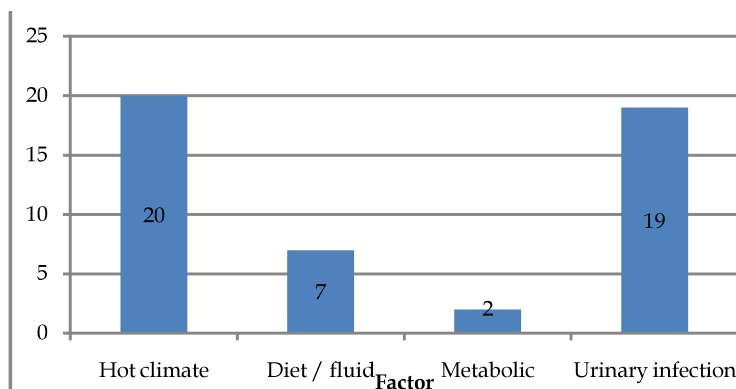
Laterality	No	%
Right	21	60
Left	8	23
Bilateral	6	17
Total	35	100



**Graph 7:** Laterality

**Table 8:** Factors affecting for calculus disease

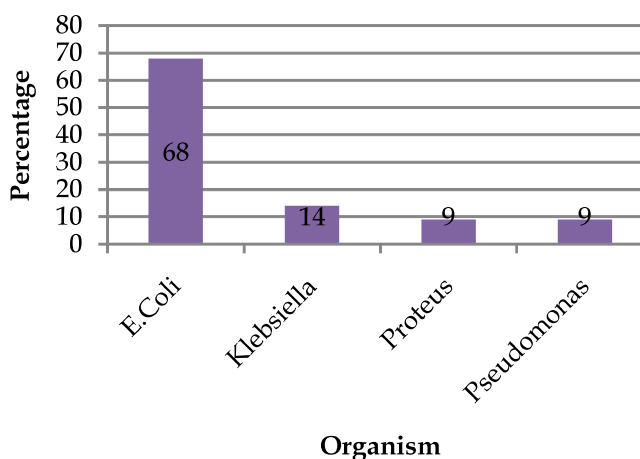
Factor	No	%
Hot climate	23	20
Diet / fluid	8	7
Metabolic	2	2
Urinary infection	21	19



**Graph 8:** Factors affecting for calculus disease

**Table 9:** Organisms involving in calculus disease

Organism	No	%
E.Coli	14	68
Klebsiella	3	14
Proteus	2	9
Pseudomonas	2	9
Total	21	100



**Graph 9:** Organisms involving in calculus disease

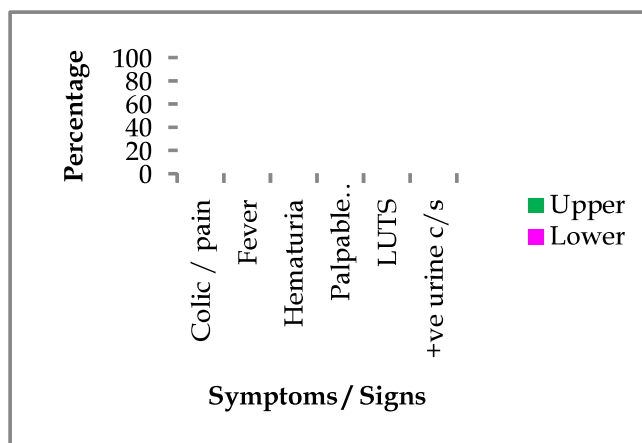
*Clinical Presentation*

Pain was the commonest symptom observed (68%) Upper urinary stone disease presented with colic either renal or ureteric as the most common symptom (87%). Lower urinary stone diseases presented with

either one or more symptoms of LUTS like dysuria, hesistancy, terminal hematuria and dribbling. Hematuria noticed in 15% cases and positive urine culture found in 21 cases (18%).Palpable mass was found in 5 patients. Hydronephrosis (2 cases) and pyohephrosis (3 cases).

**Table 10:** Symptoms & Signs

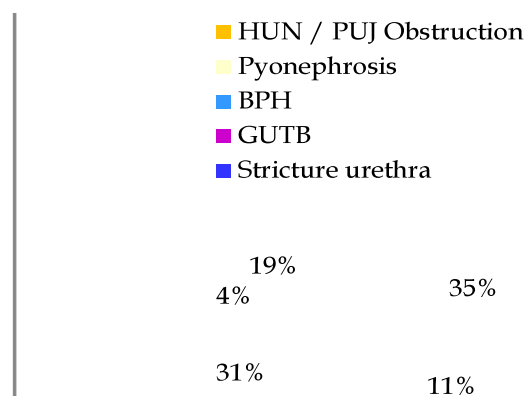
Symptoms/ Signs	Upper		Lower		Total	
	No	%	No	%	No	%
Colic / pain	74	87	2	5	76	68
Fever	6	7	2	5	8	7
Hematuria	9	10	8	22	17	15
Palpable Mass	5	5	0	0	5	4
LUTS	4	4	16	43	20	12
+ve urine c/s	14	16	7	19	21	18



**Graph 10:** Symptoms & Signs

**Table 11:** Associated urological problem

Associated problem	No	%
HUN / PUJ Obstruction	9	38
Pyonephrosis	3	12
BPH	8	33
GUTB	1	4
Stricture urethra	6	20



**Graph 11:** Associated urological problem

*Associated Urological Problem*

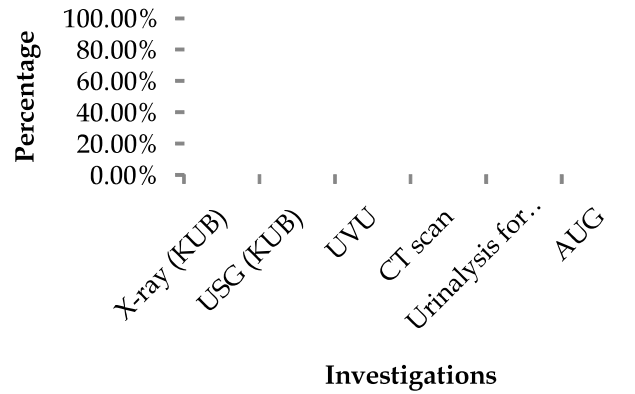
It was observed hydro uretero nephrosis was found in 9 cases and were more frequently found in multiple site stones. Pyonephrosis found in 3 cases, of which 1 had staghorn calculus. BPH was the most common associated urological problem with lower urinary stones. One case of genitourinary tuberculosis with stone disease noticed. 6 cases of stricture urethra associated with urethral and bladder stones observed.

*Method of Diagnosis*

USG (KUB) and x-ray (KUB) were done in almost all cases and constitutes 64% and 87.5% respectively as a diagnostic tool for stone disease. CT (Scan) helped in 10 cases of doubtful diagnosis and planning treatment. IVU was done in 37 cases with normal urea, creatinine levels. Ascending urethrogram (AUG) was done in 6 cases of stricture associated with vesical and urethral stones.

**Table 12:** Investigations

Investigation	N	%
X-ray (KUB)	98	87.5
USG (KUB)	72	64
UVU	37	33
CT scan	10	9
Urinalysis for crystals	0	0
AUG	6	1



**Graph 12:** Investigations

Serum biochemistry for renal parameters showed levels in 9 cases (obstructive uropathy). Sr. Biochemistry and 24 hours urine for calcium, phosphorus and oxalate showed 2 cases primary hyperoxaluria. Urinalysis for crystals was not done in any case.

One case of renal stone was managed conservatively during this study.

*Treatment Modality*

Pyelolithotomy was the most common procedure done for renal stone obstructing at pelvis (68%).

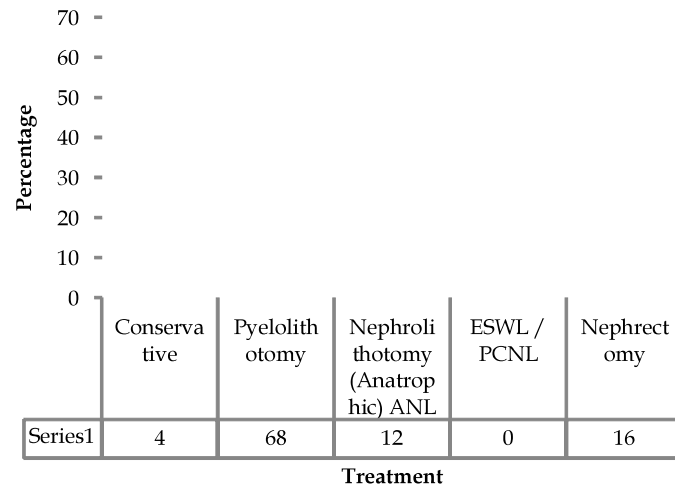
*Renal Calculus*

3 cases of anatomic nephrolithotomy done and 4 cases of nephrectomy done for obstructed and infected system with non functioning kidney (with opposite side normal functioning kidney).

**Table 13:** Treatment modality for renal calculus

Treatment	No	%
Conservative	1	4
Pyelolithotomy	17	68
Nephrolithotomy (Anatomic) ANL	3	12
ESWL / PCNL	0	0
Nephrectomy	4	16

ESWL/PCNL was not done in any case.



**Graph 13:** Treatment modality for renal calculus

*Ureteral Stones*

Uretero renoscopy (URS) with lithotripsy and DJ stenting was done in most cases for ureteral stones (51%). Whereas Meatotomy was done in stones at VUJ (17%). Open stone surgery for larger (>1cm) ureteral stones, ie. uretero lithotomy was done in 12 cases. Conservative treatment was observed in 3 cases only, as OP cases were excluded in the study.

*Multiple Site Stone Disease*

Obstructive uropathy and infection were more

frequently observed in multiple stone disease.

URS/DJ stenting was done in 43% and ureterolithotomy was done in 2 cases (14%).

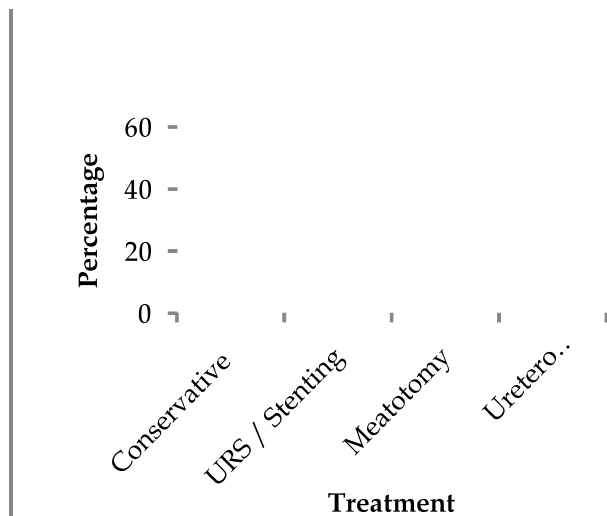
One case of post ESWL stein strasse was noticed, for which URS/DJ stenting was done.

One case of nephrectomy done for non functioning calculous pyonephrotic kidney

B/L stone disease were treated according to the site, side of obstruction and clinical presentation (symptomatic side).

**Table 14:** Ureteral Stones - Treatment

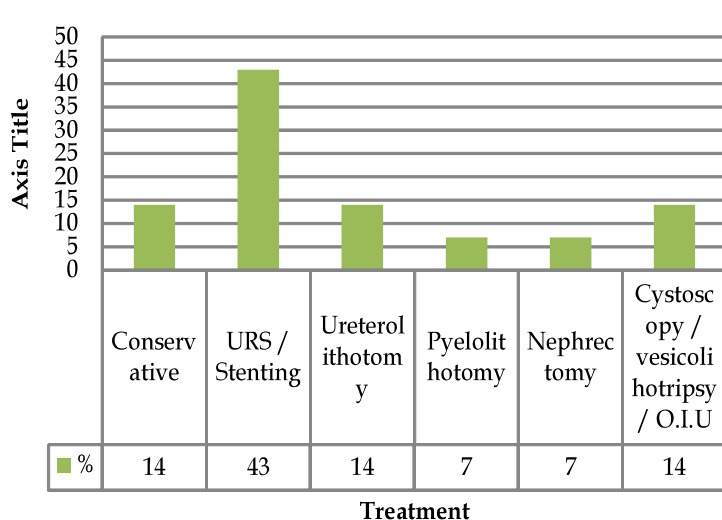
Treatment	No	%
Conservative	3	6
URS / Stenting	24	51
Meatotomy	8	17
Uretero lithotomy	12	26



**Graph 14:** Ureteral Stones - Treatment

**Table 15:** Treatment of multiple site stone disease

Treatment	No	%
Conservative	2	14
URS / Stenting	6	43
Ureterolithotomy	2	14
Pyelolithotomy	1	7
Nephrectomy	1	7
Cystoscopy / vesicolithotripsy / O.I.U	2	14



**Graph 15:** Multiple site stones Treatment

*Vesical and Urethral Calculus*

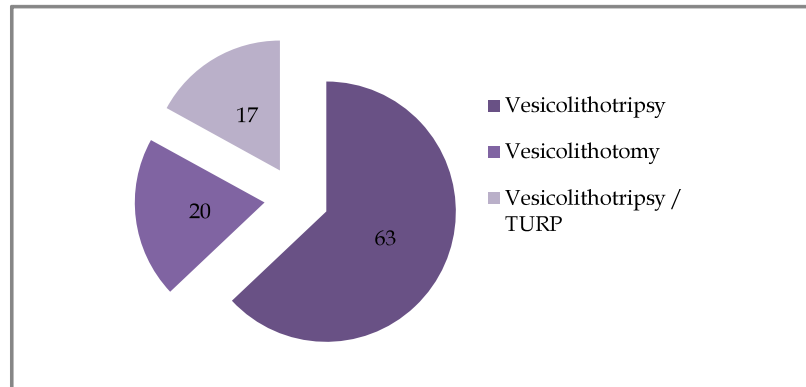
Cystoscopy and vesicolithotripsy was most commonly done for bladder stones (63%).

Vesicolithotripsy with TURP was done in 4 cases of bladder stones associated with BPH.

Vesicolithotomy was done in 5 cases. Urethral stones at posterior and bulbar urethra were retrieved by (O.I.U) optical internal urethrotomy to relieve stricture and lithotripsy. One case of fossa navicularis stone was retrieved by meatotomy.

**Table 16:** Treatment for bladder stones

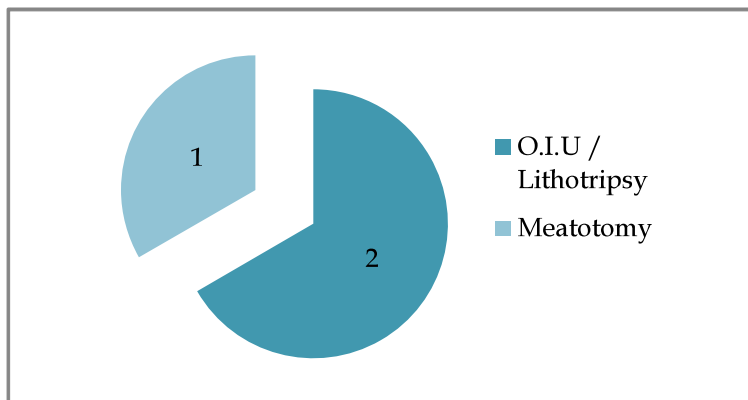
Treatment	No	%
Vesicolithotripsy	15	63
Vesicolithotomy	5	20
Vesicolithotripsy / TURP	4	17



**Graph 16:** Treatment for bladder stones

**Table 17:** Treatment for Urethral Stones

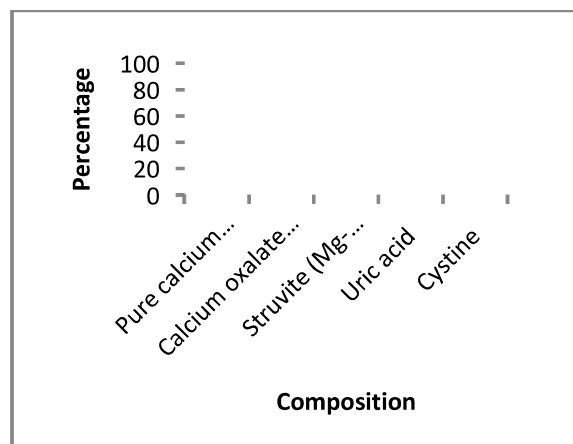
O.I.U / Lithotripsy	2
Meatotomy	1



**Graph 17:** Treatment for Urethral Stones

**Table 18:** Stone analysis

Sl. No	Composition	No.	%
1	Pure calcium	2	5
2	Calcium oxalate and phosphate	34	87
3	Struvite (Mg- oxalate ium phosphate)	3	8
4	Uric acid	0	0
5	Cystine	0	0



**Graph 18:** Stone analysis



### Stone Analysis

Of the 112 cases studied, stone analysis were performed in 39 cases after postoperative stone retrieval. Done in, Renal stones - 23 cases Ureteral stones - 10 cases and Vesical stones - 6 cases.

The most common stone was found to be calcium

oxalate with phosphate. Struvite stones found in 3 cases of staghorn calculus.

### Discussion

The observed age and sex incidence and the review of literature is tabulated below.

	Upper		Lower	
	Observed	Literature	Observed	Literature
Age (Yrs) - Peak incidence	20 - 40 yrs	3 <sup>rd</sup> - 5 <sup>th</sup> decade	40 - 60 years	>50 years
Sex (M.F)	1.5:1	3:1	96% males	Male predominance

Maximum age incidence for urinary calculi observed were in accordance with literature, both for upper and lower urinary stone disease. Sex preponderance was in accordance with literature for vesical stones where as increasing female preponderance was observed for renal / ureteral stones.

Of the 112 cases studied, only 5 cases were <20 years of which 2 cases had primary hyperoxaluria (metabolic), as paediatric urolithiasis was excluded.

The incidence of calculi were definitely high during hot environment, as evidenced by their presentation during summer season (20% of cases). The role of fluid intake / dietic influence on renal calculus disease could not be evaluated as history of many Patients were highly unreliable. 19% cases have clinical evidence of urinary infection and the most common organism grown in culture was E. coli. Those with multiple site stones and bladder stones mostly had urinary infection. Regarding distribution of calculi along the urinary tract, ureteral calculus were most frequent (41 cases) than renal calculus. Vesical calculus (24 cases) showed increasing incidence as renal stones and 3 cases of urethral stones were observed during the study. Among the renal stones, renal pelvis was the commonest site of stone impaction. 83% had single stone and 17% had multiple stones. There was a slight preponderance on right side both for renal stones (60%) as well as ureteral stones (52%). Literature says several of the comparative study shows left sided preponderance of ureteral calculi. The site of stone impaction for ureteral stones was found to be below the pelvic brim (60%) more often than above pelvic brim (40%). Pain was the commonest clinical presentation, although small minority of patients presented with hematuria (12%) and fever (6%). 4 patients had palpable mass due to hydronephrosis. LUTS were the most common presentation of vesical calculus.

Hydronephrosis was commonly associated with upper urinary stones where as BPH (3%) and stricture urethra (20%) were commonly associated with vesical / urethral stones. One case of GUTB was observed during the study. Although the sensitivity of USG (KUB) is 43%, it was observed that USG (KUB) was the most common method of stone diagnosis and it was performed along with X-ray (KUB) in almost all cases. IVP was done in 37 cases and AUG was done in 6 cases. It was the combined methods of investigations helped not only in diagnosing the calculus but also to plan for treatment process. Regarding the treatment, pyelolithotomy was the common procedure done for renal stones obstructing the pelvis. Nephrectomy was performed in 4 cases for obstructed and infected system with non function kidney. Patients with renal stones <1cm and symptoms not subsided by conservative methods were referred to centres for ESWL. URS (Ureterorenoscopy) / lithotripsy / DJ stenting was the most common procedure performed for ureteral stones <1cm size. Open stone surgery for ureteral stone (uretero lithotomy) was done in 12 cases with larger stones (> 1 cm). Meatotomy was done for stones at VUJ. Conservative treatment for ureteric colic was observed only in 3 patients as op cases were excluded in this study. The treatment for multiple site stones was done depending on the side / site of obstruction and the clinical presentation (symptoms). It was found that obstructive uropathy and the infection were more common with multiple site stones. Cystoscopy and vesicolithotripsy was the most commonly done procedure for vesical stones (63%). Open stone surgery for bladder stones were done only in 5 patients with Larger stones. TURP was combined with vesicolithotripsy in cases associated with BPH. Urethral stones were treated with O.I.U (Optical Internal Urethrotomy) for relieving stricture and lithotripsy for posterior urethral stones and stone at fossa navicularis was treated by meatotomy. Of the

112 cases studied, stone analysis were performed in 39 cases after post operative stone retrieval. Calcium oxalate and phosphate stones were major constituents of stones, and the comparative study also support this. 3 cases of staghorn calculi had struvite stones.

### Conclusion

Urolithiasis is predominantly a disease of males of 3 - 5<sup>th</sup> decade. Increasing incidence in female has been noted with upper urinary stones. 2 cases of metabolic disorder (Hyperoxaluria) were found.

There was a definite association of stone disease with hot environment and people with restricted fluid intake. Urinary infection was observed in majority of patients with multiple stones and vesical stones.

The most common organism in urine culture was E.Coli. Ureteral stones were found more frequently than renal / vesical stones with slight predominance on right side and mostly obstructing below the pelvic brim. Renal stones also show a predominance towards right side with mostly obstructing at Renal pelvis. 83% had single stone whereas 17% had multiple stones. Pain was the commonest presentation although hematuria, fever and palpable mass were found in minority of patients with upper urinary stones. Vesical calculus mostly presents with LUTS. BPH and stricture urethrae were commonly associated with lower urinary tract stones. USG (KUB) and X-ray (KUB) were performed in almost all cases which diagnosed calculus disease in majority of patient. In patients with renal stones, open stone surgeries (Pyelolithotomy / nephrolithotomy) still have a significant role than endoscopic treatment

(PCNL). Cases with smaller stones were referred out for ESWL. In patients with ureteral and vesical stones, endoscopic stone retrieval by ureterorenoscopy (URS) and cystoscopy respectively remained promising results than with open stone surgeries. Calcium oxalate and phosphate were the major constituents of stones.

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