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Clinical Profile and Management of Multiple Urolithiasis

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Abstract: Stone in the urinary tract has been a challenge to human being since the dawn of the history. Research over years has shown that the incidence of bladder calculi has reduced and incidence of upper urinary tract calculi has gone up slowly. With developments in different radiological modalities, the diagnosis of calculus disease has become more accurate and the better understanding of physicochemical principles underlying the stone disease, chemical composition of urinary calculi with the advent of medical therapy have shown rays of hopes to the scientists for prevention of stone diseases.

Keywords: Urolithiasis Management, Rural Setup.

INTRODUCTION

Stone in the urinary tract has been a challenge to human being since the dawn of the history. Anthropologic history provides evidence that urinary calculi existed as long as 7000 years ago. The "specialty of urology was recognized even by Hippocrates, who in his famous oath for the physicians stated, "I will not cut even for the stone, but leave such procedure to the practitioners of the craft"¹⁸. The history of stone disease implies that many diverse factors may be involved in its causation like heredity, environment, age, sex, urinary infection, metabolic diseases, dietary excesses or deficiencies. Research over years has shown that the incidence of bladder calculi has reduced and incidence of upper urinary tract calculi has gone up slowly. With developments in different radiological modalities, the diagnosis of calculus disease has become more accurate. Operative management of Urolithiasis has changed with new techniques, use of intraoperative ultrasonography and Doppler sonography. Recently, three elegant innovations were added to open surgery in the management of urinary stones, they are Extracorporeal Shock Wave Lithotripsy (ESWL), Endourology and Percutaneous Nephrolithotomy (PCNL). They have made stone surgery less invasive and have provided higher rates of preservation of kidney functions. The better understanding of physicochemical principles underlying the stone disease, chemical composition of urinary calculi with the advent of medical therapy has shown rays of hopes to the scientists for the prevention of stone disease. This study has been conducted in Acharya Vinoba Bhave Rural Hospital, Sawangi Meghe with limited resources and with limited resources and which is devoid of recent techniques of ESWL, PCNL, and Endourology.

MATERIAL AND METHOD

The present series is a study of 48 patients admitted with urinary calculi in Acharya Vinoba Bhave Rural Hospital, Sawangi Meghe during the period of two years (August 2008- July 2010). Cases were studied according to the definite plan outlined in special Performa, which included a detailed history of present illness, personal history, past history and family history, a record of general, systemic examination, investigations treatment and follow-up of patients. History of present illness included a detailed description of important chief complaints like pain, associated urinary complaints, and associated gastrointestinal symptoms. Family history was taken to find out especially whether any family members/neighborhood suffered from urinary calculi. Family history was also taken to rule out familial diseases like cystinuria. In occupational history, it was found out whether the patient was a sedentary worker or a manual labourer. In past history, inquiries were made about similar attacks in past, history of the previous operation, recurrence of calculi, any other major illness in past. In personal history, the emphasis was given on dietary history (vegetarian/now- vegetarian/milk/non-milk diet) and drinking water source (River/Tap water/ Bore well). Careful general and systemic examination of the patient were done with special emphasis on examination of KUB region, PR examination (for evidence of palpable bladder stone, assessment of prostatic size).

Following investigations were carried out:

Biochemical investigations:

- CBC.
- Electrolytes.
- Blood urea
- Sr. Creatinine.

Serum calcium, phosphate, uric acid levels were studied in selected patients. Parathyroid hormone levels were studied in selected patients with high suspicion of hyperparathyroidism. Routine urine analysis was done in all patients, who included urinary pH, albumin, sugar, occult blood, microscopic examination. Urine culture and sensitivity and 24 hours urine for calcium, oxalate, uric acid, and sodium were done in selected cases.

II. Radiological Investigations: (Fig. 6, 7, 8, 9, 10, 11)

- Plain X-Ray KUB was done in all patients.
- Intravenous urography was done in all patients for assessment of renal functions.
- Ultrasonography was done in 18 patients.
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TREATMENT

- **Initial Treatment:** Most of the patients with urinary calculi presented as an acute stone episode. The assessment of the seriousness of the disease process was done by evaluation of symptomatology, physical examination urine analysis, and radiological examination. Antispasmodic drugs (Baralgin, Cyclopam, and Diclofen) were used to relieve pain. Patients with gastrointestinal symptoms like nausea and vomiting were given intravenous fluids. Antibiotics were started for infections.
- **Definitive Treatment:** Hydrotherapy was given for patients with small ureteric calculi without evidence of obstruction or small renal calculi. Hydrotherapy was given as per a definitive plan. Rapid infusion of intravenous normal saline (1500 ml) was given over a period of 4-6 hours. After infusion of 1000 ml of normal saline, Lasix (100 mg) was given intravenously. Injection Cyclopam was given round o'clock; such procedure was done for three consecutive days. In this series, 2 patients were treated with hydrotherapy. The patient passed calculus 48-72 hours after initiation of hydrotherapy.
- **Procedural Treatment:** Procedural treatment was carried out in all cases.

Preoperative Preparations: All patients undergoing surgical treatment have explained the risk of operation and likely course of the disease. Preoperative antibiotics were started in all cases. In patients with associated medical diseases like renal failure, diabetes mellitus, bronchial asthma and hypertension, department of anesthesiology was consulted well in advance and patients were prepared with their advice. Blood was kept ready for the patients undergoing major surgery.

Anesthesia: The type of anesthesia was decided according to the assessment of the individual patient. For surgery on kidney, pelvis and upper ureter, general anesthesia was usually given. For lower ureteric, bladder and urethral surgery, general or spinal anesthesia was given.

Position and Incisions: Patients undergoing surgery on kidney, pelvicalyceal system and upper ureter were placed in lateral position after anesthesia and endotracheal tube insertion in such a way to get renal area of the no operative side over the kidney bridge of the operating table. The bottom thigh was flexed at 45° and bottom leg was flexed to 90°. The top thigh and leg were fully extended. A pillow was placed between the knees and sponge pad was placed under the axilla. The patient was secured in this position with a wide adhesive tape passed over the greater trochanter. (Fig. 12) Morris incision was taken with 11th or 12th rib bed approach. (Fig. 13-17) For surgery over midureter, supine position was used with a slight tilt towards opposite side. For surgery over ureter, flank incision was taken with retroperitoneal approach. For surgery over lower ureter and bladder, supine position was used. For bladder surgery, pfannenstiell incision was used. For endoscopic surgery and urethral surgery, lithotomy position was given. Patients with renal calculi underwent nephrolithotomy, pyelolithotomy and extended pyelolithotomy. One patient had to undergo nephrectomy. Patients with ureteric calculi underwent open ureterolithotomy, internal ureteric meatotomy and suprapubic transvesical ureterolithotomy. In patients with bladder calculi, suprapubic cystolithotomy was carried out. In patients with urethral calculi meatotomy was carried out. Operative findings were noted including the amount of blood loss and time required for surgery.

Postoperative management: Intravenous fluids were given as required for the maintenance of electrolyte balance. Injectable antibiotics were given for first 48 hours and then oral antibiotics were started. Analgesics and sedatives were used to relieve pain. Drains were removed in 48 hours in most of the patients. A urethral catheter was removed on the 4th postoperative day in patients with renal and ureteric surgery and on 7th to 10th postoperative day in patients who had surgery over bladder and urethra. Sutures were removed between 8th to 10th postoperative days. Daily progress records were maintained. Special mention of complications was made in the progress notes.

RESULTS

In this it was observed that urinary calculi were most commonly seen in age groups from 21-30 years (19 cases) 39.50% and 31-40 years (13 cases) 27.33%, respectively followed by age groups from 41-50 years (5 cases) having incidence of 10.34%, with incidence of ureteric calculi was more i.e. 54 calculi as against renal calculi i.e. 38 calculi; bladder calculi i.e. 07 calculi and urethral calculi i.e. 03 calculi. It was observed that urinary calculi were more common in patients having mixed diet (66.7%) as compared to a vegetarian diet (33.33%) and were more common in patients having milk (95.8%) in their diet as compared to patients not having milk (4.2%) in their diet. Blood urea levels were raised in 04 cases (8.33%) suggestive of altered renal functions. Serum creatinine was done in selected cases whenever indicated. 3 cases show the deranged creatinine. Urinary pH was acidic in 44 out of 48 cases i.e. 91.66% as against neutral and alkaline pH in 2 and 2 cases i.e. 4.16% and 4.16%, respectively. Urinary infection was present in

22 out of 48 cases i.e. 45.83% cases. Bacteria were present in 20 cases i.e. 41.66% cases. Microscopic Hematuria was present in 26 cases i.e. 47.91% cases. Albumin was present in 28 cases i.e. 58.33% cases. Crystals were detected in urine in 21 cases, out of which 18 were made up of calcium oxalate (37.5%), 1 was made up of triple phosphate (2.08%) and 2 were made up of uric acid (4.16%). Plain X-Ray KUB could detect 96 urinary calculus out of 102 (i.e. 94.11% calculus identified). Hydrotherapy was done in 2 cases of ureteric calculi. Both Patients passed calculus in the ward 48-72 hours after starting hydrotherapy. Nephrectomy was done in 1 case of not- functioning kidney. Nephrolithotomy was done for 5 calculi. Extended pyelolithotomy was done for 5 calculi. Pyelolithotomy was done for 27 calculi. All cases were treated with antibiotics, daily dressings and secondary suturing. The urinary leak occurred in 1 case. That case was treated conservatively. The urinary leak stopped with conservative management. One patient had a secondary hemorrhage. The patient was treated conservatively. Follow-up Out of 48 cases, 35 cases came for follow-up in Out Patient Department. Thus, follow-up rate was 72.91%.

C

In the present series. 48 patients of more than one urinary calculus were studied from August 2008 to August 2010. In this study, etiology, clinical presentation, types and different methods of management of urinary calculi were studied.

This study was carried out in Acharya Vinoba Bhave Rural Hospital, Datta Meghe Institute of Medical Sciences and University, Sawangi, Wardha, Maharashtra, India.

Table no. 1:- Age and sex incidence in patient of urinary calculi

S. No	Age in years		Female	Total	Percentage
	Male	Female			
1	0-10	2	0	2	4.1
2	11-20	0	0	3	6.2
3	21-30	15	4	19	39.50
4	31-40	12	1	13	27.33
5	41-50	4	1	5	10.34
6	51-60	3	0	3	6.2
7	61 and above		0	3	6.2
Total		42	06	48	100.00

From the above table-1, it is observed that urinary calculi were most commonly seen in age groups from 21-30 years (19 cases) 39.50% and 31-40 years (13 cases) 27.33%, respectively followed by age groups from 41-50 years (5 cases) having an incidence of 10.34%.

1. The youngest patient was 5 years. The eldest patient was 70 years.

Table 2A: Incidence of urinary calculi at different site

S. No.	Site	No. of Calculi		Total
		Male	Female	
1	Renal	33	5	38
2	Ureteric	47	7	54
3	Bladder	05	2	07
4	Urethral	03	0	3
Total		88	14	102

From the above table-2A, it is observed that in this study of urinary calculi incidence of ureteric calculi was more i.e. 54 calculi as against renal calculi i.e. 38 calculi; bladder calculi i.e. 07 calculi and urethral calculi i.e. 03 calculi.

Table-3: Relation of age of person with sites of calculi.

S. No.	Age in years	Renal	I. ret eric	Vesical	Urethral	Total
1	0-10	1	1	2	0	4
2	11-20	1	3	1	1	6
3	21-30	12	25	1	1	39
4	31-40	10	17	0	1	28
5	41-50	8	4	1	0	13
6	51-60	3	1	0	0	4
7	61 and above	3	1	2	0	6
Total		38	54	07	3	102

From the above table-3, it is seen that renal and ureteric calculi were more common in age groups from 21-30 years and 31-40 years as against vesical calculi which were more common at two extremes of ages i.e. from 0-20 years and above 61 years.

Table-4: Relation of diet with urinary calculi.

S. No.	Diet	No. of cases	Percentage
1	Vegetarian	16	33.3
2	Mixed	32	66.7
Total		48	100.0

From the above table-4, it is observed that urinary calculi were more common in patients having mixed diet (66.7%) as compared to vegetarian diet (33.33%).

Table - 5 Relation of the source of drinking water with urinary calculi.

S. No.	Source of drinking water	No. of cases	Percentage
1	River	23	47.95
2	Bore well	15	31.25
3	Tap water	10	20.80
Total		48	100.0

From the above table-5, it is observed that urinary calculi were more common in patients consuming river water i.e. 47.90% of patients consuming bore well water i.e. 31.25% cases and tap water i.e. 20% cases.

Table- 6: Relation of occupation with urinary calculi.

S. No.	Occupation	No. of cases	Percentage
1	Sedentary worker	32	66.66
2	Manual labourer	14	29.16
3	School age	02	04.16
Total		48	100.0

From the above table-6, it is seen that urinary calculi were more common in sedentary workers (67%) than manual labourers (29%).

Table 7: Site of Renal calculi.

S.No.	Site	Right	Left	Total
1	Pelvis	21	8	29
2	Calyx	7	2	9
Total		28	10	38

From the above table-7, it is seen that renal calculi were more common on right side i.e. 28 calculi as against 10 calculi on left side. Renal calculi were more commonly situated in pelvis i.e. 29 calculi as against 9 calculi which were placed in calyces.

Table 8: Site of Ureteric Calculi

S. No.	Site	Right	Left	Total
1	Upper ureter	7	5	12
2	Mid ureter	11	5	16
3	Lower ureter	15	11	26
Total		33	21	54

From the above table-8, it is seen that in this study lower ureteric calculi i.e. 26 calculi were more common than upper ureteric calculi i.e. 12 calculi and midureteric calculi i.e. 16 calculi. Right ureteric calculi were more common than left ureteric calculi.

Table 9: Physical findings and their Incidence in calculi of urinary calculi

S. No.	Physical findings	No. of case
1	Tenderness Right Renal Angle	24
2	Tenderness Left Renal Angle	9
3	Tenderness Right Lumbar Region	16
4	Tenderness Left Lumbar Region	7
5	Tenderness Right Iliac Fossa	13
6	Tenderness Left Iliac Fossa	10
7	Tenderness Hypogastrium	2
8	Palpable kidney	1
9	Distended Bladder	2
10	Palpable Stone in Bladder on PR examination	0
11	Palpable Urethral Calculus	2

From the table-9

Tenderness Right Renal Angle was present in 24 cases and left renal angle tenderness in 9 cases. Tenderness Right Lumbar Region was present in 16 cases and left lumbar region tenderness was present in 7 cases. Hypogastric region tenderness was present in only 2 cases out of 7 bladder calculi. The palpable kidney was present in only 1 patient with 3 renal calculi. The distended bladder was present in 2 bladder calculi. Urethral stone was palpable in 2 cases. 2 cases were associated with enlarged prostate. Total 48 patients had multiple calculi so positive findings were present more than one side.

Table-10 Hemoglobin Percentage (Hb %) in cases of urinary calculi.

S. No.	Hb(gm %)	No. of cases	Percentage
1	Less than 9	12	25.00
2	9-12	28	58.33
3	More than 12	8	16.6
Total		48	100.00

The above table-10 shows that majority of the cases i.e. 28 cases had hemoglobin percentage above 9 gm. Hemoglobin percentage was less than 9 gm in 12 cases. Hemoglobin % was more than 12 gm% in 8 cases.

Table-11: Blood urea levels in patients with urinary calculi.

S. No.	Blood Urea Level	No. of patients	Percentage
1	0-40	44	91.66
2	41 And above.	04	08.33
Total		48	100

The above table-11 shows that blood urea levels were raised in 04 cases (8.33%) suggestive of altered renal functions. Serum creatinine was done in selected cases whenever indicated. 3 cases show the deranged creatinine.

Table-12: Urinary analysis in cases of urinary calculi.

sr no.	Findings on Urinary analysis	No. of cases	Percentage
1	Reaction (a) Acidic		91.66
	(b) Neutral	2	4.16
t	(c) Alkaline	2	4.16
2	Albumin	28	58.33
3	RBCs	26	47.91
4	WBCs	22	45.83
5	Bacteria	20	41.66
6	Crystals - Calcium oxalate	18	37.50
	- Triple phosphate	1	2.08
	- Uric acid	2	4.16

From the above table-12, it is seen that urinary pH was acidic in 44 out of 48 cases i.e. 91.66% as against neutral and alkaline pH in 2 and 2 cases i.e. 4.16% and 4.16%, respectively. Urinary infection was present in 22 out of 48 cases i.e. 45.83% cases. Bacteria were present in 20 cases i.e. 41.66% cases. Microscopic Hematuria was present in 26 cases i.e. 47.91% cases. Albumin was present in 28 cases i.e. 58.33% cases. Crystals were detected in urine in 21 cases, out of which 18 were made up of calcium oxalate (37.5%), 1 was made up of triple phosphate (2.08%) and 2 were made up of uric acid (4.16%).

RADIOLOGICAL INVESTIGATIONS

Plain X-Ray KUB was taken in all cases

Table -13: Sites of stones in KUB in cases of urinary calculi.

No.	Site of calculus in KUB	No. of calculi
1	Right kidney and pelvis	27
2	Left kidney and pelvis	10
3	Right ureter	32
4	Left ureter	19
5	Bladder	7
6	Lower urinary tract (urethral)	1
7	No Abnormality detected	6
	Total	102

From the above table-13, it is seen that plain X-Ray KUB could detect 96 urinary calculus out of 102 (i.e. 94.11% calculus identified). Intravenous urography was done in all cases.

Table-14: Intravenous urography findings in cases of urinary calculi.

S. No.	I.V.U. findings	No. of cases
1	Normal IVU	09
2	Hydronephrosis	19
	Hydronephrosis with Hydroureter	15
4	Poorly functioning kidney	03
5	Nonfunctioning kidney	01
6	Hydronephrosis with poor functions	01
7	IVU not done	00
	Total	48

From the above table-14, it is seen that IVU was normal in 09 cases. Hydronephrosis was present in 19 cases. Hydronephrosis and hydroureter were present in 15 cases. The poor functioning kidney was detected in 3 cases. The non-functioning kidney was detected in one case.

Hydronephrosis with poor functions was detected in 1 case. Additional findings in IVU:

Malrotation of the right kidney was detected in 1 case (2.08%). Pelviureteric junction obstruction was detected in 1 case (2.08%).

Ultrasonography was done in 18 cases:-

S.No	1 USG	Diagnosis
1	Multiple vesical calculus	Multiple vesical calculus
2	Rt. Hydroureter with mild hydronephrosis	Rt. Ureteric calculus with Hydroureter with mild hydronephrosis
3	Rt. Hydronephrosis with hydroureter	Rt. Ureteric calculus with hydronephrosis
4	Lt. Hydroureter with left mild hydronephrosis	Lt. Ureteric calculus with hydroureter
5	Lt. Hydroureter with left mild hydronephrosis	Lt. Ureteric calculus with hydroureter
6	Rt. Hydronephrosis	Rt. Ureteric calculus with hydronephrosis
7	Lt. hydronephrosis with hydroureter	Lt. Ureteric calculus with hydronephrosis
8	Rt. Hydronephrosis with hydroureter	Rt. Ureteric calculus with hydronephrosis
9	Rt. Pelvic calculi with left hydroureter	Rt. Renal pelvic calculus with left ureteric calculus
10	Lt. Hydroureter with left mild hydronephrosis	Lt. Ureteric calculus with hydroureter
11	Multiple right renal calculi with hydronephrosis	Rt. Renal Pelvic calculus with right ureteric calculus
12	Lt. Pelvic calculus with hydronephrosis and hydroureter	Lt. renal pelvic calculus with left ureteric calculus with hydronephrosis
13	Multiple right lower ureteric calculi with hydronephrosis	Multiple right lower ureteric calculus
14	Rt. Pelvic calculus with right urethral calculus	Rt. Renal Pelvic calculus with right ureteric calculus
15	Multiple right renal calculi with hydronephrosis	Rt. Multiple renal pelvic calculus
16	Rt. Renal calculus with small kidney and right ureteric calculus	Rt. Renal Pelvic calculus with right ureteric calculus
17	Rt. Renal calculus with small renal cyst on left side	Rt. Renal pelvic calculus
18	Rt. Hydronephrosis with vesical calculus	Rt. Lower ureteric calculus with vesical calculus with right hydronephrosis

Ultrasonography was done in 18 cases of urinary calculi (37.5%). USG was especially useful in the acute stone episode. It was highly sensitive and specific in the diagnosis of UV junction calculi.

TREATMENT

Hydrotherapy

Hydrotherapy was done in 2 cases of ureteric calculi. Both Patients passed calculus in the ward 48-72 hours after starting hydrotherapy.

In 46 cases, procedural treatment was carried out.

Table-15: Operative procedures carried out in cases of renal calculi

s.	Operative Procedure	No. of calculi removed
1.	Nephrectomy	1
3	Nephrolithotomy	5
4	Extended Pyelolithotomy	5
5	Pyelolithotomy	27
Total		38

Nephrectomy was done in 1 case of not- functioning kidney. Nephrolithotomy was done for 5 calculi. Extended pyelolithotomy was done for 5 calculi. Pyelolithotomy was done for 27 calculi.

Table-16: Operative procedures done in cases of ureteric calculi.

S. No	Operative Procedure	No. of Calculi remove
1	Ureterolithotomy	47
2	Internal Meatotomy	01
3	Suprapubic Transvesical Ureterolithotomy	04
4	Hydrotherapy	02
Total		54

The above table-16 shows that internal meatotomy was done for 1 calculus. Ureterolithotomy was done for 47 calculi. Hydrotherapy was given for 2 calculi. The patient passed stone within 3 days of therapy. Suprapubic Transvesical Ureterolithotomy was done for 04 calculi.

Table-17: Operative procedures used in cases of bladder calculi.

S. No.	Operative Procedure	No. of calculi
1	Suprapubic cystolithotomy	07
Total		07

Table- 18: an Operative procedure used in cases of urethral calculi.

S. No.	Operative Procedure	No. of calculi
1	Meatotomy	03
Total		03

Table-19: Complication of surgery in cases of urinary calculi.

S. No.	Complications	No. of cases	Percentage
1.	Wound Infection	4	8.33
2	Urinary leak	1	2.08
3	Secondary Hemorrhage	1	2.08

The table-19 shows that wound infection occurred in 4 cases. All cases were treated with antibiotics, daily dressings and secondary suturing. The urinary leak occurred in 1 case. That case was treated conservatively. The urinary leak stopped with conservative management. One patient had a secondary hemorrhage. The patient was treated conservatively.

Follow-up: Out of 48 cases, 35 cases came for follow-up in Out Patient Department. Thus, follow-up rate was 72.91%.

Table-20: Follow-up of patients with urinary calculi.

S. No.	Follow-up	No. of cases	Percentage
1	Asymptomatic	31	78.12
2	Recurrent UTI	2	4.16
3	Recurrent Calculi	2	4.16
4	No follow up	13	27.08
Total		48	100.00

Recurrent urinary tract infection was observed in 2 cases, which were treated with antibiotics according to urine culture sensitivity report. Recurrent calculi were detected in 2 cases (4.16%). One case was of operated case of multiple (2 calculi in the pelvis) renal calculus and recurrence with ureteric calculus but the cause of recurrence could not be understood. The patient was treated with ureterolithotomy. Remaining 1 case was operated case of bladder calculi with lower ureteric calculus and recurrence with small bladder calculus. That case was treated with hydrotherapy. The patient passed stone after 72 hours and both patients were made stone free.

DISCUSSION

In this study, maximum incidence of urinary calculi was seen in the age group from 21 -40 years. 67 out of 102 calculi (65.68%) were found in this age group. Minimum incidence of calculi was seen in the age group below 10 years. Similar findings were noted in a study conducted by Dennison (1984) in National Centre for health statistics. The stone disease was uncommon in the age group under 15 years. In his series highest incidence of stone, the disease was in the age group of 45- 64 years. Bailey et al (1974), Burkland and Rosenberg (1955). Fetter and Zimskand (1961), Frank et al (1959), Prince and Scardino (1960) have stated that in their study the maximum incidence of urolithiasis was in the age group between 30-50.

In this series, the incidence of urolithiasis in male to female ratio was 7:1. Prince and Scardino (1960) and Blacklock (1969) have quoted preponderance of males over females. In his study, Ryall et al (1985) found the male to female ratio 3:1. According to them, the male preponderance is due to excess daily excretion of calcium, oxalate and uric acid in males as compared to females. Welshman and McGeown (1976) have demonstrated increased urinary citrate concentrations in the urine of females which may be protecting females from calculus disease. Finlayson (1974) has postulated that lower serum testosterone levels may contribute to some of the protection women and children get the stone disease. Malhotra (1963) found in his study male to female ratio as 10: 3. In present series, high preponderance of males over females (7:1) in incidence of stone disease is unexplained and may be due to small group sampling. In present series, only two females had bladder calculi out of total 07 bladder calculi (6.8%). Thompson (1921) has stated that incidence of bladder calculi was only 2% in females. This is due to less frequency of obstruction to lower urinary tract found in female patients. In this study, 92 out of 102 calculi (in 48 patients) were present in upper urinary tract (90.19%) while 10 calculi were present in lower urinary tract (bladder and urethra). This shows that in this series upper urinary tract calculi predominated over lower urinary tract calculi. Anderson (1963) has reported similar findings. King (1971) and Prien (1971) noted the historical trend away from bladder calculi towards upper urinary tract calculi . They have the explanation that industrialization and change in diet have brought the change in the trend of stone disease. But Lonsdale (1968), Suvachittanont et al (1973) have reported a high incidence of bladder stones in Thailand. In this study, ureteric calculi [52.94% (54 out of 102)] predominated over the other sites. Pritam Das (1971) has reported predominance of ureteric calculi in his studies. In the present series ureter and bladder was the commonest site of calculus in children below 10 years of age (3 out of 4 calculi). Van Reen (1981) who has stated that incidence of bladder calculi was still high in children in developing nations, such as. North Africa. Burma, Thailand, and Indonesia because of poor food quality, vitamin deficiency and urinary infection .Srivastava et al (1986) has stated the high incidence of bladder stones in children in Afghanistan. But in his study, he could find no correlation of malnutrition, vitamin deficiency with bladder calculi. In this study of 48 cases, 1 case (2.08%) of bilateral calculi was found. In a series of 350 cases of ureteral calculi, Higgins (1939) noted the presence of bilateral ureteral calculi in 6 patients (L7%). In the series by R. Scott (1975) bilateral ureteric calculi were found in 10 out of 118 cases (8.47%) of ureteric calculi. In present series of 48 cases with 102 calculi, 33 ureteric calculi out of 54 ureteric calculi were found on right side (54.25%) as compare to left side (38.88%) were 21 calculi out of 54 ureteric calculi. Thompson (1925) and Scholl (1936) reported that ureteric calculi were observed with equal frequency on the two sides\ Kretschmer (1942) in a review of 500 cases stated that 45.8% calculi were on right side and 51.8% were on left side. Drach et al (1986), Segura et al (1985) observed slight preponderance of left sided stones (Right 45% and left 55%). In Higgins series (1939) 47% stone were on right side and 53% stones were on left side. There Is no specific reason why in this series calculi were more common on right side. In this study, urinary calculi were more common In sedentary workers {66.67%o (32/48)} Then manual labourers {29.16% (14/48)}. Wickham (1979) reported increased incidence of urolithiasis in patients with sedentary occupation. Sutor et al (1974) stated that incidence of urolithiasis was 10 times greater than amongst professional workers as compared to unskilled workers. Lonsdale (1968) indicated that urinary calculi were much more likely to be found in individuals who have sedentary occupation. Blacklock (1969) reported that incidence of urinary calculi was higher in administrative and sedentary personnel of the Royal Navy than in manual workers. Mates (1969) reported that occupation was most important epidemiological factor. In his study in Czechoslovakia, the lowest incidence of stone disease was found in agricultural and border population and highest incidence was in industrial areas. Scott (1985) has reported similar findings in his studies. In this study,

urinary calculi were environ in patients having mixed diet (32 patients/48 patients {66.67% }) as compared to patients who were vegetarians (16 patients/ 48 patients {33.33% }). Robertson et al (1979) reported that stone disease was common in people who took mixed diet than vegetarians. He suggested in his paper an alternative to high protein mixed diet for a patient who was recurrent stone former was to become vegetarian. Scott (1985) has also reported the same finding. In this study, urinary calculi were more common in patients who were milk consumers (95.83%) (46patients out of 48 patients) than in patients who did not take milk (2 patients out of 48 patients) in the diet (4.16%). Similar results were reported by Holmes in 1971. He reported that stones were more common in patients who had habitual excessive ingestion of milk products in the form of cheese or ice cream . In the present study, highest incidence of urinary calculi was found in patients who had river water as their source of drinking water (47.95%) followed by bore well water (31.25%). The incidence was lowest (20.80%) in patients who were tap water drinkers. Rose and Westbury (1975) have stated that excessive water hardness contributed to stone formation due to high mineral content. In the present series high incidence of stone disease with river water, bore well water consumption may be due hardness and mineral content or deficiency of trace elements, such as, zinc who is inhibitor of calcium crystallization. In this study, one patient (2.08%) with urinary calculi had congenital abnormality in urogenital system (malrotated kidney). Beane (1967) in his study found that 7 out of 23 patients (30.43%) with bladder stones had congenital anomalies. Singh (1971) has reported incidence of congenital malformations of 2.65% in his series. In this study. "Pain" was the commonest presentation of urinary calculi. 75 out of 102 calculi presented with pain (73.52%). Pain was fixed dull aching in cases of renal calculi and was localized to back, lumbar region. Pain was intermittent and colicky in cases of ureteric calculi and radiated to groin. Suprapubic dull aching pain was commonly seen in cases of bladder calculi. Pain in urethra and tip of penis was felt in cases of urethral calculi. According to Herding Rains (1991) pain is present in more than 75% cases of urinary calculi. Drach (1992) has stated that a urinary calculus "announces" its presence with an acute episode of renal or ureteric has further stated that uroliths create symptoms only when they become trapped in some segment of urinary tract. The other important symptoms in descending order of frequency were burning micturation, vomiting, haematuria. Fever with chills, frequency, dribbling, and retention of urine, anuria, graveluria and pyuria. In the upper urinary tract, the common sites are calyx, pelviureteric junction, brim of pelvis and UV junction. In this study, no physical findings were present in three cases (6 calculi have no physical findings). Tenderness was the commonest finding in most of the cases. In cases of renal calculi tenderness was in renal angle and lumbar region. In cases of ureteric calculi tenderness was in lumbar and iliac region. In bladder calculi tenderness was commonly present in hypogastric region. In urethral calculus tenderness was present over urethra at and around site of impaction. Drach (1992) has stated that physical examination is negative in acute stone episode except tenderness and rigidity over the region of calculus. He has further stated that hydronephrotic or pyonephrotic kidney may be palpable. Banerjee (1982) has stated that physical examination is usually entirely negative except for tenderness and rigidity during renal colic. He has further stated that hydronephrotic or pyonephrotic kidney may be palpable. The statement of Banerjee (1982) has been supported by Roshan La! Gupta (1991) and Drach (1992) in this study, kidney was palpable in only 1 case (2.08%). Distended bladder was present in 2 cases (4.16%). Blood urea levels were more; v -V: < 4 cases i.e. (833%) suggesting altered renal functions. Serum creatinine was also to i d to be raised in three (6.25%) cases. Serum calcium and phosphate were estimated only in selected cases to exclude hyperparathyroidism. Serum calcium and phosphates were found to be normal in all these cases. Routine urine analysis was done in all cases. The reaction of urine was acidic in 44 out of 48 cases (91.66%). In recent years a substantial incidence of abnormal renal acidification in stone formation has been reported in study of Cintron Nidall et al (1977) and Beck mann et al (1960). In this study, urinary tract infection was present in 18 cases (37.5%). In the study of Drach G. W. (1992) Som Asit (1990), infection was predominant cause of urinary calculi formation In the series by Boyce Resnick (44 patients) 63.2%) patient had urinary infection. High incidence of urinary infection in females can be attributed to the anatomy of the Genito urinary system in female i.e. short urethra, short distance between urethral, anal & vaginal openings. In this study pus cells were present in urine in 20 cases (41.6%). 58 cases having pyuria was noted by Gaches and Gorden. Albumin was present in 28 out of 48 cases (58.33%). Microscopic examination of urine showed microscopic haematuria in 26 cases (47.91%). In this study, crystals in urine were present as follows: Ca oxalate - 18 Cases (37.5%) Triple phosphate - 1 Cases (2.08%) Uric acid - 2 Cases (4.16%).

In the study of chemical composition of urinary calculi by Balkrishna Rao (1964), Anderson(1963) and Pritam Das (1971), they found calcium and oxalate were the main compositions of stones. In selected cases, whenever indicated urine culture was done. In all the patient's plain x-ray abdomen for KUB region was taken after good bowel preparation; as the commonest error in missing calculi may be due to their concealment by bowel shadowing or bone or their being confused with other opacities (Kelsy Fry and Cattle, 1979). In this study in each case, plain X-Ray KUB was done. 96 urinary calculi were detected. In rest 6 calculi (5.88%) could not be detected. This was due to radiolucent calculi or poor bowel preparation. The confirmation of calculi in these cases was done by Ultrasonography or intravenous urography. According to Sutton (1992), 6% of urinary calculi are radiolucent which include cystine and xanthine calculi. Intravenous urography was done in all cases. 09 cases had normal intravenous urography. Hydronephrosis was abnormal finding in 19 cases (39.58%). Other abnormal findings were hydroureter. Poor functioning kidney and non-functioning kidney. IVU study helped, to confirm the KUB findings, helped in the assessment of functional status of the affected kidney as well as the opposite kidney (Sutton. 1992) and excluded the presence of radio lucent calculi. In this observation, 19 patients (39.15%) were present with evidence of hydronephrosis alone and ISpatients (69:78%) were present with hydronephrosis with hydroureter. Frank and Water (1973) found 85% of hydronephrosis in his study of 175 cases. Ultrasonography was done in 18 cases of urinary calculi (37.5%). USG was especially useful in the acute stone episode. It was highly sensitive and specific in the diagnosis of UV junction calculi. Ultrasonography played a vital role in cases of calculus anuria where after confirmation of diagnosis by ultrasonography, ultrasound-guided emergency nephrostomy was done. In addition to the diagnosis of calculus, renal parenchymal lesions, associated congenital anomalies in urinary tract could be detected with ultrasonography. Pollack. Anger, Goldferns, and Mulhollands (1978) said that radiolucent calculi can be demonstrated by ultrasound as well as radio-opaque calculi. They can be differentiated from other causes of filling defects within renal pelvis by the dense echoes produced by the acoustic shadow they cast. Ultrasonography in all the cases confirmed the diagnosis of renal stones, Presence of hydronephrosis or

hydrourerter.

In this hospital, there are no facilities of ESWL or PCNL. Thus, treatment of renal calculi was restricted to open surgery. 5 calculi were removed by nephrolithotomy. 27 calculi were removed by pyelolithotomy. 5 calculi were removed by extended pyelolithotomy. Nephrectomy was done in 1 case of non-functioning kidneys. Harding Rains (1991) and M.J. Smith (1987) have described similar procedures.

Treatment of Ureteric Calculi:

Treatment of ureteric calculi can be done with several methods:

- Hydrotherapy or forced diuresis.
- Ureteric catheterisation.
- Dormia basket.
- Ureteric meatotomy.
- Ureterorenoscopy.
- Push bag technique.
- ESWL.
- Ureterolithotomy - open surgery.

Hydrotherapy is a medical line of treatment effective for small calculi (up to 10 mm in size {Harding Rains et al - 1991}) in ureters. A small stone arrested in any part of ureter often passes after ureteric catheterization. Dormia basket extraction is one of the useful methods of extraction of lower ureteric calculi. Ureteric meatotomy is done by cutting the ureteric orifice in upward and lateral direction with diathermy electrode under vision. It is successful in calculi impacted at U-V junction. Ureterorenoscopy has an important place in armamentarium of a urologist. In ureterorenoscopy after dilatation of ureteric orifice, urethroscope is passed in ureter and calculi are crushed with forceps or fragmented with ultrasound or laser waves. Marberger (1986) has treated 192 ureteric calculi with endoscopic procedures with success rate of 84%.

R. Kinder (1987) treated 134 patients of ureteric calculi out of which 100 calculi passed spontaneously on conservative management while only 34 patients required operative procedures.

The details of the operative procedure are as follows:

	Kinder series (1987)	Present series
Ureterolithotomy	13 (38.3%)	47(91.66%)
Dormia Extraction	5 (17.6%)	-
Ureteric Meatotomy	10 (29.4%)	01(2.08%)
Ureterorenoscopy	3 (8.82%)	-
Pyelolithotomy	2 (5.8%)	

2 patients were treated with hydrotherapy in present series. 4 patients were treated with Suprapubic Transvesical Ureterolithotomy,

the push bang technique, the stone is pushed back into renal pelvis with a ureteric catheter, thus relieving the obstruction. The stone can be removed with ESWL or PCNL subsequently (Marberger, 1986). ESWL in situ is a technique in which ESWL is used to treat ureteric calculi without mobilization. Holden and Rao (1989) had 88% success rate with in situ treatment of ureteral stones. Barr et al (1990) showed a success rate of 98%. The facilities for ESWL, ureterorenoscopy, Dormia basketing, are not available in this hospital. Thus, patients with ureteric calculi were treated with ureterolithotomy, internal ureteric meatotomy, suprapubic transvesical ureterolithotomy and hydrotherapy. Similar methods have been described by Harding Rains (1991)

Treatment of Bladder Calculi

According to Strem (1987), the standard treatment options for bladder calculi include chemo dissolution, transurethral extraction with or without mechanical, electrohydraulic or ultrasonic fragmentation and open vesicolithotomy.

Though chemo dissolution sounds an attractive method, but long period required for treatment makes it impracticable. Ultrasound lithotrite has become a popular method for treating vesical calculi. Open cystolithotomy may still be safest most efficient treatment. Facilities of ultrasound lithotripsy and endoscopic neurosurgery are not available in this hospital. Thus, patients with vesical calculi were treated with suprapubic cystolithotomy.

Treatment of Urethral Calculi

Urethral calculi can be treated by:

Endoscopic extraction

- Open urethrolithotomy
- Meatotomy

In the present series, all 3 patients were treated with meatotomy.

Sharfi (1991) has suggested nonoperative treatment of urethral stones by intraurethral instillation of 2% Lidocaine jelly followed by the spontaneous expulsion of calculus. All cases of renal calculi were treated by open surgery. Recurrent calculi were detected in 2 cases (4.16%). One case was of operated case of multiple (2 calculi in the pelvis) renal calculus and recurrence with ureteric calculus but the cause of recurrence could not be understood. The patient was treated with ureterolithotomy. Remaining 1 case was operated case of bladder calculi with lower ureteric calculus and recurrence with small bladder calculus. That case was treated with hydrotherapy. The patient passed stone after 72 hours. Thus, all the 2 patients were made stone free. In the study of 130 cases of urolithiasis, John P. Maddern found 12% recurrence. Smith (1974) did a valuable research on recurrent calculi and stated that stone analysis was extremely important in planning therapy for patients who developed new calculi within the year following first episode. Complications were seen in 6 cases (12.5%). Wound infection was observed in 4 cases, the urinary leak was seen in 1 patient. Hemorrhage was noted in one case. All cases were treated conservatively. In the study of 316 cases of urolithiasis, Benjamin Barzilay et al found 30% complication". As there are no facilities for ESWL, endoscopic urology and PCNL, open surgical treatment was the treatment of choice in most of the cases.

SUMMARY AND CONCLUSIONS

Despite limited resources and lack of recent techniques of ESWL, PCNL, and Endourology multiple Urolithiasis can be managed at rural setups.

- In the present study, 48 cases of multiple urinary calculi were studied over the period of two years (2008-2010). In this study, urinary calculi were most common in the age group from 21 -40 years (67 out of 102 calculi). The youngest patient was 5 years old. The eldest patient was 70 years old.
- Males were more commonly affected than females (M: F ratio was 7:1).
- Upper urinary tract calculi were more common in the age groups from 21 to 40 years.
- Bladder calculi were common at both extremes of ages i.e. in the age group of 0- 20 years (2 cases) and above 61 years (2 cases).
- The urinary calculi were found to be more common in sedentary workers (66.66%) than manual labourers (29.16%).
- The incidence of urinary calculi was high in patients who had mixed diet (66.7%) as compared to vegetarians (33.3%).
- The incidence of urolithiasis was found more in patients who consumed river water (47.95%) as compared to bore well water (31.25%) and tap water (20.8%).
- Most of the patients with urinary calculi were milk consumers (95.83%).
- Urinary tract infection was associated with stone disease in 18 cases out of 48 cases (37%).
- In this series, 48 patients had urinary calculi at 102 sites, out of which 38 calculi were in the kidneys. 54 calculi were in the ureters, 07 calculi were in the bladder and 03 calculi were detected in the urethra. Urinary calculi were found to be more common on the right side than the left side. In cases of renal calculi, 29 calculi were detected in renal pelvis while 9 calculi were detected in calyces.
- Ureteric calculi were commonest in the lower ureter (26 calculi) followed by mid- ureter (16 calculi) and upper ureter (12 calculi).
- Pain was the commonest symptom and was presented by 75 calculi out of 102 calculi. Other associated symptoms were burning micturition, vomiting, haematuria, fever with chills, retention of urine and frequency.
- Abdominal tenderness was the commonest clinical finding in those patients when presented with pain. The site of abdominal tenderness varied according to site of urinary calculi.
- Palpable kidney was present in 1 case, while distended bladder was present in 2 cases.
- In cases of urethral calculus, stone was palpable in urethra in 2 cases out of 3 cases.
- Blood urea was raised in 4 cases.
- Urine analysis showed acidic reaction in 44 cases.
- Albumin was detected in urine in 28 cases.
- Microscopic haematuria was present in 26 cases, while WBCs in urine were detected in 22 cases.
- Calcium oxalate was the commonest crystal detected in urine (18 cases).
- Other crystals detected were uric acid and triple phosphate.

Plain X-Ray KUB was done in all cases. It could detect 96 stones out of 102 stones. 6 stones could not detect.

Intravenous urography was performed in all cases. 9 cases had normal intravenous urogram.

Hydronephrosis was detected in 19 cases.

- « Other radiological findings were hydronephrosis, poorly functioning kidney and nonfunctioning kidney.
- « Ultrasonography was performed in 18 cases and was especially helpful in diagnosis of U-V junction and P-U junction calculi.
- « All cases of renal calculi were treated by open surgery and hydrotherapy.
- « 27 calculi were removed by pyelolithotomy.

Other surgeries done were nephrolithotomy (5 calculi were removed) and extended pyelolithotomy (5 calculi were removed).

- 1 patient had renal pelvic calculi with non-functioning kidney and had to undergo nephrectomy.
- Ureteric calculi were treated with ureterolithotomy (47 calculi were removed). Internal meatotomy (1 calculus was

removed) and suprapubic transvesical ureterolithotomy (4 calculi were removed).

- 2 calculi were removed by hydrotherapy.
 - Patients with bladder calculi were treated with suprapubic cystolithotomy (7 calculi).
 - Patients with urethral calculi were treated by meatotomy (3 calculi).
 - In this way, all patients were made stone free.
- « Complications of surgery included wound infection (4 cases), urinary leak (1 case) and secondary hemorrhage (1 case).
- All patients recovered with conservative management.
- 31 cases were asymptomatic, 2 patients had recurrent urinary tract infection and were treated with antibiotics according to urine culture sensitivity report.

2 cases had recurrent calculi.

Recurrent urinary tract infection was observed in 2 cases, which were treated with antibiotics according to urine culture sensitivity report.

- Recurrent calculi were detected in 2 cases (4.16%). One case was of operated case of multiple (2 calculi in pelvis) renal calculus and recurrence with ureteric calculus but cause of recurrence could not be understood. Patient was treated with ureterolithotomy. Remaining 1 case was of operated case of bladder calculi with lower ureteric calculus and recurrence with small bladder calculus. That case was treated with hydrotherapy. Patient passed stone after 72 hours.
- Thus, all 48 cases (102 calculi) of urinary calculi were treated medically or surgically and were made stone free.