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RESEARCH ARTICLE

CLINICAL SPECTRUM AND MANAGEMENT STRATEGIES FOR URETERIC CALCULI IN A RURAL TERTIARY HEALTHCARE SETUP

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Abstract

Introduction: Ureteric calculi are a common and potentially serious urological condition, particularly in patients aged 20–50 years. This study aimed to evaluate clinical presentation, diagnostic modalities, management strategies, and outcomes in patients with ureteric stones at a rural tertiary care center.

Materials & Methods: In this prospective observational study, 120 patients diagnosed with ureteric calculi were evaluated. Data collected included demographics, stone size and location, clinical features (e.g., hydronephrosis, fever, hematuria), renal function tests, microbiological findings, imaging modalities used (USG vs. CT), and treatment modalities (medical management, ureteroscopy, PCNL, open surgery, nephrectomy). Complications were classified according to Clavien–Dindo.

Results: The mean age ranged with peak incidence in 21–49 years (60%). The most common stone sizes were 9 mm (21%), 10 mm (16%), and 11 mm (14%). Hydronephrosis occurred in 86%; fever in 66%; hematuria in 70%; and positive urine cultures in 15%—E. coli being the predominant pathogen (63%). Management included medical treatment in 32 patients, ureteroscopy in 30, push-back PCNL in 14, open surgery in 24,and nephrectomy in12.Post-treatment complications occurred in 22%, predominantly Clavien grade I. Hospital stay averaged 3–5 days for endoscopic procedures versus 7–10 days for open surgeries.

Conclusion: Ureteric calculi most commonly occur in younger to middle-aged adults and present with hydronephrosis and hematuria. Stone size and location influenced management strategy: smaller stones often resolved with conservative treatment, while larger or complex stones required invasive interventions. Minimally invasive techniques demonstrated favorable outcomes with shorter hospital stays and low morbidity. Ultrasonography remains a diagnostic tool in resource-constrained settings.

Introduction:-

One of the best historical anecdotes about ureteral calculi describes renal colic, which is one of the most painful

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sensations known. Ambroise Paré is credited with being the first to describe a ureteral calculus in 1564, when he described "the cruel pain [that] tormented the patient in that place where the stone lodged." [1]

Urinary tract stones have been known since 4800BC, the medical books of Asutu, written between 3200 and 1200 BC in Mesopotamia, include the oldest literary references to stone illness, describing symptoms and suggesting cures to dissolve the stone. Greek and Hindu literature provide the first accounts of "cutting for the stone." In his book Sushruta Samhita, an ancient Indian physician named Sushruta (about 600 BC) recounts approximately 300 surgical operations, including the perineal lithotomy and the One of the most ancient procedure for Calculi removal is lithotomy.[2]This is study of Hundred patient with Ureteric Stones and their treatment modalities used over a two-year period from 2020 to 2022, with a focus on clinical epidemiology and treatment.

Methods:-

A total of 100 individuals with ureter calculus illness were examined between October 2020 and 2022 as part of the trial. All of the patients were given a thorough clinico-epidemiological examination. In all patients, a complete hemogram, urine analysis, urine culture, and serum biochemistry, including urea and creatinine, were done.

INCLUSION CRITERIA

Patients With Ureteric Calculi Between Age Group 15-80 Admitting to Pravara Rural Hospital, Loni.
Patients Who give Informed Written Consent.

EXCLUSION CRITERIA

1. Patients Below the Age Group Of 15 Yrs.
2. Ureteric Calculi Patients Treated as Out Patients.
3. Patients With Calculus Involving Other Than Ureter .
4. Incidentally Detected Ureteric Calculi.
5. Ureteric Calculi Associated With Other Anomalies Like Neurogenic Bladder, Stricture Urethra

Study Design:-

This is an observational descriptive longitudinal study conducted in our institution Dr BalasahebVikhe Patil Rural Medical College, PMT-PIMS (DU) Loni Hospital during the period October 2020 to October 2022.
Depending on the clinical circumstances, radiological studies included plain x-ray, CT abdomen and pelvis, KUB, IVU series, Retrograde urethrogram, Voiding Cystourethrogram, and Retrograde ureterogram.

All patients with ureteric calculus had an ultrasonogram, which was repeated following therapeutic endoscopic operations.Cystoscopic stent removal was performed on patients who had ureteroscopy or open surgery. Patients were adviced for follow-up appointments one month and six months after their treatment procedures. During the follow-up period, an ultrasonogram of KUB was performed and treated as needed.

Results:-

A total of 120 cases of ureteric calculi were included in our study. The most common size observed is 9mm, accounting for 21% of the total, followed by 10mm and 11mm stones at 16% and 14%, respectively. Smaller stones, such as those measuring 4mm, 5mm, and 6mm, make up a combined 22% of the sample. Stones larger than 13mm constitute 7%, while the least frequent size is 13mm, with only 1%. Distribution of Patients according to age was give in Table 1. Clinical presentation was given in figure 1 and Frequency of patients with their stone size given in figure 2

Serial No	Age Group	Patients (Number & Percentage)
1	11–20	24 (24%)
2	21–30	27 (27%)
3	31–40	33 (33%)
4	41–50	17 (17%)
5	51–60	13 (13%)
6	61–70	5 (5%)
7	>70	1 (1%)
	Total	120 (100%)

Distribution of study cases according to age

Hydronephrosis was observed in 86% of patients, indicating a high incidence of urinary tract obstruction or backpressure. Fever was reported in 66% of patients, suggesting a frequent association with infection or inflammation. Gross hematuria and microscopic hematuriawere present in 45% and 25% of cases, respectively, reflecting varying degrees of blood in the urine. A positive urine culture was found in 15% of patients, showing that while infection was common, it was not always confirmed microbiologically. (Figure 1)

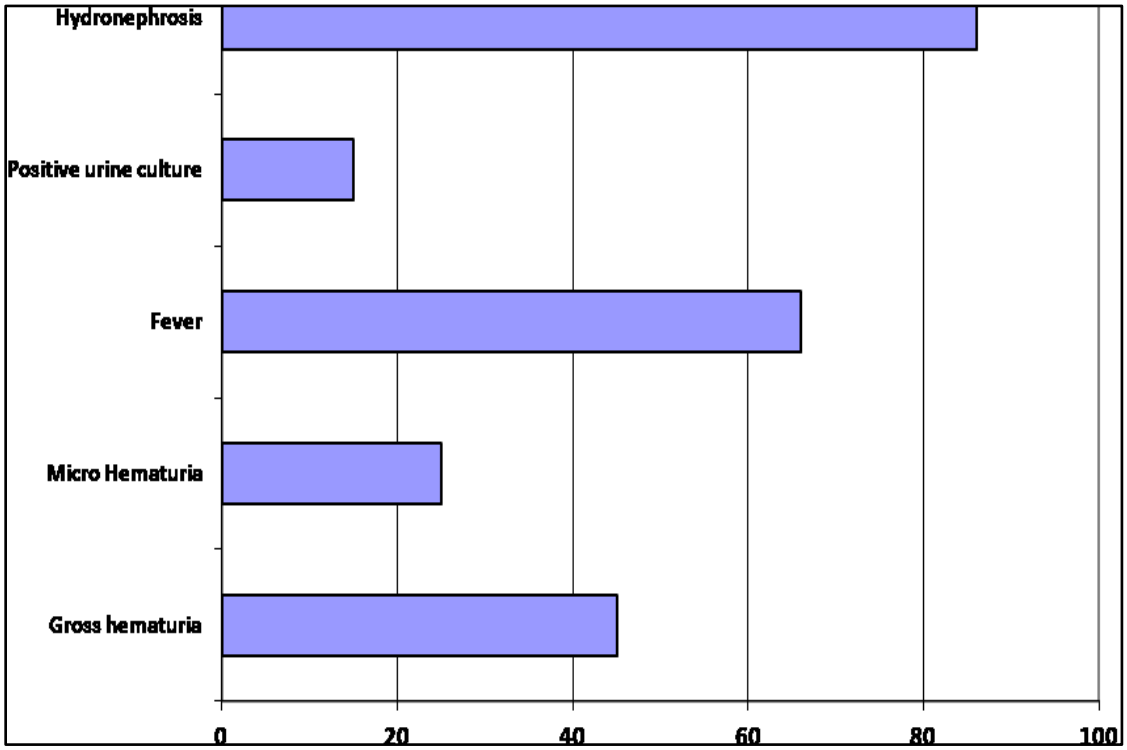

Figure 1:Clinical presentation

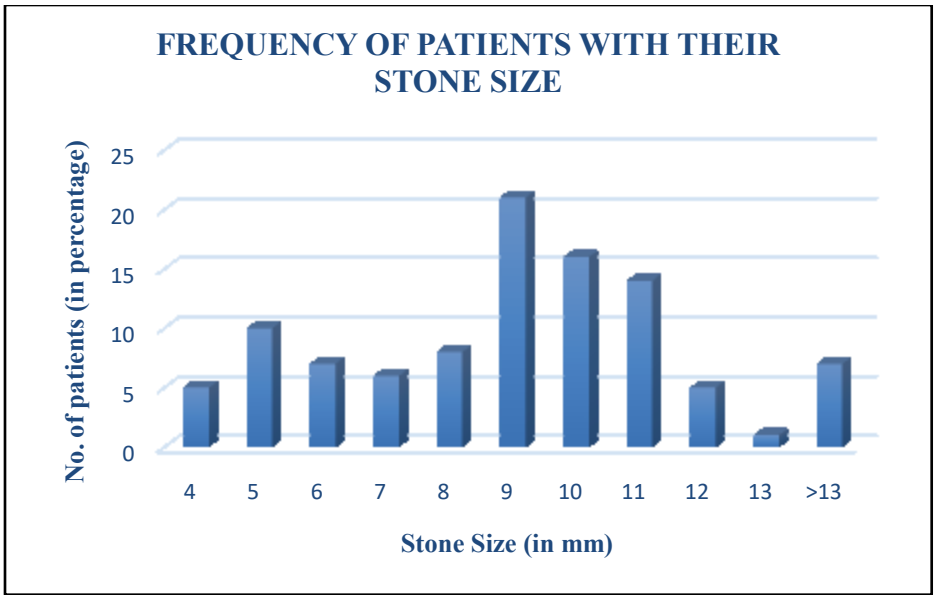

Figure 2: Frequency of patients with their stone size

Medical management

A total of 32 patients received medical management. The lower ureter had the highest number of cases, accounting for the majority with stones ranging from 4mm to 8mm, particularly 5mm (7 patients) and 6mm (5 patients).

In the middle ureter, stones of similar sizes were managed conservatively, with 5mm being the most common (2 patients). The upper ureter also had a few cases, notably 7mm stones (2 patients). Stones larger than 8mm were not managed medically, reflecting that medical management was primarily reserved for smaller stones (≤8mm).

Ureteroscopic management

The data on ureteroscopic management shows that a total of 30 patients underwent this minimally invasive procedure for ureteric stones of varying sizes and locations. Most stones treated ureteroscopically were in the size range of 8mm to 11mm. In the lower ureter, stones measuring 9mm and 10mm were the most frequently managed, accounting for 4 patients each, followed by 3 patients with 11mm stones. The middle ureter had fewer cases, with stones primarily sized 8mm, 9mm, and 12mm. The upper ureter showed a higher number of cases, especially for stones sized 9mm (6 patients), 10mm (3 patients), and 11mm (3 patients). Smaller stones (below 8mm) were rarely treated with ureteroscopy, likely due to preference for medical management or spontaneous passage.

Push Back Percutaneous Nephrolithotomy (PCNL)

Push Back Percutaneous Nephrolithotomy (PCNL) was performed in a total of 14 patients, primarily for larger stones located in the middle and upper ureter. No patients with stones in the lower ureter underwent this procedure, indicating that PCNL was reserved for more complex cases. In the middle ureter, stones sized 9mm and 10mm were treated, with 2 and 1 patients respectively. The upper ureter had the majority of cases, involving stones ranging from 9mm to greater than 13mm. Specifically, stones sized 10mm (3 patients), 11mm (2 patients), and larger stones above 13mm (3 patients) were managed with PCNL.

Uretero Lithotomy

The middle ureter had the highest number of patients treated with uretero lithotomy, especially with stones sized 9mm (2 patients), 10mm (2 patients), and 11mm (1 patient). The upper ureter had fewer cases, with stones sized 9mm, 10mm, and 11mm managed in single patients each.

Nephrectomy for Non-Functional Kidney

The majority of these cases involved stones located in the middle ureter, accounting for 7 patients, with stone sizes ranging mainly from 9mm to greater than 13mm. Specifically, stones sized 11mm and greater than 13mm

were common reasons for nephrectomy in this group. The lower ureter had 2 cases, including one patient with an 11mm stone and another with a stone larger than 13mm. The upper ureter accounted for 3 patients, with stones sized 11mm, 12mm, and above 13mm.

Table 2 :Positive urineculture micro organisms

Organism	No.	%
E.COLI	8	63
KLEBSIELLA	4	17
PROTEUS	2	13
PSEUDOMONAS	1	7
TOTAL	15	100

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TABLE 3: COMPLICATIONS ACCORDING TO CLAVIEN-DINDO CLASSIFICATION

OPERATIVE PROCEDURE	COMPLICATION ACCORDING TO GRADE AS PER CLAVIEN DINDO AND NUMBER OF CASES					Percentage
	GRADE I	GRADE II	GRADE III	GRADE IV	GRADE V	
URETEROSCOPIC LITHOTRIPSY	2	-	-	-	-	2%
PUSH BACK PERCUTANEOUS NEPHROLITHTRIPSY	3	4	-	-	-	7%
OPEN AND LAPROSCOPIC URETEROLITHOTOMY	4	3	2	-	-	9%
NEPHRECTOMY FOR NON-FUNCTIONAL KIDNEY SECONDARY TO URETERIC CALCULI	1	1	2	-	-	4%

Discussion:-

A total of 100 patients were enrolled in this study. The highest incidence of ureteric calculi was observed in the age group of 21 to 49 years, accounting for 60 percent of cases. This aligns with findings from various investigators who report the peak incidence of urinary calculi between 20 and 50 years of age.[3,4] However, Romero and colleagues[5] noted a slightly higher peak incidence of 40 to 49 years in countries like Japan and the United States. The most common symptom reported was colicky abdominal pain, experienced by 98% of patients. Additionally, 70% of patients presented with either microscopic or macroscopic hematuria, and 64% had associated fever.

The majority of the ureteric stones in these individuals ranged in size from 9 mm to 1.2 cm. The most typical size of the calculi found, according to Prstojevic et al.[6], was 5 mm. This comparatively high prevalence of bigger stones may be the result of people delaying seeking medical care after experiencing discomfort. However, Ahmed et alstudy[7] .'s found that the average stone size was 5.7 mm. T

Hydronephrosis was seen in 86% of the patients. Only 5 of these individuals exhibited palpable bulk. 15% of people developed positive urine cultures, with E. coli being the primary culprit and being susceptible to third-generation cephalosporins such cefotaxime. Proteus, Klebsiella, and Pseudomonas are among the remaining microbes. Remaining organisms includes Proteus, Klebsiellaand Pseudomonas.
The findings are similar to the study by Golechha and Solanki[8] where in E-coli formed the major organism followed by Pseudomonas. Holmgren[9] had observed proteus to be the most common organism occurring in 7% of the cases.

Renal function tests, including blood urea and serum creatinine, were performed for all patients. Among them, 15 patients showed elevated renal parameters, and 4 patients developed renal failure associated with urosepsis, necessitating dialysis and emergency surgical intervention. A plain X-ray of the abdomen and pelvis is the simplest imaging test available; however, it has limitations in detecting radiolucent stones such as uric acid and cystine stones. Additionally, the presence of stool in the colon can obscure smaller stones in the ureter. At our rural institution, the preferred diagnostic tool for acute stone detection is ultrasonography (USG) of the abdomen, as it effectively identifies the stone's location, size, and any associated hydronephrosis. Although computed tomography (CT) is often considered the gold standard, its use is limited here due to affordability constraints for most patients.

Medical management was used to treat 32 in-patients (32%). After varying periods of one to seven days of observation, three stones passed on their own. 15 of them had stones that were 5 mm or smaller. A later scan revealed that the symptoms had improved and that the stones and hydronephrosis had vanished. Thirty of the patients who had retrograde ureteroscopy had their stones successfully removed. The size and placement of the stones influence the choice of ureteroscopy. With the widespread use of ureteroscopes, endoscopy was used to try to remove all ureteric stones. Push back percutaneous nephrolithotomy was performed on 14% of patients. A total of 24 patients (24%) wereunderwent opensurgical managementin theform ofureterolithotomy and pyelolithotomy. Post operative periods were uneventful.

Among the medically managed 32 patients ,lower uretericcalculi werefound in 20 patients. Upper ureteric calculiwere foundin 6 patients. Middle uretericcalculi werefound in6 patients.
The maximumsize ofthe stonethat wasremoved by Push Back PCNL and open surgery was 16mm and 27mm respectively inour study.

Twelve patients had nephrectomy for non-functional kidney caused by obstructive long-term ureteric calculi; DTPA was performed on these patients, and function was found to be less than 15%; as a result, a straightforward nephrectomy was performed, and the stone was removed. In 10 out of 12 patients with calculi larger than 1 cm in size, obstructive uropathy was being caused by abnormal renal function tests.All patients stayed foran averageperiod of 7 to 10days in case of open surgery as comparedto 3to 5 days after endoscopicstone removal.

Few patientswere dischargedthe nextday of endoscopy. No one reported painafter endoscopy. Morbidity related to endoscopic procedure wasminimal hencethis shouldbe thefirst lineof managementeven inpatients withupper ureteric calculi.

All patients who underwent open surgery were monitored for one month following the procedure and then again after six months. They went through a KUB follow-up ultrasonogram. There were only 2 individuals with non-obstructive renal calculi, and they were both treated conservatively. After 15 days, the ureteric stents were removed via cystoscopy. Post-operative complications occurred in 22% of all patients, with Grade I complications, according to Clavien Dindo classification, being the most frequent.

Conclusion:-

Ureteric calculi predominantly affect individuals aged 21–49 years, with a slight male predominance. The majority of stones are located above the pelvic brim and range from 9 to 12 mm in size. E. coli is the most common pathogen identified in urine cultures. Ultrasonography remains the primary diagnostic modality. Management strategies are tailored based on stone size, location, and patient factors, with a focus on minimally invasive techniques. Postoperative complications are relatively low, and the overall prognosis is favorable.

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