

## CLINICAL STUDY OF UNILATERAL HYDRONEPHROSIS AND ITS MANAGEMENT

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### Abstract

**Background:** Hydronephrosis refers to aseptic dilatation of urinary tract. Unilateral hydronephrosis occurs when the obstruction is above the level of bladder. The objective is to find the commonest cause of unilateral HN in adults and management. **Materials and Methods:** Between March 2021 to September 2022, 50 patients of age >18 years with unilateral hydronephrosis on USG abdomen & pelvis who came as outpatients or admitted to surgery ward in Al Ameen Medical College and Hospital were included. The patients <18 years, pregnant patients, patients with bilateral HN and patients with renal transplantation were not included. **Result:** 74% of the patients had ureteric calculi, 16% of the cases had renal calculus and 10% of the cases had PUJ obstruction. All presented with pain abdomen, burning micturition (70%), vomiting (60%), hematuria (36%), fever (28%) and mass (8%). USG abdomen and pelvis was the primary modality of diagnosis. Plain X ray KUB was able to demonstrate calculi in 32 (64%) cases. In this study 41 cases were managed surgically and 9 cases with conservative treatment. Surgeries such as URSL & PCNL were done in 56% & 15% cases respectively. In cases of PUJ obstruction Anderson Hynes dismembered pyeloplasty was done, which constituted 12% of cases. Ureterolithotomy was done in 17% of cases. **Conclusion:** Ureteric calculi are the common causes for hydronephrosis. Highest incidence of hydronephrosis is seen in the 3<sup>rd</sup> decade. Males are more commonly affected than females. USG abdomen is the diagnostic modality of choice in majority of cases of hydronephrosis. Surgery is the most common treatment modality.

## INTRODUCTION

The word hydronephrosis is derived from the greek words hydor which means "water", nephros which means "kidney" and osis, which means "condition" is generally understood to mean dilatation of the renal pelvis and calyces as a result of intermittent and incomplete obstruction to the flow of urine. The term "hydronephrosis" should only be used to describe the presence of pelvis and calyceal dilatation, not to identify the underlying cause of that dilatation.<sup>[1]</sup>

Obstructive uropathy refers to the structural or functional changes in the urinary tract that impede normal urine flow. Obstructive nephropathy refers to the renal disease caused by impaired flow of urine or tubular fluid. Hydronephrosis refers to the aseptic dilatation of the urinary tract.<sup>[2]</sup> Proximal to the site

of obstruction dilation occurs. The term hydronephrosis is used to describe this dilatation.<sup>[1]</sup>

Depending on the site of obstruction, the hydronephrosis may be unilateral or bilateral. A unilateral hydronephrosis occurs when the obstruction is above the level of the bladder.<sup>[3]</sup> Causes could be found outside the ureter, in the wall of the ureter or lumen of the ureter. Ureteral obstruction with subsequent hydronephrosis is a common clinical occurrence.

With the introduction of infection, multiple stones may form, rapidly impair the renal function and renal parenchyma is destroyed.<sup>[4]</sup> The hallmark of partial or complete upper urinary tract obstruction is hydroureteronephrosis (HUN), with the ureteral dilatation extending to the level of the obstruction. HUN may be seen on CT imaging or ultrasound and it may range from very mild to severe with

associated parenchymal thinning in chronic cases.<sup>[5]</sup>The physiochemical basis for the crystallisation of stone salts in urine is well understood today. It is now possible to diagnose the cause of stone disease in more than 95% of patients with a variety of treatment programs, stones formation can be halted or retarded in most patients with recurrent calculi. The development of percutaneous lithotripsy and extracorporeal shock wave lithotripsy (ESWL) has led to a most remarkable and amazing accomplishment. Today, most stones can be removed carefully, with less morbidity and frequently without surgery.<sup>[6]</sup> Ultrasound imaging is a non-invasive, non-expensive, widely available imaging modality. It can achieve accurate diagnosis in most cases but it is not very effective to determine the cause of obstruction. With the introduction of ESWL, PCNL, URSL the management has become easy and have rendered open surgery virtually obsolete. A significant number of patients with hydronephrosis, majority due to urolithiasis came to the surgery and urology OPD of Al-Ameen Medical College and Hospital, Vijayapura during our study period. We have managed to treat the patients with both medical and surgical methods.

## MATERIALS AND METHODS

This Prospective study was conducted in the Department of General surgery, Al Ameen Medical College and Hospital, Vijayapura. After obtaining informed consent, 50 patients attending to Surgery/Urology OPD and/or getting admitted in the surgical /urology ward with diagnosis of unilateral hydronephrosis on USG abdomen and pelvis/ CT abdomen in Al-Ameen Medical College, Vijayapura during a period from March 2021 to September 2022 were included in this study.

### Inclusion Criteria

1. Patients willing to give informed consent
2. Patients above 18 years of age diagnosed as unilateral hydronephrosis on USG abdomen and pelvis and/or CT abdomen.

### Exclusion Criteria

1. All patients below 18 years
2. Patients not giving consent for study
3. Pregnant patients
4. Patients with renal transplantation
5. Patients with bilateral hydronephrosis

Methods: 50 subjects were selected and included in this study based on inclusion and exclusion criteria. A detailed history was taken, a thorough clinical examination and preliminary investigations were done and details entered in a structured proforma. The data collected was transferred into a master chart which was subjected to statistical analysis.

### Tests Done are

- a. Complete blood counts.
- b. Urine routine and microscopy
- c. Urine culture and sensitivity

- d. Renal function test
- e. USG abdomen and pelvis
- f. X ray KUB
- g. CT abdomen plain

The patients were selected after they are diagnosed as having unilateral hydronephrosis after careful history taking, thorough general and per abdominal examination and appropriate specific investigations. Patients with unilateral hydronephrosis related with PUJ obstruction, ureteric calculus and renal stones are included in this study. Patients with bilateral hydronephrosis, pregnant patients, renal transplant patients were not included in this study. Patients were subjected to methodical physical examination to assess his or her general condition and to know the basic vital data on admission. Local examination of abdomen was done in a methodical way and relevant findings were recorded. Per rectal examination was done in all patients while per vaginal examination was done in females. Systemic examination like respiratory system, central nervous system and cardio vascular system were done routinely. All clinical findings were recorded in the proforma case sheets.

All relevant and routine investigations were done in these cases to establish diagnosis. Ethical clearance has been obtained from the institution for the same. Depending on the severity of symptoms and findings on ultrasound, moderate to severe grade (III and IV) were considered for surgical treatment.

The patients with unilateral hydronephrosis with stone size less than 7mm were subjected to trial of conservative management and in whom medical treatment failed were considered for surgical line of treatment.

Preoperatively all patients received supportive treatment aimed at correction of dehydration, vitamin and other nutritional deficiencies. Respiratory and other infections were treated with appropriate antibiotics. Physician fitness was taken before surgery.

Postoperative follow up was meticulously done, intake and output charts and vital charts were maintained. Patients were given postoperative antibiotics, analgesics.

Most of the operated patients had uneventful recovery. Drains and catheters were removed between 3rd and 5th postoperative days. Patients were advised to come for follow up on OPD days after a fortnight and for patients with stents in situ for regular follow up.

### Statistical Analysis

Data collected from the study participants were entered in Microsoft Excel-2010 and were analysed by using SPSS version 22. Descriptive analysis was done. Qualitative data was presented as bar graphs and frequency distribution tables. Also categorical variables were expressed in frequency and proportions, continuous variables were expressed in mean and standard deviations.

## RESULTS

In this study around 74% of the cases were related to stones in the ureters. Around 16% of the cases had renal calculus and 10% of the cases had pelvic-ureteric junction obstruction.

In the present study 38% of the study participants belonging to 18-30 years age group, had ureteric calculus as a cause of hydronephrosis. Most of the patients affected are in 3rd decade accounting 20 cases (40%).

**Table 1: showing proportion of various etiological conditions (N=50)**

Diagnosis	No. of Cases	Percentage
Ureteric calculus	37	74
Renal calculus	8	16
PUJ Obstruction	5	10
Total	50	100

**Table 2: Showing age distribution of hydronephrosis patients (N=50)**

Age in years	Diagnosis		
	Ureteric calculus	Renal calculus	PUJ Obstruction
18 - 30	19	2	2
31 - 40	8	4	2
41 - 50	6	1	1
51 - 60	3	1	0
> 60	1	0	0
Total	37	8	5

In the present study unilateral hydronephrosis was more common among males (76.5%). Ureteric calculus accounted for 26 cases (76.5%) in males and 11 cases (68.7%) in females. Renal calculi accounted for 5 (14.7%) cases in males and 3 (18.7%) in females. PUJ obstruction accounted for 3 (8.8%) cases in males and 2 (12.6%) in females.

**Table 3: gender distribution of hydronephrosis patients (n=50)**

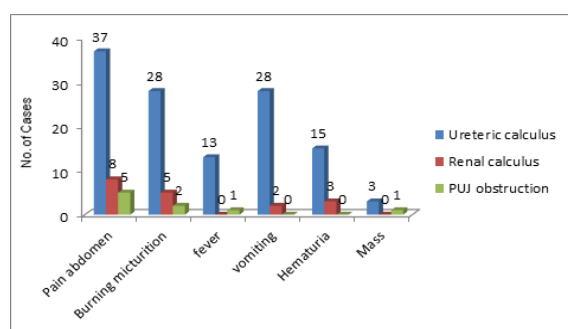
Diagnosis	Male		Female		Total
	No. of cases	Percentage	No. of cases	Percentage	
Ureteric calculus	26	76.5	11	68.7	37
Renal calculus	5	14.7	3	18.7	8
PUJ obstruction	3	8.8	2	12.6	5
Total	34	100	16	100	50

In the present study agriculturists were found to be affected more (36%) accounting for 18 patients, compared to other occupations. Students constituted second highest sufferers (26%).

In all cases chief complaint was abdominal pain followed by burning micturition and vomiting. In cases of ureteric calculi, all patients complained of pain abdomen, 56% c/o burning micturition and vomiting, 30% showed hematuria and mass in 3 cases. In cases of renal calculi, all complained of pain abdomen, 10% c/o burning micturition, hematuria in 6% and vomiting in 4% cases. In cases of PUJ obstruction, all complained of pain abdomen followed by burning micturition in 4%, mass and fever in 2% cases.

**Table 4: types of surgical treatment**

Types of surgery	No. of cases	Percentage
URSL	23	56
URETEROLITHOTOMY	7	17
PCNL	6	15
ANDERSON-HYNE'S PYELOPLASTY	5	12



**Figure 1: bar graph showing symptoms of the hydronephrosis (n=50)**

In the present study all patients presented with pain abdomen. Pain was situated in either lumbar region radiating to loin or was dull aching and localized to lumbar region. In this study, majority of cases presented with pain abdomen of duration between 1-3 months accounting for 40 cases (80%), 2 (4%) patients with less than 1 month and 8 (16%) patients had pain abdomen for 3-6 months.

In the present study 90% of patients had tenderness in lumbar region. In 16% of cases tenderness was present in renal angle. In 8% of cases, mass was

palpable which was firm to cystic in consistency, mobile in all cases. Mass was ballotable in all cases. In this study, the mean Hb over all cases was 12.44. The mean Hb was 12.4 in 37 patients, 11.95 in 8 cases and 12.8 in 5 cases.

In the present study, 26% cases with ureteric calculi, 6% cases of renal stones and 4% cases of PUJ obstruction had urinary tract infection.

In the present study 70% of patients who had unilateral hydronephrosis were right sided, in which ureteric calculi account for 58%, renal stones and PUJ obstruction 6% each.

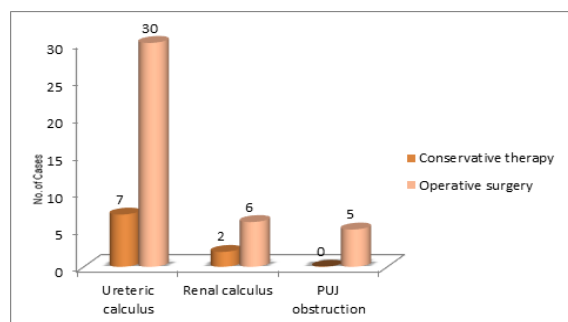
Among unilateral hydronephrosis ureteric stones contributed for majority of cases compared to renal stones and PUJ obstruction.

Ultrasound abdomen and pelvis was done for all the cases and was considered most important baseline investigations of choice. In ultrasound examination, the main feature was detection of hydronephrosis due to stones/PUJ obstruction and assessment of opposite kidney function.

In the present study, blood urea and serum creatinine were done in all cases and was found to be within normal limits and X-ray KUB were done for all. X-ray KUB was able to demonstrate stones in 32(64%) cases. IVU was

done in 14% of cases. IVU was an important diagnostic tool for assessment of function of kidney. Plain CT KUB was done in selected cases in 20% of cases.

In this study 41 cases were managed surgically and 9 cases with conservative treatment. In case of hydronephrosis due to ureteric and renal calculi, surgery was done for 36 cases. In case of hydronephrosis due to PUJ obstruction all the cases were treated surgically.



**Figure 2: bar graph showing mode of treatment (n=50)**

Minimally invasive procedures like URSL & PCNL were done in 56% & 15% cases respectively. In cases of PUJ obstruction Anderson Hynes dismembered pyeloplasty was done, which constituted 12% of cases. Ureterolithotomy was done in 17% of cases. Stenting was done in majority of cases.

## DISCUSSION

In this study, hydronephrosis shows a peak incidence in the 20-40 years age group constituting

68% of the cases with maximum number of cases occurring in 3rd decade (40%) similar to study by Prasanna L.C, Nataraj<sup>4</sup> accounting for 9 cases (45%). Joshi KS et al in 2014 concluded that average age of presentation was 33.4 years.<sup>[7]</sup>

Out of 50 cases in this study males were affected (68%) more than females (32%) with the ratio of 2.1:1 while almost similar ratio i.e 2:1 was seen in a study by Prasanna L.C et al.<sup>[4]</sup>

In the present study majority of patients belonged to agriculture, students and coolie occupation which together constituted 80% of patients. In the study by Prasanna L.C, Nataraj, more than 35% cases were coolies and agriculturists belong to low socio-economic status and students constituted second highest sufferers<sup>4</sup>. In our study all patients presented with abdominal pain varying from spasmodic to dull aching, with history of radiation of pain to groin, genitals and back. Similar presentation was seen in the study by Gowardhan Dare et al,<sup>[3]</sup> and Prasanna et al.<sup>[4]</sup> Kasabe P et al in 2014 have done a study about the incidence of pain in cases of unilateral hydronephrosis and concluded that pain is the most common (62%) presenting symptom followed by frequency.<sup>[8]</sup>

In this study 70% of cases had presented with burning micturition, 60% with vomiting, 36% cases had hematuria, 28% had fever, 8% had presented with mass per abdomen along with pain abdomen.

On physical examination 45 patients (90%) had tenderness in lumbar region, 8(16%) patients had renal angle tenderness and 4(8%) patients had mass per abdomen. This is similar to the study by Prasanna L.C et al,<sup>[4]</sup> where in 90% of patients showed tenderness in lumbar region and in 13.3% cases mass was palpable, firm to cystic in consistency and in 16.7% cases tenderness was present in renal angle with fullness in the renal angle.

In the study, majority of patients had right sided hydronephrosis constituting 70% than left sided HN with the ratio of 2.3:1 whereas the ratio was 1.57:1 in the study by Gowardhan Dare et al.<sup>[3]</sup>

Blood urea and serum creatinine were done for all patients and were within normal limits. The prime modalities of investigations included USG abdomen & pelvis, x-ray KUB, IVU and plain CT abdomen & pelvis. X-ray KUB and USG were done in all cases where as IVU was done in 14% and CT in selected patients (20%).

USG abdomen was done in all patients and was able to demonstrate calculi or give indirect evidence of ureteric calculus in the form of hydronephrosis. Pawar A et al in 2015 concluded that out of 296 patients, 291 had urolithiasis confirmed by USG and remaining 5 were confirmed by CT scan.<sup>[9]</sup>

Plain X-ray KUB was able to demonstrate calculi in 32(64%) cases in our study. Kundu AK et al in 1996 concluded that X-ray KUB detected stones in 50 (86.2%) patients.<sup>[10]</sup> Levine JA et al in 1997 concluded that X-ray KUB detected 45% ureteric calculi.<sup>[11]</sup> Urine culture in the present study showed

positive for 36% cases and negative for 64% of cases. Most of the urine culture showed E.coli and very few for pseudomonas proteins, klebsiella being urea splitting organisms. E. coli was the commonest organism cultured. This result was quite consistent with the literature.<sup>3</sup>In the present study, 37(74%) patients were of ureteric calculi, 8(16%) cases were of renal calculi, 5(10%) were of PUJ obstruction. Thus, maximum cases were of ureteric calculi i.e. 70%. These findings are more or less in agreement with those found in the literature.<sup>[3]</sup>

In the current study, 10 patients with ureteric and renal calculi with stone size less than 7mm were given a trial of conservative treatment, in 9(90%) patients stones cleared spontaneously. The overall expulsion rate was 89.5% in a study by Gowardhan Dare et al,<sup>[3]</sup> and was quite consistent with the literature. In our study, 37 patients had unilateral ureteric calculi. The positions of calculi were, mid ureter in 19(51.3%) cases and lower ureter in 18 (48.6%) cases. 7(18.9%) patients were managed conservatively. URSL with DJ stenting was done in 23 patients (56%) and ureterolithotomy in 7 (17%) cases with impacted stones and had 100% success rate without any complications. Ureteroscopic lithotripsy has gained wide acceptance worldwide and is an established technique for lower and mid ureteric calculi.<sup>[12]</sup>

In the study, PCNL was done in 6 patients (15%) with DJ stenting in 3 patients, a minimally invasive procedure and one of the complication, hemorrhage was seen in 5 patients during the procedure and well controlled.

PCNL remains the gold standard for larger and complex upper urinary tract stones.<sup>[13]</sup>

In the present study Anderson Hynes dismembered pyeloplasty was the procedure done for PUJ obstruction. The study “Pyeloplasty in Hydronephrosis: examination of surgical results from morphologic point of view” showed that surgical reconstruction of the PUJ obstruction is a safe and successful procedure,<sup>[14]</sup> and produces a lasting improvement in function and drainage in most patients. It is the gold standard against which newer techniques should be compared.<sup>[15]</sup>

Our approach on treatment modality depend upon the degree of obstruction, site of obstruction, patient’s choice of treatment, economic factors and surgeon’s personal preference etc. This study showed that URSL is the main modality of managing hydronephrosis due to urolithiasis.

## CONCLUSION

Ureteric calculi are the common causes for hydronephrosis. Highest incidence of hydronephrosis are seen in the 3rd decade. USG abdomen and pelvis is the commonly used diagnostic modality in cases of hydronephrosis. NCCT abdomen is the gold standard investigation for urolithiasis. Surgery is the most common treatment modality. Treatment of the etiology is associated with good recovery

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