SHORT REPORT

Sequelae of obstructive Nephropathy due to urolithiasis: a retrospective study at a tertiary care hospital of Lahore

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Abstract

The retrospective, observational study was planned to present the clinical manifestations of obstructive nephropathy secondary to urolithiasis, and its effect on long-term renal function. The sample comprised patients diagnosed with obstructive nephropathy secondary to stones admitted to the Department of Urology and Renal Transplant, Lahore General Hospital, Lahore, Pakistan, between January 1, 2018, and December 31, 2021. Data was analysed using SPSS 20. Of the 76 patients with a mean age of 50.06±13.42 years, 56(73.7%) were males and 20(26.3%) were females. The most frequent clinical cause was bilateral ureteric obstruction in 39 (51.3%) patients. The most common emergency procedure performed was unilateral percutaneous nephrostomy. It took an average of 10.8±2.3 days for patients to have a nadir value of creatinine. On follow-up, diabetes, presence of lower urinary tract symptoms and a higher value of creatinine at admission were significantly related to poorer outcomes (p<0.05).

Keywords: Urolithiasis, Quackery, percutaneous nephrostomy.

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Introduction

Obstructive uropathy is a clinical emergency in urology, defined as physical resistance to the passage of urine anywhere along its path leading to ureteral and pelvicalyceal dilatation. The resulting renal parenchymal damage due to this resistance is collectively termed obstructive nephropathy.[1]

Urinary tract stones (UTSs) are the most common cause of obstructive uropathy, with a high incidence of the disease; about 12% in men and 7% in women. They can be unilateral or bilateral.[2] The commonly used investigations to detect obstructive nephropathy are conventional ultrasound (US) and non-contrast computed tomography (CT) scans along with baseline investigations and renal function tests.[3] Extracorporeal shockwave lithotripsy (ESWL) and percutaneous nephrolithotomy (PCNL), either alone or combined, are recommended as the most successful treatment modalities for urolithiasis.[3,4,5] The selection of the appropriate procedure depends upon the type of presentation, size, number, type, shape, locations and laterality of the stone, as well as on individual patient characteristics, such as age, comorbidity profile, renal function, age of the patient, and stage of chronic kidney disease (CKD).[3,4,5]

A comprehensive literature search on PubMed Central and Google Scholar suggests no study has been conducted in Pakistan on the sequelae of obstructive uropathy in an acute setting. The current study wa planned to fill the gap in literature by focussing on the clinical manifestations of obstructive nephropathy secondary to urolithiasis, and its effect on long-term renal function in Pakistani patients.

Methods and Results

The retrospective, observational study was conducted at the Department of Urology and Renal Transplant, Lahore General Hospital (LGH), Lahore, Pakistan, and comprised data between January 1, 2018, and December 31, 2021. Data was extracted after approval from the institutional ethics review board. Data of all inpatients with the final diagnosis of obstructive nephropathy secondary to calculi was included, while cases with obstructive nephropathy due to causes other than stone disease were excluded. Data was collected using a self-designed proforma covering demographic data as well as disease onset, investigational and management details. The patients were called for an annual follow-up, and the outcomes were noted after taking written consent from the participants. Data were analysed using SPSS 20. Data was expressed as either mean ± standard deviation, or as frequencies and percentages. Analysis of variance (ANOVA) test was applied to check the impact of quantitative variables on follow-up outcomes. P<0.05 was considered statistically significant.

Of the 76 patients with a mean age of 50.06±13.42 years,

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Table-1: Impact of quantitative variables on follow-up outcomes..

	Healthy N (%)	Mortality N (%)	ESRD N (%)	CKD N (%)	Stone disease recurrence N (%)	P-VALUE
Gender						
Male	16 (21.6)	10 (13.5)	3 (4.1)	24 (32.4)	2 (2.7)	0.33
Female	10 (13.5)	2 (2.7)	0 (0)	7 (9.5)	0 (0)	
Lumbar Pain						
Left	7 (9.5)	1 (1.4)	0 (0)	6 (8.1)	0 (0)	0.37
Right	6 (8.1)	0 (0)	1 (1.4)	5 (6.8)	1 (1.4)	
Bilateral	10 (13.5)	7 (9.5)	1 (1.4)	16 (21.6)	0 (0)	
No	3 (4.1)	4 (5.4)	1 (1.4)	4 (5.4)	1 (1.4)	
Urine Volume						
Normal	17 (23)	5 (6.8)	1 (1.4)	20 (27)	2 (2.7)	0.78
Oliguria	4 (5.4)	3 (4.1)	1 (1.4)	4 (5.4)	0 (0)	
Anuria	5 (6.8)	4 (5.4)	1 (1.4)	7 (9.5)	0 (0)	
Nausea						
No	12 (16.2)	7 (9.5)	3 (4.1)	9 (12.2)	1 (1.4)	0.102
Yes	14 (18.9)	5 (6.8)	0 (0)	22 (29.7)	1 (1.4)	
LUTS						
No	18 (24.3)	3 (4.1)	3 (4.1)	23 (31.1)	2 (2.7)	0.013
Yes	8 (10.8)	9 (12.2)	0 (0)	8 (10.8)	0 (0)	
Hypertension						
No	18 (24.3)	7 (9.5)	3 (4.1)	20 (27)	1 (1.4)	0.69
Yes	8 (10.8)	5 (6.8)	0 (0)	11 (14.9)	1 (1.4)	
Diabetic						
No	25 (33.8)	7 (9.5)	3 (4.1)	28 (37.8)	1 (1.4)	0.01
Yes	1 (1.4)	5 (6.8)	0 (0)	3 (4.1)	1 (1.4)	
Stone Site						
Unilateral Kidney	2 (2.7)	0 (0)	0 (0)	1 (1.4)	1 (1.4)	0.11
Bilateral Kidneys	2 (2.7)	3 (4.1)	2 (2.7)	5 (6.8)	0 (0)	
Unilateral Ureter	5 (6.8)	1 (1.4)	0 (0)	2 (2.7)	1 (1.4)	
Bilateral Ureters	12 (16.2)	6 (8.1)	1 (1.4)	18 (24.3)	0 (0)	
unilateral kidney and unilateral ureter	5 (6.8)	2 (2.7)	0 (0)	5 (6.8)	0 (0)	
Emergency Haemodialysis						
No	26(35.1)	5(6.8)	0(0.00)	21(28.4)	2(2.7)	0.000
Yes	0(0.00)	7(9.5)	3(4.1)	10(13.5)	0(0.00)	
PCN						
None	9 (12.2)	3 (4.1)	1 (1.4)	9 (12.2)	0 (0)	0.94
Unilateral	8 (10.8)	6 (8.1)	1 (1.4)	14 (18.9)	1 (1.4)	
Bilateral	9 (12.2)	3 (4.1)	1 (1.4)	8 (10.8)	1 (1.4)	
Emergency JJ stenting						
No	25 (33.8)	11 (14.9)	3 (4.1)	31 (41.9)	2 (2.7)	0.63
Yes	1 (1.4)	1 (1.4)	0 (0)	0 (0)	0 (0)	
Emergency URS						
No	22 (29.7)	12 (16.2)	3 (4.1)	31 (41.9)	2 (2.7)	0.09
Yes	4 (5.4)	0 (0)	0 (0)	0 (0)	0 (0)	
GFR of Right side						
Not done	12 (16.2)	10 (13.5)	0 (0)	22 (29.7)	2 (2.7)	0.103
Above 50	3 (4.1)	0 (0)	0 (0)	0 (0)	0 (0)	
30-50	1 (1.4)	0 (0)	0 (0)	0 (0)	0 (0)	
15-30	7 (9.5)	1 (1.4)	1 (1.4)	2 (2.7)	0 (0)	
Less than 15	3 (4.1)	1 (1.4)	2 (2.7)	7 (9.5)	0 (0)	
GFR of left side						
Not done	12 (16.2)	10 (13.5)	0 (0)	22 (29.7)	2 (2.7)	0.074
Above 50	1 (1.4)	0 (0)	0 (0)	0 (0)	0 (0)	
30-50	4 (5.4)	0 (0)	0 (0)	1 (1.4)	0 (0)	
15-30	1 (1.4)	0 (0)	0 (0)	4 (5.4)	0 (0)	
Less than 15	8 (10.8)	2 (2.7)	3 (4.1)	4 (5.4)	0 (0)	
Refer to Nephrology						
No	16 (21.6)	2 (2.7)	0 (0)	6 (8.1)	2 (2.7)	0.001
Yes	10 (13.5)	10 (13.5)	3 (4.1)	25 (33.8)	0 (0)	
Family History						
None	16 (21.6)	9 (12.2)	2 (2.7)	13 (17.6)	2 (2.7)	0.31
1St Degree	5 (6.8)	2 (2.7)	0 (0)	13 (17.6)	0 (0)	
2nd Degree	3 (4.1)	0 (0)	1 (1.4)	5 (6.8)	0 (0)	
Distant	2 (2.7)	1 (1.4)	0 (0)	0 (0)	0 (0)	

ESRD: End-stage renal disease, CKD: Chronic kidney disease, LUTS: Lower urinary tract symptoms, PCN: Percutaneous nephrostomy, URS: Ureterorenoscopy, GFR: Glomerular filtration rate.

Table-2: Impact of quantitative variables on follow-up outcomes.

	N	Mean	Std. Deviation	P-Value (ANOVA)
Creatinine Levels at Admission				
Healthy	26	6.8577	6.46697	0.069
Mortality	12	10.2833	5.40821	
ESRD	3	16.0000	6.92820	
CKD	31	7.6645	4.78334	
Stone disease recurrence	2	8.8500	7.00036	
Creatinine levels before definitive management				
Healthy	26	2.1269	1.50428	0.003
Mortality	12	4.6000	2.70958	
ESRD	3	4.8333	2.60256	
CKD	29	2.8621	1.82843	
Stone disease recurrence	2	1.3000	.00000	
Hb Levels at Admission				
Healthy	25	11.20	2.49	0.084
Mortality	12	9.11	2.84	
ESRD	3	8.83	1.22	
CKD	30	10.54	2.22	
Stone disease recurrence	2	12.15	0.92	

ESRD: End-stage renal disease, CKD: Chronic kidney disease, ANOVA: Analysis of variance.

56(73.7%) were males and 20(26.3%) were females. The most common symptom at presentation was lumbar pain in 61 (81%) patients. 21(28.8%) patients had opted for traditional treatment option of homeopathy. Lack of awareness was the most common reason for not coming in early as observed in 50 (65.7%) patients. The most frequent clinical cause was bilateral ureteric obstruction in 39 (51.3%) patients. The most common emergency procedure performed was unilateral percutaneous nephrostomy (PCN) insertion in 31 (40.8%) patients. It took an average of 10.8±2.3 days for patients to have a nadir value of creatinine. Most of the patients on follow-up were either completely healthy 27 (35.5%) patients or

had some degree of CKD 31 (40.1%) patients. On follow-up, diabetes, presence of lower urinary tract symptoms (LUTS) and a higher value of creatinine at admission were significantly related to poorer outcomes ($p<0.05$) (Tables 1-2).

Discussion

The study was conducted at LGH, which is one of the major referral centres for cases of obstructive uropathy from various parts of the Punjab province. The study demonstrated that males were more frequently affected by obstructive nephropathy (74%) than females (26%), which was consistent with Satav et al.[4] and Darabi MR et al.[2] Besides, the current study also noted that a family history of urolithiasis was present in 42.1% of the patients.

Pain in the lumbar region was the most common presenting complaint (82.90%) among the patients, which was in contrast to an Ethiopian study which reported decreased urine output (67%) as the most frequent clinical manifestation at presentation.[6] Other symptoms at presentation were nausea (56.6%), LUTS (34.2%) and anuria (22.4%) in the present study. The presence of LUTS was also associated with significantly poorer long-term outcomes. Dwellers of rural areas of Pakistan generally prefer to have low-cost treatments options, like herbal, homeopathic and spiritual treatment. Allopathy is known to have the highest costs related to the treatment of obstructive uropathy. In addition, Mohod et al. also documented the effectiveness of homeopathic medicines berberis vulgaris, tabacum and pareira brava in relieving the clinical manifestations due to obstructive nephropathy.[7] In the current study, many patients underwent one or more such treatment modalities before presenting to the hospital, which led to a significant delay in treatment. The most common reason for such decisions was a lack of awareness regarding the disease and its severity.

The current data showed that the most common site for stones causing obstructive nephropathy was bilateral ureters, and the most common definitive procedure for stone removal was bilateral ureteroscopy. As far as the glomerular filtration rate (GFR) of the patients is concerned, most of them had reduced GFR on the right side; <15ml/min in 22.4%, 15-30ml/min in 14.5%, 30-50ml/min in 1%, and >50ml/min in 4%. In the rest of the patients, GFR was not measured. A similar trend was observed for GFR on the left side. Sichani et al. concluded that the mean pre-operative GFR was 68.2ml/min. Reduction in GFR is attributed to the pressure effect of obstruction in the path of urine which is transmitted to the kidney, and leads to kidney damage with hydronephrosis. However, the GFR at admission had no significant impact on long-term renal function.[8]

A Malaysian meta-analysis stated that both PCN and retrograde ureteral stenting (RUS) were efficacious in decompressing an obstructed urinary system, but PCN was preferable over RUS because of its reduced impact on the patient's postoperative quality of life.[9] Unilateral PCN was the most common emergency procedure performed in the current study as well.

In a recent prospective study with 7,257 patients, every seventh patient with type 2 diabetes mellitus had kidney stone disease.[10] Approximately 13% of the patients had diabetes mellitus in the current study, while 35.5% had hypertension. Kittanamongkolchai et al. revealed that stone formers were found to have a higher risk of hypertension compared to controls. The presence of diabetes came out as a significant factor in long-term renal function outcomes.[11]

The current study showed that the mean standard creatinine level at the time of admission was 8.38±5.91mg/dl, while, after the definitive treatment, the creatinine level reduced to 2.88±2.08mg/dl. An Indian study reported a mean creatinine level of 4.71mg/dl at the time of admission, whereas the immediate post-operative creatinine level was 3.78mg/dl, and after 6 months, it further decreased to 2.85mg/dl.[4]

Another significant variable impacting the long-term outcome was referral to nephrology, but there is uncertainty regarding the causal relationship between referral and poorer outcomes.

The current study has limitations a small sample size and a single-centre design.

Conclusion

Most of the patients presenting with obstructive nephropathy due to stones were males, and the most common symptom at presentation was lumbar pain. There was a delay in the presentation of urolithiasis patients, which was commonly due to a lack of awareness regarding disease severity and treatment options, and financial constraints. There is a need for better education regarding urolithiasis in the general population so that such complications may be prevented. On follow-up, the significant factors impacting the long-term patient health status were the presence of LUTS, diabetes, referral to nephrology, and nadir value of serum creatinine levels.

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Abbreviations Hb: Hemoglobin, CT: Computer Tomography, PCNL: Percutaneous Nephrolithotomy, US: Ultrasound, ESWL: Extracorporeal shockwave lithotripsy, CKD: Chronic kidney disease, ANOVA: Analysis of variance, LUTS: Lower urinary tract symptoms, GFR: Glomerular filtration rate, PCN: percutaneous nephrostomy, RUS: Retrograde urinary stenting, URS: Ureterorenoscopy, AVF: Arteriovenous fistula, ESRD: End-stage renal disease.

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AUTHOR'S CONTRIBUTION:
UMK: Conceived the research plan, sampling, composed the sampling proforma, wrote the results section and reviewed the draft.
AA: Planned the research, guided on sampling, patient follow-up, proof-reading of draft and supervision.
MS: Wrote introduction and methods sections.
HMQ: Wrote discussion and conclusion sections.
AIB: Wrote abstract and parts of introduction, sampling, performed data entry on SPSS.
KHG: Approved study at departmental level, guided on design and methods and final approval.