

Original Research Article

Urine analysis in KUB calculi in a tertiary care hospital

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ABSTRACT

Background: This study was conducted to study the complete urine examination in patients presented with stones in kidney ureter and bladder.

Methods: A retrospective study was done in patients with KUB stones who are attended OP or admitted in Saveetha Medical College and Hospital from January 2019 to December 2019. The data was collected from the Department of Urology, Radiology and Clinical pathology and entered in excel sheet, analysed descriptively. In our study 1000 cases were found to be CT-KUB and their urine samples are examined by dipstick method, microscopic examination and computed tomography (kidney ureter bladder) remain the most accurate imaging modality to detect kidney stones and to direct management.

Results: A cross-sectional study was conducted in 1000 patients with KUB stones and their urine examination was done. CT-KUB stones are found in the kidney of 540 patients, ureter- 440 patients, bladder- 20 patients respectively. In our study 17-70 years age group of patients were presented with stones and their urine examination showed RBC (30%), protein (21%), pus cells and leukocytes (26%).

Conclusions: The present study found abnormal components are present in urine of KUB stone patients such as Red blood cells, Protein, Pus cells and leukocytes present. Hence it is mandatory to check the urine examination in-KUB Stone patients to prevent the further consequences in kidney, ureter and bladder.

Keywords: Dipstick, Protein, Pus Cells, Red blood cells, Stones, Urine

INTRODUCTION

In clinical laboratory, urine analysis is one of the major diagnostic screening test. Routine urinalysis is very useful for the diagnosis of urinary tract infection and neoplastic conditions.

Urolithiasis is calculus formation at any level in the urinary collecting system, but most often the calculi arise in the kidney. Males more commonly affected than females. The types of renal stones are Calcium stones, Uric acid, struvite and cysteine stone. About 80% of renal stones are composed of either calcium oxalate or calcium oxalate mixed with calcium phosphate. The most important causes for various stone formation are

increased urine concentration (supersaturation of constituents), urine pH, alkaline urine due to UTIs, the urea-splitting bacteria, gout, leukaemia and hyperuricemia.

Kidneys function in excretion of toxic substances and metabolic by products out of the blood, regulate the water quantity and blood pressure, maintain acid-base equilibrium, detoxify drugs, metabolize hormones, retain the proteins, electrolytes and other compounds in adequate quantity.¹

Urinalysis can provide valuable information about the patient's health status, including indications of renal, urological and liver disease, diabetes mellitus, urinary

tract infection (UTI) and general hydration. Samples should be examined within 30 minutes from collection to avoid false results.² Many patients suffering with burning micturition and loin pain could be indicating stones in the kidney, ureter and bladder.

The colour of urine has been considered to be one of the most vital tools for assessment of hydration.³ Normally, the colour of fresh urine ranges from pale yellow and clear. There might be severe renal diseases without the presence of any symptoms.⁴

Computed tomography (kidney ureter bladder) remain the most accurate imaging modality to detect the variable sizes of stones in different location such as kidney, ureter, and bladder and also useful for early diagnosis and treatment.

The aim of our study was to do complete examination of urine parameters in KUB calculi patients.

METHODS

A retrospective and observational study of 1000 patients with kidney ureter bladder stones and data of urine complete examination values were collected from January 2019 to December 2019 from the department of clinical pathology, radiology and urology in Saveetha Medical College and Hospital, Thandalam, Chennai, Tamil Nadu.

The selection criteria of the population was, the patients with stones in KUB, attended OP or IP of urology department, with radiological and urine examination tests.

The sample size was complete enumerate method and by using Excel sheet, data was analysed descriptively.

The urine was collected at the laboratory in a sterile container according to the prescribed timings. Midstream sample was collected using a clean-catch method into a sterilized urine container, 1 to 2 ounces of urine was collected (30 to 59 milliliters) of collection and was

tested in the laboratory within 30 minutes. Otherwise urinary constituents can become unstable and may affect test results.^{4,5} By using a reagent strip method to analyse the various parameters of urine in KUB patients.

For microscopic examination of urine 15 ml of sample was taken in a conical tube and centrifuged at 1500 rpm for 5 minutes and the sediment was observed by pathologist in high power magnification (400 times).^{4,5}

The study was approved by institutional ethical committee (IEC).

RESULTS

Among 1000 cases, the males were 600 (60%) and female were 400 (40%), the common site of stones were kidney, ureter and rarely bladder with predominantly single stones and size of the stones were <6 mm associated with hematuria and proteinuria.

In our study the age group between 31-40 was having 270 cases out of which single stones were 78% and multiple stones (22%) and the commonest site in this group was kidney (52%) and 79% of the calculi size was <6 mm; 70% of the cases were showing RBCs on microscopic examination (Table 1 and 2, Figure 1).

The age group between 21-30 was having 220 cases out of which single stones were 95% and multiple stones (5%) and the commonest site in this group was ureter (50%) and 82% of the calculi size was <6 mm; 50% of the cases showing RBCs on microscopic examination and 60% of the cases having protein (Table 1 and 2).

The age group between 17-20 was having 20 cases and all were having only single stones that were present only in ureter (100%) and the size of the calculus was <6 mm (Table 1 and 2, Figure 1).

The least common site for calculus was bladder (Figure 1) out of 1000 cases only 20 cases (2%) shown 50% as single and 50% multiple stones of size <6 mm in the age group of 41-50 (Table 1 and 2).

Table 1: Analysis of urine parameters: according to age-wise, the number of stones (single or multiple), protein, blood, and microscopic examination.

Age	No. of patients	No. of stones			Positive cases							
		Single	Multiple	%	Pus cells	Epithelial cells	RBCs	Cast	Crystals	Others	Protein	Blood
17-20	20	20 (100%)	0	2	10	Normal	10	0	0	0	10	10
21-30	220	210 (95%)	10 (5%)	22	30	Normal	50	10	10	20	60	60
31-40	270	210 (78%)	60 (22%)	27	50	Normal	70	10	10	10	30	70
41-50	190	160 (84%)	30 (16%)	19	50	Normal	40	0	0	20	30	40
51-60	190	170 (89%)	20 (11%)	19	80	Normal	70	0	0	10	40	70
61-70	110	70 (64%)	40 (36%)	11	40	Normal	60	0	0	20	40	60

Table 2: KUB stones; according to age-wise, number of calculi, site and size of the calculi.

Age	No. of patients	Site and Size of the calculi								
		Kidney			Ureter			Bladder		
		No. of cases	<6 mm	>6 mm	No. of cases	<6 mm	>6 mm	No. of cases	<6 mm	>6 mm
17-20	20	0 (0%)	0 (0%)	0 (0%)	20 (100%)	20 (100%)	0(0%)	0 (0%)	0 (0%)	0 (0%)
21-30	220	100 (45.5%)	60 (27.3%)	40 (18.2%)	110 (50%)	90 (40.9%)	30 (13.6%)	0 (0%)	0 (0%)	0 (0%)
31-40	270	140 (63.6%)	110 (40.7%)	30 (11.1%)	130 (48.1%)	70 (26%)	60 (22.2%)	0 (0%)	0 (0%)	0
41-50	190	110 (55.8%)	90 (47.3%)	20 (10.5%)	80 (42.1%)	60 (31.5%)	20 (10.5%)	10 (5.3%)	10 (5.3%)	0
51-60	190	110 (55.8%)	80 (42.1%)	30 (15.7%)	70 (36.8%)	30 (36.8%)	40 (21%)	0 (0%)	0 (0%)	0 (0%)
61-70	110	80 (72.7%)	50 (45.4%)	30 (27.2%)	20 (18.1%)	0 (0%)	20 (18.1%)	10 (9.1%)	0 (0%)	10 (9.1%)

**Figure 1: coronal and axial view of stones: A, B-in kidney, C, D-ureter and E, F-bladder.**

In the age group of 61-70, 36% of the cases having multiple stones among that 10% were present in bladder and the size of the stones are >6 mm in all the cases (Table 1 and 2).

On microscopic examination of urine all the age groups showing positive for RBCs. Casts and crystals were seen only in the age group of 21-30 and 31-40. In the age group of 51-60 pus cells were predominant and epithelial cells were normal in number in all the groups (Table 1).

DISCUSSION

Urolithiasis is calculus formation at any level in the urinary collecting system and it is the most common disease of the urinary tract. Globally, the prevalence and recurrence rates of kidney stone disease are increasing with limited options of effective drugs. Urolithiasis

affects about 12% of the world population at some stage in their lifetime.⁵ The prevention of stone recurrence requires the knowledge about the mechanisms involved in stone formation.⁶ The complications of kidney stones have been associated with an increased risk of chronic kidney diseases, end-stage renal failure cardiovascular disease, diabetes and hypertension.^{7,8} It has been suggested that kidney stones may be a systemic disorder linked to metabolic syndrome. Nephrolithiasis is responsible for 2 to 3% of end-stage renal cases if it is associated with nephrocalcinosis.^{9,10}

It affects all ages, sexes and races but occurs more frequently in men than in women within the age of 20-49 years.¹¹ However, the lifetime recurrence rate is higher in males, although the incidence of nephrolithiasis is increasing among females.¹²

Recent studies have reported that in both developed and developing countries the prevalence of urolithiasis has been increasing in the past decades. This increasing prevalence is believed to be associated with changes in lifestyle modifications such as lack of physical activity, dietary habits and global warming.¹³ In the United States, it is estimated that 600,000 Americans suffer from urinary stones every year and affect 1 in 11 people.¹⁴ In the Indian population, about 12% of them are expected to have urinary stones and out of which, 50% may end up with the renal failure with loss of kidney functions.¹⁵

A study done by Kanno et al showed that among 1644 kidneys, unenhanced computed tomography tests detected at least 1 stone in 994 kidneys. The other investigations like ultrasonography and plain radiography detected at least 1 stone in 882 and 488 kidneys, yielding a sensitivity of 88.7% and 49.1% and a specificity of 68.3% and 99.1%, respectively.¹⁶

Our study showed, out of 1000 cases, the number of single stones was 840 (84%) and multiple stones were 160 (16%) in number in the age group of 17 to 70 years.

Khan et al study found that males had almost double the risk of renal stones compared to females, which was in coherence with a study reporting that kidney stones are greater in males, with a male to female ratio of 3:1.¹⁷ In our study males (60%) were most commonly affected than females (40%), 3:2. Our study correlating with the Khan et al study.

A study done in Saudi Arabia showed a total of 1506 individuals were interviewed, including 82% from Makkah, 15.7% from Jeddah, and only 2.3% from Taif. The total percentage of urolithiasis was 6.2%; including males 6.6% and females 5.8% (p=0.06).¹⁸

Another study by Chand et al showed that the total 345 calculi. Among the 345 calculi, 237 were renal stones, 47 were ureteric stones, 33 of stones were found in the vesico-ureteric junction (VUJ), 22 of the stones were found in the pelvic ureteric junction (PUJ), and 6 were in the bladder. In our study out of 1000 cases 540 were renal stones, 440 were ureteric stones and 20 were bladder stones. Kidney stones are the most common. The distal ureter is the most common site of the ureteric stone. Our study is correlating with Chand et al.¹⁹

Awasthi et al study showed that renal calculi mostly affects the productive years of life i.e. 30-40 years of age. Males suffer more from renal calculi compared to females, similar to our study.²⁰

A study done by Brisbane et al showed kidney, ureter, bladder (KUB) plain film radiography is most helpful in evaluating for interval stone growth in patients with the known stone disease and is less useful in the setting of acute stones. MRI provides the possibility of 3D imaging without exposure to radiation, but stones are difficult to visualize.²¹

In our study, CT KUB done, showed the number of single and multiple stones in the kidney, ureter, and bladder. The most common site of stones is in the kidney followed by ureter and the very least number of stones are present in the bladder.

A study done by Zafar showed urine analysis of 93 patients, have red blood cells or pus cells or both in 48 (51.6%), which included 40 (58.82%) of 68 patients with calculi detected on CT KUB with variable sizes of stones <3 mm (20.6%), 3-5 mm (44.1%) and 5 mm (35.3%).²² In our study, urine examination showed 30% RBCs, 26% pus cells, 21% protein, 2% crystals, 2% cast and 8% bacteria etc., are present. No abnormal epithelial cells detected and predominantly the stone size was <6 mm (67%) and >6 mm (33%).

The limitation of our study is retrospective study, so no follow up of patients, so we could not know the recurrence of stone formation.

CONCLUSION

We concluded that out of 1000 cases, males are predominantly presented with urinary calculi than females, single stones are more than multiple stones and common sites are renal and ureter, very rarely in the bladder. By routine urine examination, red blood cells, pus cells, and proteins are seen in all the age groups. Cast and crystals are seen only in the age group of 21-40. The predominant size of the stones are <6 mm and in older age group (61-70) have stones in the bladder and the size was >6 mm. So urine analysis was necessary in KUB calculi patients, to rule out any kidney damage, infection and treatment modality to prevent further complications. Drinking more water and changes in food habits can prevent the stone formation.

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REFERENCES

1. Lana JF, Macedo A, Ingrao IL, Huber SC, Santos GS, Santana MH. Leukocyte-rich PRP for knee osteoarthritis: Current concepts. J Clin Orthopaed Trauma. 2019;10:S179-82.
2. Simerville JA, Maxted WC, Pahira JJ. Urinalysis: a comprehensive review. Am Fam Phys. 2005;71(6):1153-62.
3. Hajar F, Taleb M, Aoun B, Shatila A. Dipstick urine analysis screening among asymptomatic school children. North Am J Med Sci. 2011;3(4):179.
4. Froom P, Bieganiec B, Ehrenrich Z, Barak M. Stability of common analytes in urine refrigerated for 24h before automated analysis by test strips. Clin Chem. 2000;46(9):1384-6.
5. Chauhan CK, Joshi MJ, Vaidya ADB. Growth inhibition of struvite crystals in the presence of herbal extract Commiphora wightii. J Mater Sci Mater Med. 2008;20(1):85-92.
6. Khan SR, Pearle MS, Robertson WG, Gambaro G, Canales BK, Doizi S, et al. Kidney stones. Nat Rev Dis Primers. 2016;2(1):1-23.
7. Mikawlawng K, Kumar S, Vandana R. Current scenario of urolithiasis and the use of medicinal plants as antiurolithiatic agents in Manipur (North-East India): a review. Int J Herbal Med. 2014;2(1):1-12.

8. El-Zoghby ZM, Lieske JC, Foley RN, Bergstralh EJ, Li X, Melton LJ, et al. Urolithiasis and the risk of ESRD. *Clin J Am Soc Nephrol.* 2012;7(9):1409-15.
9. Sigurjonsdottir VK, Runolfsson HL, Indridason OS, Palsson R, Edvardsson VO. Impact of nephrolithiasis on kidney function. *BMC Nephrol.* 2015;16(1):1-7.
10. Courbebaisse M, Prot-Bertoye C, Bertocchio JP, Baron S, Maruani G, Briand S, et al. Nephrolithiasis of adult: from mechanisms to preventive medical treatment. *Rev Med Intern.* 2017;38:44-52.
11. Edvardsson VO, Indridason OS, Haraldsson G, Kjartansson O, Palsson R. Temporal trends in the incidence of kidney stone disease. *Rev Med Intern.* 2013;83(1):146-52.
12. Afsar B, Kiremit MC, Sag AA, Tarim K, Acar O, Esen T, et al. The role of sodium intake in nephrolithiasis: epidemiology, pathogenesis, and future directions. *Eur J Intern Med.* 2016;35:16-9.
13. Soia NH, Walter TM. Prevalence and risk factors of kidney stone. *Glob J Res Analysis.* 2016;5(3):183-7.
14. Scales CD, Smith AC, Hanley JM, Saigal CS. Prevalence of kidney stones in the United States. *Eur Urol.* 2012;62(1):160-5.
15. Joseph KC, Bharat B, Park H, Joshi MJ. Inhibition of growth of urinary type calcium hydrogen phosphate dihydrate crystals by tartaric acid and tamarind. *Curr Sci.* 2005;88(8):1232-8.
16. Kanno T, Kubota M, Funada S, Okada T, Higashi Y, Yamada H. The utility of the kidneys-ureters-bladder radiograph as the sole imaging modality and its combination with ultrasonography for the detection of renal stones. *Urology.* 2017;104:40-4.
17. Khan AS, Rai ME, Gandapur, Pervaiz A, Shah AH, Hussain AA. Epidemiological risk factors and the composition of urinary stones in Riyadh Saudi Arabia. *J Ayub Med Coll Abbottabad.* 2004;16(3):56-8.
18. Nassir AM. Prevalence and characterization of urolithiasis in the Western region of Saudi Arabia. *Urol Ann.* 2019;11(4):347.
19. Chand RB, Shah AK, Pant DK, Paudel S. Common site of urinary calculi in kidney, ureter and bladder region. *Nepal Med Coll J.* 201;15(1):5-7.
20. Awasthi M, Malhotra SR. Renal calculi- prevalence, risk factors, and dietary management: a review. *Indian J Nutr Diet.* 2016;53(2):228.
21. Brisbane W, Michael R. Bailey MR, Mathew D. Sorensen MD. An overview of kidney stone imaging techniques. *Nat Rev Urol.* 2016;13(11):654-62.
22. Zafar SI, Zafar N, Ahmed SQ. Efficacy of urinalysis in screening patients undergoing CT KUB for suspected urolithiasis. *Pak Armed Forces Med J.* 2017;67(6):962-5.

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