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Study of Urinary Stones by Making Chemical Analysis in the eastern Region of Uttar Pradesh in India

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Abstract

Objectives: *Chemical composition of urinary stones and serum is important in understanding the pathogenesis and medical management of calculus disease.*

Methods: *The studies of 50 patients with urinary stones (44 males & 06 females) were collected from different parts of Allahabad region in different age group between 10-60 years. We studied quantitative chemical analysis of urinary stones and serum calcium, oxalate, inorganic phosphate and uric acid in urolithiasis cases using colorimetric and enzymatic methods.*

Result: *The overall incidence of different types of stones were found in following order: Kidney > Ureter > Bladder stones. Incidence of kidney stones was higher in the age group 31-40 years than ureter and bladder stones. In present study calcium in kidney and ureter stone were found to be in all 100% and in bladder stones 99.2% while inorganic phosphate 97.2% in kidney, 99.5% in ureter and 98.5% in bladder stones respectively. Serum oxalic acid content was found higher in 18 cases. Higher serum calcium value was found in 22 cases out of 50 cases. Serum inorganic phosphate higher value was in 06 cases. In our study 12 stones formers had associated hyperuricemia.*

Conclusion: *Crystalline component calcium oxalate was found in most of the cases. Males are more prone to urinary stones disease than females. The incidence of kidney stone was found more as compared to ureter and bladder.*

INTRODUCTION

A calculus formed in the urinary tract is known as urinary stone. Urolithiasis is a multifactorial recurrent disease, distributed worldwide in urban, rural, non-industrial and industrial regions with different chemical composition of the analysed stones in context to various risk factors. Besides diet, genetic factors are also reported to contribute in pathogenesis of urolithiasis ^[1]. Some authors have suggested the impact of climate change, changing lifestyle and dietary choices as the more probable cause of the increasing incidence and prevalence of urolithiasis ^[2]. Siener confirmed such findings in studies on recurrent stone formers. Changing chemical stone compositions have been reported, possibly as results of the described changes of lifestyle ^[3]. Kidney stone, ureter stones and bladder stones are formed due to the accretion of solid hard, minerals deposit in the urinary tract ^[4]. Urinary stones are more common in certain areas. These areas include south east Asia, India, Middle east Europe and England ^[5]. Regional variations have been found in India in the incidence of urolithiasis from southern India, Northern India, North east India and North Western India ^[6,7].

MATERIAL & METHOD

In our study 50 urinary stones (kidney, ureter, bladder) were analysed for the chemical composition and serum biochemical parameters such as calcium, inorganic phosphate, oxalic acid and uric acid were also analysed.

1. Urinary stones were collected from department of Surgery M.L.N. Medical College Allahabad and private nursing

homes of other parts of Allahabad region such as Pratapgarh, Kaushambi & Mirzapur etc.

2. Age, location of stones, sex and other information were obtained from the patient record in hospitals. Urinary calculi were divided according to their location i.e. kidney, bladder, and ureter. Physical study of stones was also done which included morphological study and weight of urinary stone.
3. Stones were washed with distilled water and dried. In a pestle and mortar stones were powdered and used for the chemical analysis.
4. Stones solutions were prepared by dissolving 20 mg of the powdered stone in 2ml of 6N HCl and the final volume was made up to 4.0 ml with distilled water. Stones solutions were kept in the boiling water bath for one hour. They were cooled in tap water then centrifuged at 5000 rpm for 10 minutes and supernatant was collected. Calcium, Inorganic phosphate, oxalic acid and uric acid were estimated quantitatively.

RESULTS

Fifty urinary stones from patients and their serum and urinary samples were collected from different places of Allahabad region. The other information of the patient such as location of urinary stone, sex, age were also obtained.

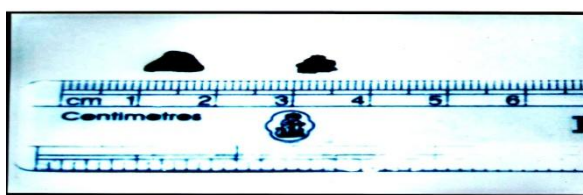
Physical study of urinary stones- Colours of urinary stones were found to be brown, gray, white, light yellow and black. Kidney and ureter stones

were found to have colours like black, gray, white, light yellowish and while bladder stones were brown, black and light straw colour.

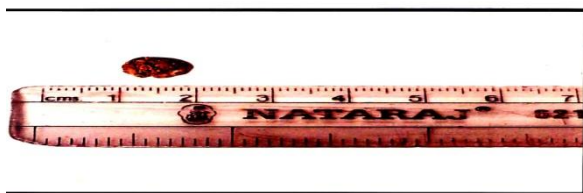
Size and shape-Shapes of the Kidney, bladder and ureter stones depended upon the types of stone and location. The kidney stones were oval, rounded with rough surface and irregular and bigger in size and shape and hard in consistency. The bladder and ureter stones were spherical, irregular in size. Ureter stones were small than kidney and bladder stones.

Weight-The weight of kidney, ureter and bladder stones were found in the range of 49mg – 2.640gm in the present study.

The incidence of urinary stones- The incidence of different urinary stones was found in order kidney>ureter>bladder. The incidence of kidney, ureter and bladder stone was found between age group 10-60years.



Ureter Stone (Age = 35 Years , Sex = Female)



Bladder Stone (Age = 62 Years , Sex = Male)

Chemical analysis of urinary stone- Incidences of urinary stones (kidney, ureter, and bladder) according to age groups

Age group	Kidney	Ureter	Bladder	Total
<10	-	-	-	-
11-20	02	-	-	02
21-30	08	04	02	14
31-40	16	04	04	24
41-50	04	02	-	06
51-60	04	-	-	04
Total no of stones	34	10	06	50

DISCUSSION

The present study was carried out in 50 cases of urolithiasis in Allahabad region. We have studied chemical analysis of urinary stones and serum calcium, inorganic phosphate, oxalic acid and uric acid. The incidence of urinary stones in our study was found kidney > ureter > bladder. Other workers also studied incidence of urolithiasis in following order kidney>ureter>bladder^[8]. Incidence of kidney stones was higher in the age group of 31-40 years then ureter and bladder stones. Other study were also similar, the incidence of urinary stones higher in age of 31-40 years^[9]. Most studies of seasonal variation in the diagnosis of renal stones has shown increase incidence in summer and autumn^[10]. In my study 42 cases were found to be vegetarian and 08 cases were non-vegetarian. Robertson et al 1981 described that vegetarian consume more oxalate and calcium rich diet while non-vegetarian consume protein rich diet^[11].

In present study inorganic constituents calcium in kidney and ureter stone was found to be in 100% and in bladder stone it was found 99.2% while inorganic phosphate 97.2% in kidney, 99.5% in ureter and 98.5% in bladder stones. The chances of stones in kidney are quite high in Allahabad region

due to increase consumption of milk and curd. This calcium rich protein diet produces hypercalcemia which can contribute to stone formation^[5].

Organic constituent oxalic acid was found 100% in all urinary stones (kidney, ureter and bladder). Similar results were reported by several workers^[6]. In Gwalior region B.N.B. Rao in 1964 reported high oxalate contents in kidney, ureter and bladder stones which are similar to our study^[12].

We reported uric acid 71.2% in kidney stone, 73.5 % in ureter and 72.2% in bladder stones. Teotia and Teotia (1977) in Meerut region reported more incidences of uric acid calculi while Pundir et al reported 70.3% uric acid in kidney stones, in ureter 87.5% and in bladder stones it was 78.94%. The high incidence of calcium and oxalate stones in this region might be due to the high consumption of leafy vegetables such as amaranthus, spinach, mustard, sesame products such as gajak which are known for their high oxalate content^[13,6].

In our study hypercalcemia was found in 22 cases out of 50 cases. The serum calcium level was in the three type of stones formers in the following order kidney > ureter > bladder. The content of calcium was found in the range of 0.25-62 mg /dl. Individually the calcium content was in the range of 1.0-46.5 mg /dl, 1.8-65.2 mg /dl and 0.25-62 mg /dl with in kidney, ureter and bladder stones respectively. Pundir et al in 1998 reported that high incidence of calcium stones depends upon hypercalcemia and the availability of oxalate or phosphate. Serum oxalic acid value was found higher in 18 cases than the normal. Hyperoxalemia is due to high oxalate rich diet^[6,14].

Most (75% to 80%) kidney stones are calcium stones, composed of calcium oxalate and/or calcium phosphate. These stones are generally associated with high concentration of calcium in the blood or urine^[15].

We have reported serum inorganic phosphate values higher in 08 patients out of 50 cases. The occurrence of inorganic phosphate content was found in kidney stones 2.25-25.4 mg /dl, ureter stones 0.23-27.2 mg /dl and bladder stones 0.24-25.1 mg /dl. The results are compared with reported by other workers^[16].

In present study 12 stones former had hyperuricemia. In the present study the uric acid content was found in all the three type of calculi. In kidney stones 0.22- 15.3 mg /dl, ureter stones 0.3-13.7 mg /dl and bladder stones 0.25- 12.0 mg /dl. Acidic urinary pH and dehydration are responsible for uric acid lithiasis. Shah and Shah (2002) Hyperuricosuria promotes calcium oxalate and phosphate crystallization in urine.

The crystalloid components are mainly calcium oxalate, calcium phosphate, calcium carbonate, magnesium ammonium phosphate, uric acid and cysteine. Uric acid (UA) stone represents about 4.5–23% and the other less frequent types of kidney stones are magnesium ammonium phosphate or struvite stones, ammonium urate stones, cystine stones, xanthine and other miscellaneous stones^[17].

CONCLUSION

The most common age of stone formers in our study was 31-40 years of age. Vegetarian are more affected then as compared to non vegetarian. Males are more prone to urinary stones disease than

females. The incidence of kidney stone was found more as compared to ureter and bladder. Crystalline component calcium oxalate was found in most of the cases as compared to other components.

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