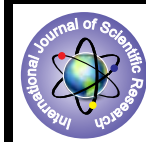


## Biochemical Analysis of Renal Calculi Inpatients of Srms Ims, Bareilly , U. P, India



### Medical Science

**KEYWORDS :** kidney stone, calcium , uric acid, oxalate

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### ABSTRACT

*Introduction: Urolithiasis is one of the oldest disorders known to mankind. Kidney stones also called renal calculi are solid crystal aggregation of dissolved minerals in urine.*

*Aim & objective: The main objective of this research is to compare the chemical composition of these stones with other parts of the country and to correlate with age, sex, diet.*

*Material and methods: The materials for this study were kidney stones obtained from urology department of SRMSIMS.(museum specimen). 14 stones were taken out of which 10 males and 4 females, mean age range 8-63 years.*

*Result: Calcium Oxalate and uric acid mixed with Oxalate are commonly found in patients of Bareilly and adjoining areas.*

*Conclusion: As the chemical composition of renal stones are important for understanding their etiology and the therapy is usually based on the analysis, so this study can help a proper management of the disease.*

Introduction: Kidney stones also called renal calculi are solid crystal aggregation of dissolved minerals in urine. Calculi typically form inside the kidney or bladder. Some of the substances found in urine are able to crystallize and in a concentrated form these chemicals can precipitate in to a solid deposit attached to the kidney wall. These crystals can grow through a process of accretion to form a kidney stone. [1]

Urolithiasis is one of the oldest disorders known to mankind. A 7000 years old stone has been found in Egyptian mummy. [2] Upper urinary tract stone disease is one of the commonest urological ailments, which require hospital admission and some sort surgical intervention. According to a recent survey it constitutes 10-25% of total workload in urological practice. [3] The prevalence of incidence is estimated 5-10% and wide geographical variation is observed. [4] Common in Europe, North America, Japan, Middle East but the incidence is low in South African people. It has been estimated that in U.K. population the incidence is about 2-3% . The incidence of stone disease is common in Bangladesh, more in northern part of the country.[5]

A number of factors are known to cause stone formation with wide variation even in different parts of the country. Sex, age, occupation, fluid intake, climate, diet, race, inborn errors of metabolism are major factors influencing renal stone formation. [6] Renal stones are three times more common in males than females and the peak age of occurrence is 20 -50 years in most of the patients. [5]

Kidney stone analysis is done to see what chemicals are in it. The test is done on a kidney stone that has been passed in the urine or removed from the urinary tract during surgery. Chemical analysis of kidney stone shows the type of stone which can guide treatment and give information that may prevent more stone from forming. People who have had a kidney stone have a chance of having another one. So prevention measures are important .Thus the composition of each urinary stone must be identified.

The aim is to analyze the biochemical compositions of renal calculi in patients of SRMS IMS Bareilly and to find out the frequency of occurrence in this neighboring area. As the chemical composition of renal stones are important for un-

derstanding their etiology and the therapy is usually based on the analysis, so this study can help a proper management of the disease.

#### Material and Methods:

The materials for this study were kidney stones obtained from urology department (museum specimen). 14 stones were taken out of which 10 males and 4 females, mean age range 8-63 years.

All specimens were first washed carefully with distilled deionized water and dried after noting the morphological features such as color shape, size weight etc. Kidney stones were ground with agate pestle and mortar . This procedure produced a fine homogenous powder which was then stored in a sample tube until analyzed for biochemical composition by the procedure described in Varley's practical clinical biochemistry. [15]Some information regarding stone formation like brief family history, diet, renal function tests, serum levels of calcium , uric acid etc is also noted from the record.

Heat a small amount of the powder in a small crucible or better on a small platinum lid or foil. If the stone is organic as in uric acid and cystine stones it will burn away entirely or leave only a trace of ash. Watch carefully for the presence of a flame.

Uric acid, ammonium urate and xanthine burn away without producing a flame. But cystine gives a pale blue flame with a rather sharp smell, while fibrin gives a yellow flame with a smell of burnt feathers. [16]

Result: In present study 14 stones obtained from Urology department were analyzed for their chemical composition. After the chemical analysis we found that 92.5% stones composed of calcium oxalate as a major content while 28.58% had uric acid mixed with calcium and Oxalate . One struvite and calcium Phosphate stone was also found . according to our study Bareilly region calcium oxalate and Uric acid mixed with Oxalate and calcium are commonly found . 4 stones (28.57%) were mixed uric acid with calcium oxalate, ammonium ,phosphate . No stones had pure uric acid as contents on stone analysis . 1 stone (7.14%) had the composition of magnesium ammonium phosphate. 1 stone (7.14%) had the composition of both calcium oxalate and cal-

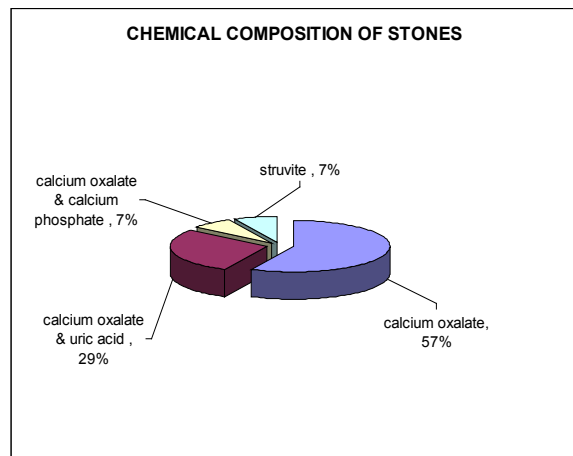
cium phosphate . Calcium Oxalate and uric acid mixed with Oxalate are commonly found in patients of Bareilly and adjoining areas.

**Table-1**  
Age & male female ratios of patients with urinary stones.

Years	Total No of patients	No of Male	No of Female	M. F. Ratio
0-10 Years	4	3	1	3:1
11-30 Years	5	4	1	2:1
31-50 Years	3	2	1	2:1
51-70 Years	2	1	1	1:1

**Table-2**  
Different types of stones

Types	Occurrence
Calcium oxalate(pure)	8
Uric acid (pure)	-
Struvite	1
Calcium oxalate+uric acid	4
Calcium oxalate+Calcium phosphate	1



**Figure-1** Chemical composition of stones

**Discussion:**

Urinary calculi are composed of substances normally present in urine together with a certain amount of proteinaceous material. Occasionally urates , calcium , magnesium , oxalate , phosphate, carbonate, cystine . The most common type of kidney stone is composed of calcium oxalate crystals occurring in about 80 % of cases. [17] About 5-10% of all stones are formed from uric acid .[17]

In our study the age range found 7-65 years with maximum patients between the age range of 7 to 35 years , including male to female ratio of 2.5 :1 . Similarly another study found similar results.[5] Chemical analysis of removed stone revealed combination of calcium , oxalate and uric acid in different proportion. In 92.5 % stones calcium and oxalate were found as a major content, while 28.58 % had uric acid mixed with calcium oxalate. 7% had struvite

stones .phosphates were found in mixture with calcium and oxalate.

Our results of stone analysis are similar to the studies conducted in AIIMS done by Ansari Ms et al. where 93% were calcium oxalate .[8] Shenaz J Khan et al. found 46% calcium oxalate + uric acid , 27% calcium + phosphate , 19% pure calcium oxalate, 2% pure uric acid and 6% triple phosphate.[3] Rehman et al . found 62% calcium oxalate with urates, 29% calcium oxalate, 5% uric acid and 5% mixed stones in a study conducted at Bahawalpur . [5] The information of chemical composition of renal stones is essential for knowing their etiology. The therapy for the renal stone disease is also based on the analysis of calculi and by the help of chemical composition proper management of the disease and prevention of its recurrence is possible.

Calcium oxalate stones mainly develop due to hyperoxaluria, which is a metabolic disorder that causes stone formation. [18] Oxalate is the end product of several metabolic pathways. 10-20% urinary Oxalate is derived from dietary sources and food rich in oxalate are cranberries, spinach, chocolate and tea. [19] Urine oxalate concentration effects calcium oxalate supersaturation as does urine calcium concentration. Hence any condition that increases oxalate absorption from food may lead to increased oxalate production and cause calcium oxalate stone formation .[20] The patients in present study were great consumers of leafy vegetables (spinach, tomato, saag ) and tea . And stones recovered from those were oxalate containing stones including pure calcium oxalate, calcium oxalate + uric acid; we found there is no patient with pure uric acid. According to Morton et al the pure uric acid stones are relatively rare. [21] Reduced urinary pH could be an important risk factor for uric acid stone formation. [22] Uric acid stones can also be developed from excess intake of meat and fish, although hyperuricosuria lead to stone formation. [20] We found 1 (7%) struvite (magnesium ammonium phosphate) stone. Formation of these calculi may be due to urinary infection. The males were greatly affected by renal calculi as compared to females .It may be because of low citrate content in males as compared to females .[23][24] Citrate act an inhibitor of stone formation which is derived from both endogenous and exogenous sources . Citrus fruits are the basis of most effective dietary treatment for these calculi. [25] The diet may be the causative factor for calcium oxalate & uric acid stones.

**Conclusion:** As the chemical composition of renal stones are important for understanding their etiology and the therapy is usually based on the analysis, so this study can help a proper management of the disease.

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