

## THE COMPOSITION OF URINARY STONES IN CENTRAL SINDH

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### ABSTRACT:

#### OBJECTIVE:

To determine chemical analysis of urinary stones of central sindh.

#### STUDY DESIGN:

Prospective and randomized study.

#### SETTING:

Department of Surgery and Pathology of Peoples University of Medical and Health Sciences Nawabshah .

#### DURATION OF STUDY:

Three years from May2008 to May 2011.

### MATERIAL AND METHODS:

Total 106 urolith patients who underwent open stone surgery were included in the study. EDTA Titration used for determination of calcium ions and determination of oxalate, phosphate, magnesium, ammonia, uric acid and cystine stones was carried out using spectrophotometer. These patients were asked to fill out a proforma with parameters of age, sex, radiological location of stone and chemical composition of surgically recovered stones. The stone analysis findings were reviewed and compared with other reported series

### RESULTS:

In this study 75(70.75%) patients were male and 31 (29.25%) female. Male to female ratio was of 2.41:1. The age ranged from 1 to 70 years with the mean of 22.69 years. The peak incidence of upper urinary tract stone in 20-30 years and lower urinary tract stones in both sexes was under 10 years. Anatomical location of stone showed 48(45.29%) renal, 13(12.26%) ureteric and 45(42.45%) bladder calculi. Chemical analysis revealed 56(52.8%) calcium oxalate, 7(6.6%) calcium phosphate, 11(10.3%) ammonium urate, 18(16.9%) uric acid, 13(12.2%) Sturvite and 1(0.9%) cystine calculi.

### CONCLUSION:

It was concluded that urolithiasis is predominantly male disease. No age group was spared to stone disease. Calcium oxalate, uric acid, ammonium urate and mixed calculi are the main types in our study due to poor nutritional status, poverty and inadequate health facilities. Considering that knowledge of stone composition is of utmost importance to modify the incidence of

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urolithiasis.

**KEYWORDS:**

*Chemical composition, Urolithiasis.*

**INTRODUCTION:**

Urolithiasis is a major public health problem with a significant proportion of patients requiring extensive surgical procedures and a sizeable minority losing their kidney<sup>1</sup>. It is one of the old and wide spread disease in all populations<sup>2</sup>. It is a common disease with global distribution. Urinary tract stones occur in about 10% of people at some point in their lives<sup>3</sup>. Stone is the sixth most common condition requiring surgery in Pakistan<sup>4</sup>. Sindh has been documented to be second major calculosis area in Indo-Pak subcontinent<sup>5</sup>. Calculus disease is an age-old medical problem and medical science doesn't have all the answers about exactly why they make? No one is certain why people do or do not develop urinary stone. The epidemiological principles have been widely applied to the study of stone disease as a multifactor disorder. There is a wide variation in the incidence of urinary stone disease in different parts of the world even in the different parts of the country<sup>6,7</sup>. The etiology of stone formation is reflected on the composition of calculi<sup>2</sup>. Urinary calculi are polycrystalline aggregates consisting of varying amount of crystal and organic matrix components. Calcium oxalate, calcium phosphate, magnesium ammonium phosphate, uric acid and cystine are the most common types of urinary stones.<sup>8,9,10,11,12</sup>. Since the chemical composition of urinary stones differs from place to place<sup>13</sup>, the published work on calculus disease in Pakistan shows glaring differences when compared to similar reports in European and American Literature<sup>14</sup>. The compositional analysis of urinary calculi is required for management aids so it is important to catch the stone, it must be passed by spontaneous passage (lithuria), broken up by lithotripsy and then passed or removed by surgical procedures, so it can be chemically analyzed. Stone disease usually continues through out the life. After the first stone attack occurs in a person they have a cumulative 10% chance per year of forming another stone, this translates in to 50% chance over a 5-year period of time<sup>14</sup>. Once a person has had urinary stone, he wants to know what can be done to avoid forming another stone. Therefore knowledge of percentage of chemical composition may

contribute to the ability to predict the most important cause of the stone.

Nawabshah sub-continent has identical geographical features, dietary habits, race and socioeconomic status. The purpose of this study is to provide better accurate knowledge of the composition of the stone to elucidate the underlying etiology and to plan meaningful regimen towards prevention of stone recurrence. The new research is making us rethink every thing we thought we knew about them to plan the future strategy.

**MATERIAL AND METHODS:**

Ethics committee approval was obtained for this trial. This prospective and randomized study was conducted in the Department of Surgery and Pathology of Peoples University of Medical and Health Sciences Nawabshah from May 2008 to May 2011. A total of one hundred six urolith patients with different stone burden underwent open stone surgery. In all it was possible to get semi-quantitative chemical analysis by Merckognost method of the most important constituents of urinary calculi like calcium, oxalate, phosphate, ammonia, magnesium, uric acid and cystine were included in this study. EDTA titration at pH 12 in presence of methyl thymol blue colour of the complex changed from blue to green, method for the determination of calcium ions. Determination of oxalate, phosphate, magnesium, ammonia, and uric acid and cystine stones was carried out using spectrophotometer Super Aquarius CE 9500. Phosphate was determined by Molybdenum blue method forming hyrazinium sulphate blue complex in acidic medium at  $\lambda$  mm 825 nm. Magnesium was determined using Solochrome back at pH 10.1 at  $\lambda$  max 520 nm. Ammonia was determined by Nessler reagent at  $\lambda$  max 410 nm. These patients were asked to fill out a questionnaire on pre-designed proforma with outcome parameters of age, sex, radiological location of stone and chemical composition of surgically recovered stones. The stone analysis findings were reviewed and compared with other reported series.

**RESULTS:**

Out of 106 patients 75(70.75%) were male and 31(29.25%) female with male to female ratio of 2.41:1. The age ranged from 1 year to 70 years with the mean of 22.69 years with the peak incidence of upper urinary tract stones in 20-30

years and lower urinary tract stones in both sexes were under 10 years (Table-I). Anatomical location of stone showed 48 (45.25%) renal, 13(12.26%) ureteric and 45(42.45%) bladder calculi as shown in (Table-II) Chemical analysis

revealed calcium oxalate 56(52.8%), calcium phosphate 7(6.6%), ammonium urate 11 (10.3%), uric acid 18(16.9%), Sturvite 13(12.2%) and cystine 1(0.9%) calculi (Table-III).

**DESCRIPTION OF TABLES**

**Table-I. Age and sex distribution.**

Age	Sex		
Group	Male	Female	Total
(Years)	24	8	32
1-10	9	6	15
11-20	18	5	23
21-30	8	6	14
31-40	6	2	8
41-50	8	0	8
51-60	6	0	6
61-70	0	0	00
Total	79	27	106

**Table-II. Anatomical distribution of urinary calculi.**

Anatomical site	Male	Female	Total	Percentage (%)
Kidneys	26	22	48	45.29
Ureters	10	3	13	12.26
Urinary bladder	39	6	45	42.45
Total	75	31	106	100

**Table-III. Comparison between frequencies of the presence of stone minerals.**

Chemical Composition	Funez A	Brien	Rizvi SA	Bilquis L	Ikramullah	Hussain SM	Present study
	%	%	%	%	%	%	%
Calcium oxalate	61.3	59.1	28	48	61.6	60	52.8
Calcium phosphate	18.5	18.5	14	8	11.6	10	10.3
Ammonium urate	7.13	0.8	18	20	---	---	16.9
Uric acid	11.2	12.3	4	8	9.4	20	6.9
Sturvite	6.6	9.0	36	12	17.4	10	12.2
Cystine	0.77	0.3	---	4	--	---	0.9

**DISCUSSION:**

Urinary stone disease has been a significant medical problem since the earliest recorded times. The amount of work being performed worldwide is testament to the severity of the symptoms associated with urinary calculus disease. With regards to the prevalence patterns of urinary stones this study has revealed males are more likely to suffer than females and no age group is spared as reported by others<sup>15</sup>. The anatomical distribution of stone site in our series showed kidney stones (45.29%) are more frequent than bladder stones (42.24%) which are in agreement with other studies<sup>16</sup>. The spectrum of stone composition varies greatly from country to country due to wide variety of dietary and cultural differences that affect stone formation. The examination of composition of individual urinary stone plays an important role in the diagnosis of treatment of various types of urolithiasis<sup>17</sup>. The cumulative results of stone analysis of a particular type of a patient together with the data on distribution of different types of stone disease is likely to enhance our understanding of epidemiology and etiology of the disease<sup>18</sup>. Scheele published the first analysis of calculi in 1776. Winer emphasized the importance of analyzing stones in determining the etiology of its formation and devised simple spot tests to give qualitative chemical composition of calculi<sup>19</sup>. The frequency of calcium oxalate, ammonia urate uric acid and mixed stoned was similar to that reported by other authors<sup>20,21,22,7,23,24</sup>. Urate was more common in vesical stones and calcium oxalate in renal stones; this may be attributed to the diet we consume like green leafy vegetables and protein imbalances.

Stone disease is the most common urological disease in central Sindh. The presence of calcium oxalate and ammonia urate in kidney and bladder stones suggests that the likely causes of stone disease in our setting are malnutrition and dehydration and high dietary intake of vegetables. Hot atmosphere, lack of fluid intake, poverty, illiteracy and dense population leads to the fact that we live in stone belt. Therefore non-specific advice is given to our patients with proper hydration and fruit juices. With such overwhelming evidence as shown in present study with special reference to risk factors and possible causes of stone formation is imperative that further

investigations be carried out in line with this research to elucidate these factors and create awareness amongst the population at large as to the dietary and cultural factors that may contribute to this illness. Clinicians alike should play key role in order to curtail this problem and facilitate and more viable and effective preventive measures to ensure a healthier and more active population.

**CONCLUSION:**

Urinary stone is a common problem in central Sindh with male predominance. Endemic bladder calculi are still prevalent in children coming from the rural areas and low socioeconomic group who lived on little meat, less milk and increased leafy vegetable as important risk factors. Hopefully with a better understanding of risk factors, an important metabolic evaluation and composition of stones, public education for early detection and treatment is required to arrive at some definite conclusion for clinicians to improve therapeutic and preventives purposes.

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