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TO EVALUATE THE BIOCHEMICAL COMPOSITION OF RENAL CALCULI IN GENERAL POPULATION OF SOUTHERN DISTRICT OF KPK. PAKISTAN.

MUHAMMAD SAJJAD[1], MUKAMIL SHAH[2], ZARD ALI KHAN[1], IMTIAZ AHMAD[2]

1. Departments of Pathology, Bannu Medical College Bannu.
2. Department of Pathology Saidu Medical College, Swat.

ABSTRACT

BACKGROUND: Renal stone are hard solid non metallic mineral particles that forms in urinary tract especially in kidney in response to multiple etiological factors including genetics, environmental, metabolic, hormonal etc.

OBJECTIVE: Renal calculi are stony hard solid particles that form in urinary tract. Most of the time stones are small and passes out in urine without causing problems. Sometimes a stone may causes retention of urine resulting in excruciating pain and needs prompt medical/ surgical treatment.

MATERIAL AND METHODS: This descriptive study was carried out in Pathology Department Bannu Medical College Bannu. The duration of this study was three years (January, 2012 to December, 2014). A total of 84 renal stones were analyzed by using chemical qualitative method. Each stone sample was washed, dried, crushed and then analysis was performed using qualitative chemical analysis kit Biolabo, Manufacturer Biolabo SAS, France.

RESULTS: The commonest renal calculi are mixed stone 31 (%) followed by uric acid (28.1%) calculi, followed in frequency by calcium oxalate calculi (26.1 %), mixed calculi containing calcium oxalate and uric acid (21.8%) and calculi containing calcium oxalate and calcium phosphate (10.4%). Other variety of calculi was less common.

CONCLUSION: This study like other studies show calcium oxalate as the commonest renal calculi, but other calculi varies in their frequency as also in other studies.

KEY WORDS: Renal calculi, Chemical analysis of stones, Calcium oxalate stone.

INTRODUCTION

Renal stones also known as a renal calculus or nephrolith is a solid mass of mineral substances. The prevalence of nephrolithiasis is increasing globally. These increases are seen across age, sex and race. Changes in dietary habits have a key role. Also global warming may influence these trends[1,2]. The history of urinary tract stones dates back to antiquity. Globally 1%–15% of the population is affected by urinary tract stones. These constitute the third most common cause of urinary tract diseases following urinary tract infections and prostatic hyperplasia[3, 4]. In the United States about 9% of the population has renal stone. These are slightly more in men than women. Also symptomatic urolithiasis is more common in men than women. In 2013 globally renal stones resulted in about 15,000 deaths[5].

The exact etiology of renal stones is not known, but familial tendency toward stone formation has long been recognized. There may be combination of genetics and environmental factors. Dehydration is the major factor in renal stone formation. The pathophysiology of renal calculi is super saturation of urine i.e solvent content of urine contains more solutes than it can hold in solution. Depending on the chemical composition of the excess solutes in urine is associated with the type of stone in kidney. Also stone formation is rapid when the urine pH is unusually high or low. The diagnosis of renal calculi is usually based on symptoms, urine routine examination and X- Ray/ ultrasound etc[6].

Hydrotherapy is the best method of renal stone prevention in people who have previous history of renal stones i.e. drinking of more fluids is suggested to produce more than two liters of urine per day. If this is not effective enough than use of diuretics may be taken[7]. It is recommended that soft drinks containing phosphoric acid typicall colas be avoided. Renal stones may be asymptomatic or may cause symptoms i.e. producing typical intense flank pain radiating to the groin and characterized by paroxysms, often followed by hematuria[8].

This study describes the composition of upper renal tract calculi in Bannu Kpk Pakistan with an estimated population of around 1.2 million and to compare the same with other studies from other regions of Pakistan and other countries.

METHODOLOGY

This study was performed in Pathology Department, Bannu Medical College Bannu. KPK. Pakistan. A total of 84 cases of renal calculi analysis were performed. The stones were collected from Khalifa Gul Nawaz Teaching Hospital Bannu and other Private centers of the region as well as from patients who passed the stone spontaneously and subjected them for analysis. The study period was three years (January, 2012 to December 2014).

All the stones subjected to chemical analysis were cleared out of all possible impurities by washing with water. The size, shape and hardness of the stones were noted. The stone were crushed into powder form. Qualitative analysis and flame test were performed. In the qualitative test the crushed powder of the calculus were transferred to test tube and then treated with different reagents for carbonate, calcium, oxalate, phosphate, magnesium, ammonium, uric acid and cystine presenc to see for different color of different chemical reagents produced by the minerals and organic substances present in the stone. The results were read out by the chemical pathologist.

RESULTS

A total of 84 stones were subjected to chemical analysis. Out of these 62 stones belong to male patients and 22 belong to female patients. The male to female ratio was 2.81: 1. The age range was from 4 – 55 years with average age of 26.4 years. The common age group involved was 21-30 years followed by 31 to 40 years. Table 1.

Table No 01: Age distribution of renal stone patients (n=84).

S. No	Age group years	No of patients	Percentage	Valid percent
1	1-10	3	3.51%	3.51%
2	11-20	35	41.66%	41.66%
3	21-30	28	33.33%	33.33%
4	31-40	14	16.66%	16.66%
5	41-55	4	4.76%	4.76%
6	TOTAL	84	100%	100%

The most common stones in this study was calcium oxalate 38 (%) followed by calcium oxalate phosphate 22 (%), calcium oxalate phosphate magnesium 12 (%) and uric acid stones 2 (%).Table 2.

Table No 02: Chemical composition of renal stones (n=84).

S. No	Type of calculi	No of patients	Percentages	Valid percent
1	Ca, Ox	38	45.23%	45.23%
2	Ca , Ox, PO4	22	26.19%	26.19%
3	Ca, Ox, PO4, Mg	12	14.28%	14.28%
4	Uric Acid	02	2.38%	2.38%
5	Total	84	100%	100%

DISCUSSION

Urolithiasis is a common and a major cause of morbidity worldwide. The history of renal stones dates back to times of Egyptian mummies. They are found in 1% of all autopsies[9].

The distribution of urolithiasis varies differently across the world. Pakistan being in the stone belt zone has a high incidence of renal stone disease.[9, 10]. In this study of 84 cases of renal stones the age range is from 4 – 55 years with

average age of 26.4±13.4 years. In a study conducted by Rafique et al[10] in 2000 in Multan the age range was from 1.5- 85 years with mean age of 31.1 years. In another study conducted by Altaf et al[19] in Jamshoro in 2013 the age range was from 5-75 years with mean age 45±16.4. In this study male patients are 62 and female are 22, with male to female ratio is 2.81: 1. In a study conducted by Rafique et al[10] the male to female ratio was 3:1, where is in a study conducted by Altaf et al[19] the male to female ratio was 2.4:1, these both are near to our study . In another study conducted by Khan et al[7] in 2013 in D.I. Khan the male to female ratio was 7.8:1 which is quite different from our study, the reason may that men suffer from hyperuricemia more than female, also because of large muscle mass of men as compared to women or there could be other unknown gender related factors[11-13]. Thus, the daily breakdown of the tissue results in increased metabolic waste and a predisposition of stone formation. The other more significant cause may be because of the male urinary tract being more complicated than the female urinary tract [14].

In this study the common age group involved is 21-30 years followed by 31- 40 years. In a study conducted by Rafique et al[10] also the common age group was 21-30 years, also in study conducted by Altaf et al[19] the common age group was 15-30 years. Another study conducted by Khan et al[7] the commonest age group was 21-40 years, where is in a study conducted by Ikramullah et al[6] in 2012 in Peshawar the commonest age group involved was 31-60 years which is quite different from our study.

In this study the most common stones are calcium oxalate 38 (45.23 %%) followed by calcium oxalate + calcium phosphate 22 (26.19%), calcium oxalate+ cacium phosphate + magnesium 12 (14.28 %%) and uric acid stones 2 (2.38 %%).Here this study is compared with other national and international studies in tabulated form to see the differences amongst them.

Table No 03: Comparison of renal stone composition with local studies.

S. No	Type of stone	Present study	Bangash[9]	Rafique[10]	Hashmi[8]	Zafar[5]
1	CA OX	38(45.23%)	89(38.4%)	183(26.1%)	120(60%)	87(33.7%)
2	CA OX+ CA PO4	22(26.19%)	37(15.9%)	73(10.4%)	44(22%)	49(18.9%
3	CA OX+ CA PO4+ MG	12(14.28%)	NIL	NIL	NIL	2(0.77%)
4	UA	2(2.38%)	1(0.43%)	197(28.1%)	4(2%)	NIL

Table No 04: Comparison of this study with international studies.

S.No	Type of stone	Present study	Iran 2008[16]	Saudi Arabia 2004[18]	Japan 2003[17]
1	CA OX	38(45.23%)	80.2%	78%	81.6%
2	CAOX+ CAPO4	22(26.19%)		NIL	NIL
3	CAOX+ CAPO4+ MG	12(14.18%)	0.4%	NIL	NIL
4	U A	2(2.38%)	0.2%	19%	9.6%

Abrevation used: CA=Calcium, OX= Oxalate, PO4= Phosphate, MG=Magnesium, UA=Uric Acid.

Comparison of both local and international studies shows gross differences in the composition of renal calculi. This may be due to the differences in drinking water habit, excessive consumption of meat leading to marked increase in kidney stones because of over acidification of urine leading to increased excretion of oxalate, calcium and uric acid, whereas the excretion of citrate, which provides protection against stone formation is decreased. Dietary oxalate contributes to about half of the urinary oxalate. Spinach, rhubarb, beets, chocolate, nuts, tea, wheat bran, strawberries, and soya foods are known to increase urinary oxalate concentrations[15,16]. Vitamin C increases urinary oxalate excretion and the risk of calcium oxalate crystallisation leading to calcium stones formation due to low volume of urine, increased excretion of oxalic acid and calcium and a

deficiency of citrate, which inhibits crystallization in the urine[17]. Also there are limitations in the method of stone analysis in different laboratories, all these may contribute in the differences in chemical composition of renal stones in different locations both at local and abroad levels[18.19].

CONCLUSION

This study like other studies show calcium oxalate as the commonest renal calculi, but other calculi varies in their frequency from region to region as show in other studies conducted at various places.

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CORRESPONDENCE ADDRESS

Name: Dr. Mohammad Sajjad
Address: Associate Professor Pathology,
Bannu Medical College, Bannu KPK. Pakistan
E mail Address: sajjadkhattak66@gmail.com
Phone 0992333-9343645