EPIDEMIOLOGICAL RISK FACTORS AND COMPOSITION OF URINARY STONES IN RIYADH SAUDI ARABIA

Abdus Salam Khan, Manzoor Ellahi Rai, Gandapur, Ayesha Pervaiz, Arif Hussain Shah*, Abdallah Aba Hussain*, Muhammad Siddiq**

Women Medical College, Abbottabad, *Food/Drug and Central Laboratory, Riyadh, Saudia Arabia, ** National Institute of Health, Islamabad.

Background: The purpose of this study was to perform the chemical analysis of stones to know the pattern of biochemical composition of stones and to determine epidemiological risk factors for stone formation in Riyadh Saudi Arabia. **Methods:** 307 renal stones were analyzed during one year period from September 2000 to August 2001. These stones were sent to central lab Riyadh for analysis from different hospitals attached to this region. The stones were analyzed by semiquantitative method. The kits supplied by Maascia Bruneli SPA. (Italy) was used for chemical analysis of stones. The powered stones and standards both were analyzed for uric acid, cystine, oxalate, carbonate, phosphate, ammonia, calcium and magnesium contents. **Results:** Male to female ratio was 5:1. The stone frequency was 2.5 times more in Saudis as compared to non-Saudis. Maximum number of stones were analyzed in peak summer months. Calcium oxalate stones were the commonest followed by uric acid and phosphate stones. No cystine stone was found in the series analyzed. **Conclusion:** From the study of epidemiological factors it seems that the Saudis are more prone to development of stones. A clear stone season seems to exist in the area corresponding to the summer months. The relative increased frequency of stones in the region indicates that nutritional, environmental and genetic factors play a role in the occurrence of stones.

Keywords: urinary stones, composition, epidemiology

INTRODUCTION

Urolithiasis or formation of urinary calculi at any level of the urinary tract is a common condition. Urinary calculi are worldwide in its distribution but are more common in some geographic areas as in parts of United States, South Africa, Pakistan, India and South East Asia.

It is estimated that approximately 2% of the population renal stone disease at sometimes in their life with a male to female ratio of 2.1. The peak incidence is observed in 2nd and 3rd decades of life. Renal Icalculi are characterized clinically by renal colic as they pass down along the ureter and manifest as haematuria[1] .

There are four types of calculi. Most stones about 75% are calcium containing composed largely of calcium oxalate mixed with calcium phosphate. Another 15% are called triple phosphate stones or struvite stones composed of magnesium ammonium phosphate.6%are uric acid stone and 1-2% are made up of cystine stones.[2].

Renal stones formation is believed to be the result of both excessive concentration of the stone constituents and conducive physicochemical situations. Important factors are excessive concentration of

urinary excretory products because of highly concentrated urine resulting from environmental or habitual chronic dehydration. Hypercalciuria from various causes, excessive oxalate or uric acid production or an acquired or genetic basis and hereditary cystinuria are important causes. The factors conducive to precipitation of crystalloid may be equally important. An alkaline pH favors calcium phosphate stone formation.[3].

Since the chemical composition of calculi is very important for the purpose of determining both the origin and aetiology, a study was therefore done to perform the chemical analysis of stones to know the pattern of biochemical composition of stones in Riyadh Saudi Arabia.

MATERIAL AND METHODS

The stone were sent to Central Lab Riyadh from different government hospitals, for chemical analysis. These stones were either removed surgically or were expelled by other means. A request form having brief history was sent with the stone The stone were washed in distilled water grinded and powdered in a mortar and were analyzed by samiquantitative method [4].

The kits supplied by Mascia Brunell S.P.A (Italy) was used for chemical analysis of stones. The synthetic standard available in the form of fine power was analyzed along with the test samples to serve as a control. The powered stones and standard both were analyzed for uric acid, cystine, oxalate, carbonates, phosphates; ammonia, calcium and magnesium contents.

RESULTS

Three hundred and seven (307) stones were analyzed chemically during one year period from September 2000 to October 2001.Both Saudis and Non-Saudis patients from different countries working in Saudi Arabia were included in the study. Out of these,256 stones belonged to males while 51 stones to female. The male to female ratio was 5:1. Two hundred and twenty (220) stones were of Saudi patients while 87 were of non-Saudis. The stones were 2.5 times more common is Saudis as compared to Non-Saudis Table 1. Maximum number of stones were analyzed in summer months I e June, July and August, Table 2 Out of a total of 307 stones, 238 stones (78%) were calcium oxalate, 59 (19%) were uric acid and 10 (3%) were phosphate (Struvite) stones. One stone was typical stag horn stone, about 4cm in length.

Table–1: Sex and nationality wise distritution of stones

	No. of Stones	**%age**	**Ratio**
Sex			
Male	256	83.0	5 : 1
Female	51	17.0	
Nationality			
Saudi	220	72.0	2.5: 1
Non-Saudi	87	28.0	

Table-2: Month wise distribution of stones

Month	**Number**	**%age**

January	23	7.5
February	25	8.2
March	07	2.3
April	16	5.2
May	28	9.1
June	34	11.0
July	35	11.4
August	38	12.4
September	32	10.4
October	25	8.2
November	23	7.5
December	21	6.8
Total	**307**	

Table-3: Types of stones

Stone type	**No. of Stones**	**%age**
Calcium Oxalate	238	78%
Uric Acid	59	19%
Struvite	10	3%
Total	**307**	**100%**

DISCUSSION

The present study shows that incidence of stone formation in central region of Saudi Arabia (Riyadh) is quite high. The stone incidence is 2.5 times higher in Saudis as Compared to Non-Saudis (Table-1). Ramello et al reported the incidence of urolithiasis in Asia, Europe North America and Saudi Arabia. The maximum numbers of stone formers (20%) were reported in Saudi Arabia while the minimum in Asia (1-5). These findings support our observations.[5]

The male to female ratio in this study was 5:1. Most workers have reported that it is 2 times more in male than females. Peters et al have reported that, it is 2-4 times more in males as compared to females. These findings are in close proximity to our reports.[6]

Maximum number of cases were found in the summer months of June, July and August. These results suggest that there is clear stone season in this area corresponding to hot summer months. Similar observations were made in a retrospective study by Al-Hadramy in the western region of Saudi Arabia[7].

Majority of the stones were composed of calcium (78%) followed by uric acid (19%) and phosphate stones 9 (3%). No cystine stone was found in the present series. Al most similar finding were reported by Halem and Al-Rasheed from Saudi Arabia in other studies.[8-9]

However the relative incidence of calcium oxalate stones in our study was on the higher side as compared to uric and struvite stones. Almost similar finding were reported by Kambal et al from Sudan.[10]

The exact pathogenesis of urolithiasis is not known. A number of promoters, inhibitors and predisposing factors can contribute to the development of stone formation. From the above results it appears that nutritional and environmental factors play a role in the pathogenesis of urolithiasis is Saudi Arabia.

In addition to the other factors, oxalate rich diet like rice, tomatoes, salad and Coca-Cola group of drinks may play contributory role in the formation of calcium oxalate stones. Again high animal protein consumption and affluency may be one of the reasons of uric acid stone formation. The relatively decreased incidence of infective stones in this study may be due to the better health conditions and high standard of living in Saudi Arabia.

Concludingly, it is stated that nutritional and environmental factors seem to play a role in stone formation. Hence dietary intervention on a large scale and health education in this regard may be helpful on the preventive side.

REFERENCES

1. Rennke H. Urolethiasis. In: Cotran RS, Kumar V, Collins T, Eds. Robbins Pathologic Basis of Disease. 6th ed., Philadelphia WB. Saunders company, 1999: 989-90.

2. Scheriner GF, Renal Calculi In : Kissane JM Ed. Anderson Pathology: 9th ed., New Delhi: Jaypee Brothers, 1991;840-41.

3. Jager P. Genetic versus environmental factors in renal stone disease. Curr opinn Nephrol Hyperten. 1996: 5342-46.

4. Beeler MF, Zeith DA, Morris RH, Biskin GR. Calculus semiquantitative tests on composition of urinary calculi analysis. Am J Clinical Pathology 1964;41-55.

5. Ramello A, Vital C. Marangella M. Eqidemiology of Nephrolithiasis. J Nephrol 2000:138 Suppl 3:545-50.

6. Alhadramy MS. A retrospective study on urolithiasis. J Pak Med Assoc 1997;11(47):281-4.

7. Paul C, Timothy B, Boone IF. Principles of surgery: 6th Ed. New York, Tokyo, London McGraw hill 1994:1743-52

8. Abdul-Haleem RE, Al-Sibaai A , Baghlafao AO. Ionic associations with in 460 non-infection urinary stones. Quantitative chemical analytic study, applying a new classification. Scand J urol Nephrol 1993;27(2):155-62.

9. Al-Rasheed SA; Elfaqish SR, Hussain I, Almugerin Mm. The etiological and clinical pattern of childhood urolithiasis in Saudi Arabia. International Urology Nephrol 1995;27(4):349-55.

10. Kambal A, Wahab EM, Khattab AH. Composition of Urinary stones in Sudan. Br J Urol 1979;51(5):342-4.

Address For Correspondence:

Prof. Abdus Salam Khan, Head of Pathology, Women Medical College, Abbottabad.