ORIGINAL ARTICLE

Twenty Four Hour Urinary Aberrations in Renal Stone Formers

MUHAMMAD MASOOD[1], ABDUL GHAFFAR[2], ANUSHA GHAFFAR[3]

ABSTRACT

Aim: To compare the urinary aberrations in renal stone formers with healthy controls .
Methods: It is case control study carried out at Department of Urology, Nishtar Hospital Multan from May 2016 to November 2016. Patients with renal stones n-160 were recruited into Group-A and Equal number n-160, age matched healthy male volunteers with no evidence of urolithiasis were recruited in group-B .
urine volume). Findings of aberrations were noted.
Results: Mean age (±S.E.M.) of patients was 41.68±0.70 vs. 39.65±0.76 years in group-A and group-B respectively. In our study low urine volume was evident in 21(13.1%) cases and 10(6.3%) controls in group-A and B respectively. Hypercalciuria was found in 42(26.3%) cases and 23(14.4%) controls in group-A and B respectively. Hyperuricosuria was found in 21(13.1%) cases and 19(11.9%) controls in group-A and B respectively. Low urine volume and hypercalciuria were significantly more common in Group-A compared with group B while hyperuricosuria had no significant difference between group-A and B.
Conclusion: Present study concludes that hypercalciuria was more frequent in cases (26.3%) than controls (14.4%) and hyperuricosuria was 13.1% in cases and 11.9% controls. Low urine volume was evident in 13.1% cases and 6.3% controls.
Keywords: Urolithiasis, Urinary stones, Urinary aberrations

NTRODUCTION

Urolithiasis is a worldwide problem sparing no geographical, cultural or racial groups but in certain areas of the world, the incidence of urinary stones is much higher. The etiology of urolithiasis is multifactorial and is influenced by both genetic and environmental factors[1]. Different types of stones occur in different parts of the world, and dietary factors probably play a part in determining the varying patterns[3]. There are different types of urinary stones. Calcium Stones, 80% to 85% of all urinary stones are composed of calcium salts[4]. Calcium oxalate monohydrate (COM) or whewellite and calcium oxalate dehydrate (COD) or weddellite are the commonest constituents of calcium stones[5]. Cystinuria is an autosomal recessive disorder of transmembrane cystine transport manifested in intestine and kidney[7]. These stones account for about 1% of all urinary stones. Cystinuria can cause renal stones in childhood, but the peak of clinical expression is in the 2nd and 3rd decades of life. Other relatively uncommon stones are Xanthine silicate and Iatrogenic stones (composed primarily of proteinaceous material and fungus balls).

Intrinsic factors of urolithiasis include ethnic, racial and familial background. Under all concepts of causation of urinary calculi, heredity plays role. People having family history of urolithiasis are high risk for developing urinary lithiasis[10]. Cystinuria is a prime example of familial transmission of a type of urinary lithiasis. Kidney stones occur more frequently in men with increasing age[11]. About 3 males are affected for every female.

Geography has an effect on urinary stone disease in terms of temperature and humidity. There is no doubt in geographic variability in cases of urinary stones[12]. There is noticeable increase in urinary calculi in those who live in deserts and tropical areas. There is a relationship between environmental temperature and seasonal incidence of urinary stone disease also. That may be due to high temperature, perspiration, change in pH and volume of urine .Moreover, increased exposure to sunlight during summer causes increased production of vitamin D3 and increased urinary calcium excretion[13]. This may cause a higher incidence of urolithiasis during summer season. This factor has more impact on light-skinned people[13].

The magnitude of the increased risk may be greater in women than in men[14]. Water intake, diet, occupation and medications definitely predispose the stone formation.

MATERIALS AND METHODS

It is case control study carried out at Department of Urology, Nishtar Hospital Multan from May 2016 to

[1]*SR Urology, MIKD. Multan,*
[2]*Associate Professor of Urology, MIKD. Multan, Multan,*
[3]*House Officer Urology Nishtar Hospital, Multan*
Correspondence to Dr. Muhammad Masood Email: masood1541@yahoo.com, aghaffaruro@yahoo.com

November 2016. Patients with renal stones n-160 were recruited into Group A and Equal number n-160, age matched healthy male volunteers with no evidence of urolithiasis were recruited in group B .

This study was carried out in Department of Urology, Nishtar Hospital Multan and was completed from 17th May 2016 to 16th November 2016. Using the Non probability purposive sampling technique ,and calculating the Sample size as p_1=25%[10], p_2=14%, α=0.05 and power of test 80%, total n-320 patients were selected. Group A (stone formers) n-160 male patients and n-160 in group B (normal controls).

The collected information were analyzed with SPSS version 10. Descriptive statistics were used to calculate mean and standard deviation for continuous variables like age. Frequencies and percentages were calculated for categorical variables like gender, hypercalciuria, hyperuricosuria and low urine volume. Chi-square test was used to compare categorical variables (hypercalciuria, hyperuricosuria and low urine volume) in Group A and Group B. p-value ≤ 0.05 was considered statistically significant. Effect modifiers like age, duration of disease were controlled by stratification and chi-square test was applied to see the effect of these on outcome variables.

RESULTS

Age distribution is shown in table-1. Duration of disease in patients with renal stone is given in table. Table-3 shows the urinary aberration with renal stone and health controls. In table-4 age distribution of patients with renal stone and healthy controls in relation to outcome is shown. Table-5 shows age distribution of both groups. In table-6 age distribution of patients with renal stone and healthy controls in relation to outcome is shown. In table-7 age distribution of patients with renal stone 0 in relation to outcome is shown.

Table 1: Age distribution of both groups

Age (yrs)	Group A (%)	Group B (%)
21-30	16(10%)	28(17.5%)
31-40	55(34.4%)	56(35.5%)
41-50	57(35.6%)	47(29.4%)
51-60	32(20%)	29(18.1%)
Total	83(100%)	83(100%)

Table 2: Duration of disease in group-A

Duration	Group A	Percentage
1-10	65	40.6
11-20	58	36.3
21-30	31	19.4
31-40	05	03.1
41-50	01	00.6

Table 3: Urinary aberrations in both groups

Aberrations	Group A	Group B
Low urine volume	21(13.1%)	10(06.3%)
Hypercalciuria	42(26.3%)	23(14.4%)
Hyperuricosuria	21 (13.1%)	19(11.9%)

Table 4: Age distribution of both groups in relation to outcome

Age (yrs)	No.	Group A	No.	Group-B
21-30	16	1(06.2%)	28	1(03.3%)
31-40	55	5(09.1%)	56	4(07.1%)
41-50	57	9(15.8%)	47	4(08.5%)
51-60	32	6(18.8%)	29	1(03.6%)

Table 5: Age distribution of both groups in relation to outcome

Age(yrs)	No.	Group-A	No.	Group-B
21-30	16	5(31.3%)	28	1(03.6%)
31-40	55	17(30.9%)	56	7(12.5%)
41-50	57	15(26.3%)	47	10(21.3%)
51-60	32	5(15.6%)	29	5(17.2%)

Table 6: Age Distribution of both groups in relation to outcome

Age (yrs)	No.	Group-A	No.	Group-B
21-30	16	2(12.5%)	28	4(14.3%)
31-40	55	5(09.1%)	56	7(12.5%)
41-50	57	10(17.5%)	47	5(10.6%)
51-60	32	4(12.5%)	29	3(10.3%)

Table 7:- Duration of disease in group-A in relation to outcome

Duration	n= (G/A)	No. of patients in group-A with		
		Low urine volume	Hyper-calciuria	Hyper-uricosuria
1-10	65	11 (16.9)	16 (24.6)	08 (12.3)
11-20	58	08 (13.8)	15 (25.9)	05 (08.6)
21-30	31	01 (03.2)	08 (25.8)	06 (19.4)
31-40	05	01 (20.0)	03 (60.0)	01 (20.0)
41.50	01	-	-	-

DISCUSSION

The formation of stones in the urinary tract stems from a wide range of underlying disorders. Clinicians look for the underlying causes for nephrolithiasis is imperative to direct management. Medical management of recurrent kidney stone patients based on the process of correcting specific abnormalities of the 24-hour urine collection(s) will allow most stone patients to be treated by their primary urologist without referral to a dedicated kidney stone centre[12].

There are many advances in genetics, pathophysiology, diagnostic imaging, medical treatment, medical prevention, and surgical intervention of nephrolithiasis. Several extrinsic factors, e.g. geography, climate, water intake, diet,

metabolic disorders and occupation, are considered risk factors for stone formation and recurrence. If there was a reliable prediction of which factor were important in increasing the risk for stone formation and recurrence, efforts in both medical prevention and life-style changes could be preferentially directed towards those factors. Dehydration and low urinary volume are widely accepted risk factors for urinary stone disease. Nephrolithiasis is a disease of concentration. Modifying the concentration of the lithogenic factors is the focus of stone prevention[13,14].

Present study was conducted to compare the urinary aberrations in renal stone formers (Group-A) with healthy controls (Group-B) at Nishtar Hospital Multan. In our study low urine volume was evident in 21(13.1%) cases and 10(6.3%) controls in group-A and B respectively. Hypercalciuria was found in 42(26.3%) cases and 23(14.4%) controls in group-A and B respectively. Hyperuricosuria was found in 21(13.1%) cases and 19(11.9%) controls in group-A and B respectively. Low urine volume and hypercalciuria were significantly more common in group-A compared with group-B while hyperuricosuria had no significant difference between group-A and B. These results are comparable with international literature.

Stitchantrakul et al evaluated urinary risk factors for recurrent calcium stone formation in Thai stone formers[15]. Seven patients (8.1%) were diagnosed as incomplete renal tubular acidosis (iRTA). Among the 79 idiopathic calcium stone formers (ISF), 15.2%, 10.1%, 7.2% of patients were hypercalciuria, low urinary volume, hyperuricosuria respectively. Hypocitraturia was the most common urinary risk factor found in Thai recurrent idiopathic calcium stone formers followed by hypercalciuria and low urinary volume. Almost one-fourth of the stone formers had multiple risk factors. iRTA was common among recurrent calcium stone formers.

Orakzai et al investigated the frequency of biochemical abnormalities in urolithiasis patients and compared the abnormality between the first time and recurrent stone formers[16]. Out of total of 113 patients, 83(73%) had some urinary or blood abnormality. Highest number of abnormalities was in urine. Low volume 33(39.76%), hypercalciuria 33(39.76%) and hyperoxaluria 20 (24.1%) were the main urinary abnormalities. Females had significantly higher frequencies of low urinary volume (48% vs 21%, p=0.001). Sandeep Julka et al evaluation in high-risk patients with renal stones in North India and found that among the metabolic abnormalities detected hypercalciuria was in 26 patients (52%), hyperuricosuria in 9 (18%) and low urine volume (6%)[17].

In one study conducted in Portugal, a population of 87 consecutive idiopathic recurrent calcium stone formers (IRCSF) was evaluated over a 5-year period. The results were compared with a control group of 45 healthy subjects (HS). Significantly higher urinary calcium and lower urinary citrate were observed in IRCSF group when compared with HS group. Hyperoxaluria was the most frequent abnormality, observed in 40.2% of the patients, hyperuricosuria in 33.3%, hypercalciuria in 24.1%, low urine volume in 19.5%[18].

Kıraç et al in a Turkish study evaluated the metabolic changes in patients with recurrent calcium oxalate stones. Hyperoxaluria was the major metabolic abnormality (64.4%), but we also detected low urinary volume, hypercalciuria, hypocitraturia, hypernatriuria, and hyperuricosuria in 66(46.2%), 47(32.8%), 47(32.8%), 44(30.8%), and 21(14.7%) patients, respectively[19]. Pais determined effect of dietary control of urinary uric acid excretion in calcium oxalate stoe formers and n-stone forming control two hyperuricosuric (3%) in control group and one (2%) in the stone forming group were identified[20].

CONCLUSION

Present study concludes that hypercalciuria was more frequent in cases (26.3%) than controls (14.4%) and hyperuricosuria was found in 13.1% of cases and 11.9% of controls. Low urine volume was evident in 13.1% of cases and 6.3% ofcontrols. . This proved the hypothesis that Renal stone formers have low urinary volume and elevated levels of 24 hour urinary calcium and uric acid as compared with healthy controls.

REFERENCES

1. Goldfarh DS, Fischer ME, Keich Y, Goldberg J. A twin study of genetic and dietary influences on nephrolithiasis; a report from Vietnam Era Twin (VET) Registry. Kidney In. 2005; 67: 1053-61.
2. Goddard J, Turner AN, Cummig A, Stewart LH. Diseases of the kidney and genitor-urinary system. In: Boon NA, Colledge NR, Walker BR, editors. Davidson's principles and practice of medicine. New York: Churchill Livingstone; 2002. p. 455-518.
3. Miggiano GA, Migneco MG. Diet and nutrition in nephrolithiasis. Clin Ter 2007; 158: 49-54.
4. Trinchieri A, Castelnuovo C, Lizzano R, Zanetti G. Calcium stone disease: a multiform reality. Urol Res 2005; 33: 194-8.
5. Stoller ML. Urinary stone disease. In: Kreder KJ, Williams RD, editors. Smith's general urology. New York: McGraw Hill; 2004. p. 256-90.
6. Taylor EN, Stampfer MJ, Curhan GC. Dietary factors and the risk of incident kidney stones in men: new insights after 14 years of follow-up. J Am Soc Nephrol 2004;1 5: 3225-32.
7. Hess B. Pathophysiology, diagnosis and conservative

therapy in calcium kidney calculi. Ther Umsch 2003; 60: 79-87.
8. Chen YY, Roseman JM, Devivo MJ, Huang CT. Geographic variation and environmental risk factors for the incidence of initial kidney stones in patients with spinal cord injury. J Urol 2000; 164: 21-6.
9. Pearle MS, Lotan Y. Urinary lithiasis: etiology, epidemiology and pathogenesis. In: Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. Campbell-Walsh urology. Philadelphia: Saunders; 2007. p. 1361-92.
10. Taylor EN, Stampfer MJ, Curhan GC. Obesity, weight gain, and the risk of kidney stones. JAMA 2005; 293: 455-62.
11. Hall PM. Preventing kidney stones: calcium restriction not warranted. Cleve Clin J Med 2002; 69: 885-8.
12. Pearle MS, Lotan Y. Urinary lithiasis: etiology, epidimiology and pathogenesis. In: Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. Campbell-Walsh urology. Philadelphia: Elsevier; 2007. p. 1257-86.
13. Paterson R, Fernandez A, Razvi H, Sutton R. Evaluation and medical management of the kidney stone patient. Can Urol Assoc J 2010; 4(6): 375-9.
14. Taylor EN, Curhan GC. Diet and fluid prescription in stone disease. Kidney Intern 2006; 70: 835–9.
15. Stitchantrakul W, Kochakarn W, Ruangraksa C, Domrongkitchaiporn S. Urinary risk factors for recurrent calcium stone formation in Thai stone formers. J Med Assoc Thai 2007; 90(4): 688-98.
16. Orakzai N, Hanbury DC, Farrington K. Screening for biochemical abnormalities in urolithiasis patients. J Ayub Med Coll Abbottabad 2004; 16(2): 7-8.
17. Julka S, Gupta SK, Srivastava A. Protocol-based metabolic evaluation in high-risk patients with renal stones in North India. Indian J Endocrinol Metab 2012; 16(2): 283-7.
18. Serra E Fernando A, Domingos E Conceição, Salgueiro E M, Prata M. Avaliação metabólica da litíase cálcica idiopática recorrente em Portugal. Acta Médica Portuguesa 2004; 17(1): 2-3.
19. Kıraç M, Küpeli B, Karaoğlan Ü, Bozkırlı İ. Metabolic evaluation in patients with recurrent calcium oxalate stones. Türk Uroloji Dergisi 2011; 37(3): 246-51.
20. Pais VM Jr, Holmes RP, Assimos DG. Effect of dietary control of urinary uric acid excretion in calcium oxalate stone formers and non-stone-forming controls. J Endourol 2007; 21(2): 232-5.