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RENAL STONES - AN OCCUPATIONAL HAZARD?

Surgery

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ABSTRACT

Urolithiasis is the most common presentation among urological admissions in most of the tropical countries like India. It's been postulated that an individual's occupation, may predispose him to various environmental exposures and also dietary and fluid intake restrictions which may in turn predispose him for formation of urolithiasis. However, no Indian study has been conducted to study the correlation between the occupation and the incidence of urolithiasis. Hence this study was designed with an objective to assess the impact of occupation on urolithiasis.

Methods: This was a cross sectional observational study in which all patients above the age of 18 years treated in the Urology department between 01 Jan 2015 and 30 June 2017 were included. The demographic profile of all the patients were recorded which included the occupation as categorised by the International Standard Classification of Occupations (ISCO-08). The number, the maximum size of the stone and the location were also recorded.

Results: A total of 1736 patients were treated as in-patients at our urology centre between 01 Jan 2015 and 30 Jun 2017. Out of these, 962 patients (55.41%) were treated for Urolithiasis and 774 (44.59%) for other diseases. A total of 6 patients were excluded from final analysis. It was seen that the outdoor occupation i.e. the Armed Forces, Elementary Occupations and the Skilled agricultural, forestry and fishery worker groups had a higher proportion of urolithiasis; 69.50; 56.95 and 52.69 % respectively. Among the indoor workers the plant and machine operators had the highest proportion of urolithiasis (46.88%).

Conclusion: The Armed forces and the other outdoor profession are at an increased risk of developing urolithiasis. Although other factors definitely interplay in the causation but the occupation of an individual which has an effect on multiple factors may increase the risk of developing urolithiasis.

KEYWORDS

Introduction

Urolithiasis is the most common presentation among urological admissions in most of the tropical countries like India.

Urinary tract stones are crystallized masses of minerals that are formed mainly due to super concentration and stasis of urine. Multiple risk factors are involved in triggering and development of these urinary stones. The risk factors can be categorized according to the types of stones. The urinary stones composed of cysteine, xanthine and uric acid are formed in urinary tract particularly as a result of derangement in metabolism of these compounds. These defects of metabolism can be inherited, exhibiting positive family histories in affected patients. In the formation of triple phosphate (stag horn) calculi, urinary tract infections play a major role. Bacteria such as protease and staphylococcus split urea into ammonia making urine more alkaline which in turn predispose to urinary calculi formation. Besides these factors, a hyper-concentrated low urinary volume owing to less fluid intake and increased respiratory and cutaneous water loss is also identified as an important risk factor in urinary stone formation[1].

The occupation of the individual may predispose him to various environmental exposures and also dietary and fluid intake restrictions which may in turn predispose him for formation of urolithiasis. However, no Indian study has been conducted to study the correlation between the occupation and the incidence of urolithiasis. Hence this study was designed with an objective to assess the impact of occupation on urolithiasis.

Material and Methods

The study was designed as a cross-sectional descriptive study with an aim to assess the impact of occupation on urolithiasis. The Institutional Review Board clearance was taken prior to the conduct of the study. The records of all patients treated in the Urology department between 01 Jan 2015 and 30 June 2017 were reviewed.

Inclusion Criteria

1. All patients treated as in patients in the Urology centre of our hospital.
2. Age more than or equal to 18 years.

Exclusion Criteria

1. Patients whose records did not capture the complete data.

The demographic profile of all the patients included in the study were recorded which included the age, sex, family history of stones and the occupation. The occupation of the individual was categorised into one of the 10 groups as per the International Standard Classification of Occupations (ISCO-08); (Table 1). Besides these parameters the number, the maximum size of the stone and the location were also recorded.

Statistical analysis: Data were entered and coded in MS Excel (Version, 2007) and all statistical analyses were performed by using SPSS software (Version 16, SPSS Inc, Chicago, IL, USA).

Results

A total of 1736 patients were treated as in-patients at our urology centre between 01 Jan 2015 and 30 Jun 2017. Out of these, 962 patients (55.41%) were treated for Urolithiasis and 774 (44.59%) for other diseases. Out of these complete records were missing for 06 patients; 02 in urolithiasis group and 04 in non –urolithiasis group and were excluded from the final analysis [Fig 1].

The demographic profile of the Urolithiasis group is presented in Table 2. The mean age of the patients treated for urolithiasis was 38.5 years. Out of these 81% of the patients were male and the male female ratio was 4.26:1.

The occupational distribution is shown in Table 3.

It was seen that the outdoor occupation i.e. the Armed Forces, Elementary Occupations and the Skilled agricultural, forestry and fishery worker groups had a higher proportion of urolithiasis; 69.50; 56.95 and 52.69 % respectively. Among the indoor workers the plant and machine operators had the highest proportion of urolithiasis (46.88%).

Discussion

Urolithiasis is the most common diagnosis in any urological clinic and consequently the most commonly treated entity. Our data also confirmed this fact as 55.41 % of our patients were treated for Urolithiasis alone.

In developing countries the male-to-female ratio in patients with urolithiasis range from 1.15:1 in Iran and 1.6:1 in Thailand to 2.5:1 in Iraq and 5:1 in Saudi Arabia. In our study this ratio was 4.26:1. There has been an increase in the incidence of urolithiasis in the females over the last few decades and this has been attributed to the lifestyle associated risk factors.

Occupation has an indirect impact on the causation of Urolithiasis. Physical activity, ambient temperature, fluid intake and dietary factors are the known variables for the causation of urolithiasis. Occupation has a direct impact on these factors thereby indirectly affecting the incidence of urolithiasis. Although not many studies have looked into the correlation of occupation with urolithiasis, it has been seen that the outdoor workers are more prone to develop urolithiasis.

The International Standard Classification of Occupations (ISCO 2008) categorises the occupations in ten broad groups. We have taken this internationally accepted classification to divide our study population into various subgroups and to calculate the prevalence of Urolithiasis in each of these subgroups.

It has been postulated that the chronic stress lead to the development of urinary tract calculi. This factor may play a role besides the dietary and the genetic factor in the high stress jobs as seen in the Managers and the Professionals. The proportion of managers and professionals with urolithiasis in the in our study was less as we felt that these patients prefer to go to a private hospital rather than getting treated in a Government hospital like ours. Hence the exact prevalence of urolithiasis in this group may not be the true reflection of the actual prevalence in the population at large.

High Ambient temperature specially when combined with a low urinary volume is an important risk factor for urolithiasis. This is especially true for outdoor workers in the tropical countries. Our findings also corroborate with this and the prevalence rates of urolithiasis in outdoor workers were found to be high. It was 56.95% in the Elementary occupations group which includes the agricultural and the construction labourers besides the street vendors. Brikowski et al, in their study, examined how global warming alters regional distribution of kidney stones using a modeling technique. They predicted that, based on the effects of global warming, the percentage of people living in areas designated as high risk for kidney stone formation would increase from 40% in 2000 to 56% by 2050, and up to 70% by 2095. This would result in a significant "climate-related" increase in kidney stone events.

The Armed forces personnel are also exposed to extremes of climates. And besides the climate the service conditions at times would not be conducive for them to consume enough fluids leading to higher chances of formation of urinary tract calculi. There may be many other confounding variables which would increase or decrease the chances of stone formation in an individual but the overall prevalence rate of urolithiasis in this occupational subgroup was the highest in our study. The rate of urolithiasis in the Armed Forces subgroup was 69.5%. A similar finding has been reported by various authors in various countries [11].

This study did not look into the causative factors of the urolithiasis and only explored the occupational distribution. The greatest limitation of this study is that it is a hospital based study and may not represent the true prevalence of urolithiasis in the general population and the occupation subgroup. Moreover the prevalence of urolithiasis in some of the subgroups may have been overestimated due to less number of patients in the subgroup.

Conclusion

Urolithiasis remains the most common urological condition. The Armed forces and the other outdoor profession are at an increased risk of developing urolithiasis. Although other factors definitely interplay in the causation but the occupation of an individual which has an effect on multiple factors may increase the risk of developing urolithiasis.

TABLES

Group Code	Occupation
1	Managers
2	Clerical support workers
3	Professionals
4	Technicians and associate professionals
5	Service and sales workers
6	Plant and machine operators, and assemblers
7	Craft and related trades workers
8	Skilled agricultural, forestry and fishery workers
9	Elementary occupations
10	Armed forces occupations

Table 1: Major Occupation Groups (ISCO-08)

Demographic Profile	Urolithiasis (n=960)	No Urolithiasis (n=770)
Mean Age (years)	38.5	45.7
Male: Female Ratio	4.26:1	2.3:1
Family History of urolithiasis: n (%)	114 (0.12%)	89 (0.09%)
Mean size of stone (mm)	8.24	-
Location		
Renal	574	-
Ureter	372	-
Bladder	12	-
Urethra	2	-
Number of stones		
>10	87	-
5-10	66	-
2-5	164	-
1	643	-

Table 2: Demographic Profile of the study population.

Occupation	Urolithiasis	No Urolithiasis	Total	Proportion (%)
Managers	1	4	5	20.00
Clerical support workers	19	34	53	35.85
Professionals	10	20	30	33.33
Technicians and associate professionals	15	18	33	45.45
Service and sales workers	73	76	149	48.99
Plant and machine operators, and assemblers	90	102	192	46.88
Craft and related trades workers	151	167	318	47.48
Skilled agricultural, forestry and fishery workers	98	88	186	52.69
Elementary occupations	127	96	223	56.95
Armed forces occupations	376	165	541	69.50
Total	960	770	1730	

Table 3: The occupation wise distribution of Urolithiasis.

Figures

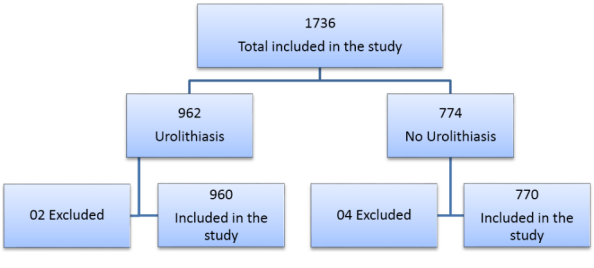

Fig 1: The distribution of the subjects in the study groups

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