

Does occupation have an impact on the occurrence of ureteric calculi? - A single centre experience

AUB Pethiyagoda*, K Pethiyagoda**

*Department of Surgery, Faculty of Medicine, University of Peradeniya, Sri Lanka

**Department of Community Medicine, Faculty of Medicine, University of Peradeniya, Sri Lanka

Abstract- In urology clinical practice in a tropical country like Sri Lanka, a pattern of occupational distribution in patients presenting with ureteric colic can be observed. As ureteric colic is a debilitating condition which can lead to serious complications thus identifying the risk factors is important. The occupation of an individual has a major impact on predisposing to urolithiasis such as low water intake, excessive perspiration and stress, thus some occupations are at higher risk. This research enrolled 191 patients diagnosed with ureteric colic. It concludes that outdoor workers such as army soldiers and manual laborers have a higher occurrence of urolithiasis compared to indoor workers.

Index Terms- Excessive perspiration, Occupation, Outdoor workers, Low water intake, Urolithiasis.

In the urinary bladder stone formation takes place in a different ways when compared to that of upper tract, as the main risk factor for bladder calculi being stasis of urine due to outflow obstruction.(14, 15). This entity will not be discussed in this study as etiology and symptomatology of bladder calculi differ from upper tract calculi.

The main objective was to assess the impact of occupation on urolithiasis and identify occupations contributing to risk. The occupational distribution of patients with ureteric calculi was compared with the occupational distribution of the general population of Sri Lanka presented by Department of Census and Statistics in Economic and Social statistics of Sri Lanka, 2014.(16). Sub-objectives were to assess the gender distribution and to assess indoor and outdoor workers' percentages of patients with ureteric colic.

I. INTRODUCTION

Ureteric colic is a frequent presentation among surgical admissions in Sri Lanka. It is most commonly caused by urinary tract calculi (1, 2). Hyper concentrated low urinary volume owing to less fluid intake and increased respiratory and cutaneous water loss is an important risk factor in urinary stone formation. Previous studies have demonstrated that both ureteric and renal calculi formation is increased due to low intake of fluids and reduced frequency and amount of voiding urine.(3, 4). According to previous studies, between 4-15 % of the population have a urinary tract stone during their life time and recurrence range approach 31% to 75%.(5, 6).

Urinary tract stones are crystallized masses of minerals that are formed mainly due to super concentration and stasis of urine. In addition, multiple risk factors are involved in triggering and development of urinary stones. The risk factors can be categorized according to the types of stones.(7). The urinary stones composed of cysteine, xanthine and uric acid are formed in urinary tract particularly as a result of derangement in metabolism of each compound.(8-10). These defects of metabolism can be inherited, exhibiting positive family histories in affected patients. In literature, a positive family history for urolithiasis has been identified in a large number of patients with urolithiasis and as a percentage it extends up to 50%.(8). In the formation of some stones such as triple phosphate (stag horn) calculi, urinary tract infections play a major role. Bacteria such as protease and staphylococcus can split urea into ammonia making urine more alkaline which in turn predispose for urinary calculi formation.(11-13).

II. PATIENTS AND METHOD

This study was conducted as a descriptive cross sectional study using data from patients admitted to surgical ward, Teaching Hospital Peradeniya from May 2014 to May 2015. The study enrolled 191 patients with suspected ureteric colic. In all the patients, presence of ureteric calculi was confirmed by typical symptoms and other investigations, namely urine full report, X-ray Kidney Ureter Bladder (KUB) and Ultrasound KUB scans. The patients, in whom imaging studies and urinary investigations failed to show definite ureteric calculi, were excluded from the study. Demographic details including occupation, urine full report findings, ureteric stone site and size were recorded.

Gender percentages, indoor and outdoor workers' percentages of the study population were calculated. All the patients were categorized into occupational groups according to International Standard Classification of occupations-ISCO-08.(17). According to the objectives, occupational distribution of study population was compared with occupational distribution of general Sri Lankan population.

III. RESULTS

There were 150 (78%) males and 41 (21%) females respectively, with a male to female ratio of 3.6:1. Their mean age was 44 years.

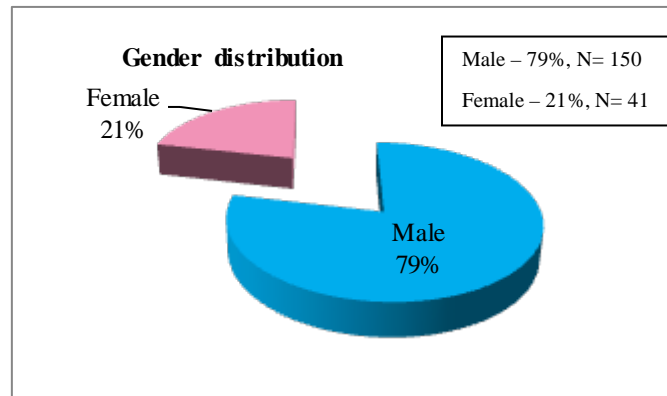


Figure 1: Gender distribution

Analytical results present as outdoor workers 80.06% and indoor employee 19.94% in the study.

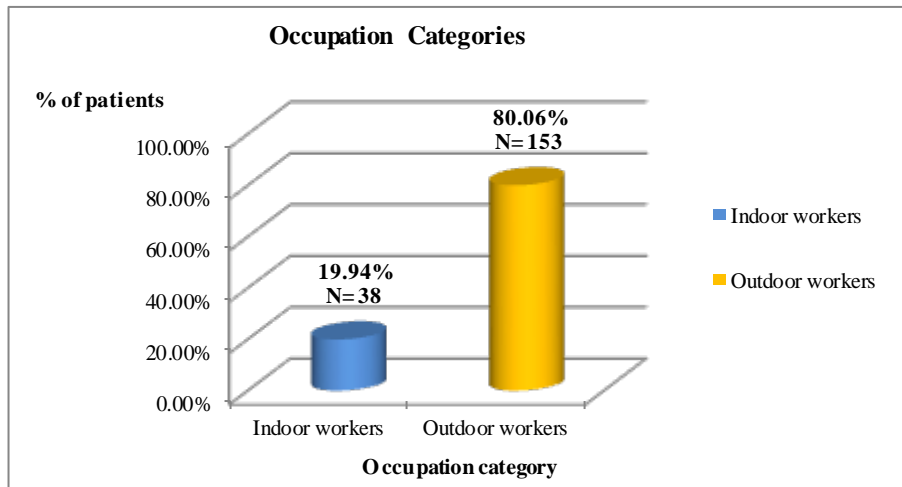


Figure 2: Indoor and outdoor workers in population of patients diagnosed with ureteric colic.

There were senior officials and managers 0.08%, professionals 1.5%, technicians and associate professionals 1.3, clerks 2.09%, sales and service workers and proprietors 7.8%, skilled agricultural and fishery workers 10.4%, craft and related workers 18.76%, plant and machine operators and assemblers 23%, elementary workers 18.3% and not identified 0.5%. In Sri Lanka Labor Force Survey Annual Report – 2014 by census and statistics department shows the normal distribution of population and labor force as follows, senior officials and managers 4.5%, professionals 6.4%, technicians and associate profession 5.9%, clerks 4.3%, sales and service workers and proprietors 11.8%, skilled agricultural and fishery 20.2%, craft and related workers 17.2%, plant and machine operators and assemblers 8.3%, elementary occupation 20.9% and armed forces occupations 0.4%.

Table 1 – Percentages of population representing each occupational category for general Sri Lankan population and population of patients diagnosed with ureteric colic.

<i>Sri Lanka Labor Force Survey Annual Report 2014 by Department of census and statistics.</i>	Occupation categories	% in general population	% in study population
	Senior officials and managers	4.5	0.08
	Professionals	6.4	1.5
	Technicians and Associate profession	5.9	1.3
	Clerks	4.3	2.09
	Sales and service workers and proprietors	11.8	7.8
	Skilled Agricultural and fishery workers	20.2	10.4
	Craft and related workers	17.2	18.76
	Plant and machine operators and assemblers	8.3	23
	Elementary occupations	20.9	18.3
Armed forces occupations	0.4	16.7	
Total		100	100

IV. DISCUSSION

In the current study we focused on patients with a suspected ureteric colic admitted to surgical ward from May 2014 to May 2015. There were a total of 277 patients admitted to the surgical ward Teaching Hospital Peradeniya with suspected ureteric colic, making up an average of 5 to 6 patients per week. Out of them 191 (as a percentage 68.9% of all suspected ureteric colic) were diagnosed to have ureteric stones by either USS KUB or X-ray KUB. The gold standard investigation for ureteric calculi is non contrast spiral computer chromatography (CT),(18) however for this population it was not available at the time of study. This may have excluded some positive cases for our study.

The results of current study shows, indoor employee percentage in the study populations is lower than which is in the general Sri Lankan population. In contrast, the percentage of the outdoor occupations such as craft and related workers, machine operators and assemblers, elementary occupation and armed forces in study population exceed those percentages in the general population.

The results of this study slightly differ from findings of researches done in western countries, as they have reported higher proportion of white collar occupations presented with ureteric calculi.(19-22). They have contributed the higher rate of urinary stone formation in professionals to the occupational stress they are facing. This is rational in the background of low perspiration, in temperate climate of these countries. In addition, as western countries have more facilities in their working environments, water intake may not be restricted. In tropical countries such as Sri Lanka, throughout the year there is a hot environment thus cutaneous water loss as sweat is more. The same rationale is proven in a study done in china, in which they have shown that outdoor workers have higher heat exposure thus have higher prevalence of urolithiasis.(23, 24). As Sri Lanka is a developing country there may be limitations in availability of clean water in work places. In addition, researches done by occupational scientists in Sri Lanka have shown that the occupational stress among blue collar workers is higher than white collar professionals.(16, 25-27). Considering these factors, it can be assumed that in our population high perspiration, low intake of water and occupational stress are important risk factors in formation of urinary stones.

In this study, male to female ratio of urolithiasis patient population was 3.6:1 and which is consistent with literature. In the literature many studies has shown male predominance in urolithiasis and male to female ratio varied from 1.5:1 to 5:1.(22, 28). This could be expected as this study has shown that vast majority of patients with urolithiasis are outdoor workers, where the majority consists of males.

In addition, the lower rate of admissions of professionals and technicians and associate professions may also have contributed by the lower tendency of admitting to the government sector medical treatments. The outdoor workers such as elementary workers, drivers and craft related trade workers have relation to increased respiratory and cutaneous water loss as per there hard physical workouts. On other hand, according to their work pattern they usually have reduced frequency of voiding urine and low intake of fluids. The findings of current research suggest that working in hot environments, low intake of fluids and reduced frequency of voiding urine are important risk factors for urolithiasis. Thus, mainly outdoor workers such are drivers, army soldiers and elementary workers have an occupational risk of urolithiasis, requiring for preventive interventions.

V. CONCLUSION

In conclusion, some employees namely armed forces, elementary workers, plant and machine operators and drivers have higher risk of urolithiasis compared to others. The outdoor workers are more susceptible in developing urolithiasis compared to indoor workers. The risk factors assumed are low water intake, excessive perspiration and occupational stress. Further studies should be conducted to establish the exact risk factors for urolithiasis among these outdoor workers, in order to control them for preventing urolithiasis. Furthermore, this study confirms that men are at a higher risk of forming urinary stones compared to women which is similar to existing literature.

REFERENCES

- [1] Masarani M, Dinneen M. Ureteric colic: new trends in diagnosis and treatment. *Postgrad Med J*. 2007;83(981):469-72.
- [2] Teichman JMH. Acute Renal Colic from Ureteral Calculus. *New England Journal of Medicine*. 2004;350(7):684-93.
- [3] Siener R, Hesse A. Fluid intake and epidemiology of urolithiasis. *European journal of clinical nutrition*. 2003;57 Suppl 2:S47-51.
- [4] Borghi L, Meschi T, Amato F, Briganti A, Novarini A, Giannini A. Urinary Volume, Water and Recurrences in Idiopathic Calcium Nephrolithiasis: A 5-year Randomized Prospective Study. *The Journal of Urology*. 155(3):839-43.
- [5] Safarinejad M. Adult urolithiasis in a population-based study in Iran: prevalence, incidence, and associated risk factors. *Urological Research*. 2007;35(2):73-82.
- [6] Kodama H, Ohno Y. [Descriptive epidemiology of urolithiasis]. *Hinyokika Kiyo*. 1989;35(6):923-34.
- [7] Karabacak OR, Dilli A, Saltas H, Yalcinkaya F, Yorukoglu A, Sertcelik MN. Stone compositions in Turkey: an analysis according to gender and region. *Urology*. 2013;82(3):532-7.
- [8] el-Reshaid K, Mughal H, Kapoor M. Epidemiological profile, mineral metabolic pattern and crystallographic analysis of urolithiasis in Kuwait. *Eur J Epidemiol*. 1997;13(2):229-34.
- [9] Coward RJ, Peters CJ, Duffy PG, Corry D, Kellett MJ, Choong S, et al. Epidemiology of paediatric renal stone disease in the UK. *Arch Dis Child*. 2003;88(11):962-5.
- [10] Kang HW, Lee SK, Kim WT, Kim YJ, Yun SJ, Lee SC, et al. Hypertriglyceridemia and low high-density lipoprotein cholesterolemia are associated with increased hazard for urolithiasis. *J Endourol*. 2014;28(8):1001-5.
- [11] Meissner A, Mamoulakis C, Laube N. [Urinary tract infections and Urolithiasis]. *Urologe A*. 2010;49(5):623-8.
- [12] Takeuchi H, Okada Y, Yoshida O, Arai Y, Tomoyoshi T. [Urinary tract infection associated with urinary calculi. 1. The significance of urinary tract infection in urinary calculi]. *Hinyokika Kiyo*. 1989;35(5):749-54.
- [13] Zanetti G, Paparella S, Trinchieri A, Prezioso D, Rocco F, Naber KG. Infections and urolithiasis: current clinical evidence in prophylaxis and antibiotic therapy. *Arch Ital Urol Androl*. 2008;80(1):5-12.
- [14] Childs MA, Mynderse LA, Rangel LJ, Wilson TM, Lingeman JE, Krambeck AE. Pathogenesis of Bladder Calculi in the Presence of Urinary Stasis. *The Journal of urology*. 2013;189(4):1347-51.
- [15] Li WM, Chou YH, Li CC, Liu CC, Huang SP, Wu WJ, et al. Local factors compared with systemic factors in the formation of bladder uric acid stones. *Urologia internationalis*. 2009;82(1):48-52.
- [16] Economic & Social Statistics of Sri Lanka 2014: Statistics Department, Central Bank of Sri Lanka 2014. 19 p.
- [17] International Standard Classification of Occupations: ISCO-08: International Labour Organization; 2012. 87-357 p.
- [18] Mc Laughlin PD, Crush L, Maher MM, O'Connor OJ. Recent Developments in Computed Tomography for Urolithiasis: Diagnosis and Characterization. *Advances in Urology*. 2012;2012:7.
- [19] Linder BJ, Rangel LJ, Krambeck AE. The effect of work location on urolithiasis in health care professionals. *Urolithiasis*. 2013;41(4):327-31.
- [20] Brundig P, Berg W, Schneider HJ. [Stress and risk of urolith formation. I. The influence of stress on lithogenous urinary substances (author's transl)]. *Urologia internationalis*. 1981;36(3):199-207.
- [21] Schneider HJ, Peacock M, Robertson WG, Vahlensieck W. *Urolithiasis Etiology and diagnosis*: Springer Science & business Media; 2012. 428 p.
- [22] Iguchi M, Umekawa T, Katoh Y, Kohri K, Kurita T. Prevalence of urolithiasis in Kaizuka City, Japan--an epidemiologic study of urinary stones. *International journal of urology : official journal of the Japanese Urological Association*. 1996;3(3):175-9.
- [23] Luo H, Turner LR, Hurst C, Mai H, Zhang Y, Tong S. Exposure to ambient heat and urolithiasis among outdoor workers in Guangzhou, China. *The Science of the total environment*. 2014;472:11306.
- [24] Brikowski TH, Lotan Y, Pearle MS. Climate-related increase in the prevalence of urolithiasis in the United States. *Proceedings of the National Academy of Sciences of the United States of America*. 2008;105(28):9841-6.
- [25] Jayasuriya RM, Mihirani WGN, Sandyani SKU, Mahawatta SM, Suraweera T. Organizational stress among sri lankan it professional SPNCTM. *PNCTM*. 2012;VOL. 1.
- [26] Fernando W. *Stressful Work and Job Strain of Truck Drivers in Moratuwa Urban Council Area-Sri Lanka*. 2011.
- [27] Fernando W, Gamini V. Occupational stress in taxi (three wheelers) drivers: with special reference to colombo district in Sri Lanka.
- [28] Abomelha MS, al-Khader AA, Arnold J. Urolithiasis in Saudi Arabia. *Urology*. 1990;35(1):31-4.

AUTHORS

First Author – AUB Pethiyagoda, Consultant genito-urinary surgeon/ Senior lecturer, Department of Surgery, Faculty of Medicine, University of Peradeniya, Sri Lanka. Email: pethiya@yahoo.com. Telephone: 0094773079078

Second Author – K Pethiyagoda, MSc in community medicine & PhD in occupational health, Senior lecturer in community medicine, Department of Community Medicine, Faculty of medicine, University of Peradeniya, Sri Lanka. Email: Kalyaniq33@gmail.com

Correspondence Author - AUB Pethiyagoda. Email: pethiya@yahoo.com, Alternate Email: aubp@pdn.ac.lk, Contact number: 0094773079078