International Journal of Community Medicine and Public Health
Lageju N et al. Int J Community Med Public Health. 2022 Apr;9(4):1632-1636
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20220831

Original Research Article

Epidemiological profile of patients with urolithiasis in a tertiary care center of Eastern Nepal: a retrospective cross-sectional study

Nimesh Lageju[1]*, Durga Neupane[1], Awaj Kafle[2], Harsh Kumar[1]

[1]MBBS, B.P. Koirala Institute of Health Sciences, Dharan, Nepal
[2]Department of Surgery (Division of Urology), B.P. Koirala Institute of Health Sciences, Dharan, Nepal

Received: 15 January 2022
Accepted: 15 February 2022

***Correspondence:**
Dr. Nimesh Lageju,
E-mail: nimesh.lageju@yahoo.com

ABSTRACT

Background: This study is aimed to estimate descriptive statistics of socio-demographic and clinical profile of patients with urolithiasis visiting urology division, Department of Surgery of BPKIHS.
Methods: This is a retrospective study. A total of 409 patients diagnosed with urolithiasis admitted to BPKIHS from January to December 2017 were included. The hospital medical records of patients were reviewed using a Pro forma to record the epidemiological data. The data was entered into the Microsoft Excel software and analyzed using statistical package for social studies (SPSS) software 23.0 version.
Results: The peak age group of the high burden of urolithiasis observed was 20-30 years (27.1%) with the mean age plus standard deviation of the patients being 39.60±15.67 years. Among them, 54% were male and 46% were female with a ratio of 1.17:1. The most common site of urolithiasis was the ureter (44.1%) and kidney (39.3%). 11% of patients had stones on more than one site.
Conclusions: It is concluded that the highest prevalence of urolithiasis is in the age group 20-30 years with male predominance and the common site being ureter. Further studies are needed as other factors affecting this disease are yet to be studied.

Keywords: Urolithiasis, Calcium oxalate, Cysteine, Uric acid, Prevalence

INTRODUCTION

Urolithiasis is a term used to describe calculi or stones that form in the urinary system, usually in the kidneys or ureters, but may also affect the bladder or urethra.[1] These are formed from the accumulation of substances like calcium, oxalate, cystine or uric acid which are present in urine.[2]

It is the third commonest urological disease behind UTI and prostatic pathology.[3] It affects both adults and children. Among adults, males are more affected than females and the peak of onset is between 20 and 30 years.[4] It has been reported that urinary calculus has different prevalence rates among different races and ethnicities.[5] Familial and Hereditary predisposition to the stone formation has also been known.[4]

The temperature and humidity of the environment have been reported to affect the incidence of urinary calculus disease. So, geographical characteristics may be the indirect predictors of calculus formation.[6] Studies examining the effect of climate on urolithiasis have shown that the incidence is higher among populations living in warmer climes than those in colder climates.[7]

Higher incidence and prevalence rates are also seen in affluent developed countries compared to poorer

developing nations, which may be due to differences in diet with wealthier populations eating higher levels of salt, protein, calcium and purines.[8]

Other factors known to predispose to urinary calculus include medical conditions such as diabetes, hypertension, hyperparathyroidism, metabolic syndrome, gout and chronic UTIs. Drugs such as the anti-retroviral like Indimavir and Atazamavir or the immunosuppressive like Sulfasalazine are known to increase the risk of stone formation.[8]

Worldwide, the prevalence of urolithiasis varies from 2 to 20%8. And it is also projected that the prevalence will escalate.[9] Although the incidence and prevalence of urolithiasis are not known in Nepal due to the lack of centralized epidemiological data, research done in Bir hospital showed the overall incidence in in-patients was 53.4 per 10,000.[10]

The objective of this study was to explore the epidemiological profile of patients with urolithiasis in a tertiary care center of Eastern Nepal and deduct useful information so that involved risk factors can be avoided and the burden of disease can be alleviated with necessary lifestyle modifications and considerations.

METHODS

It's a retrospective cross-sectional study comprised of all patients who were diagnosed with urolithiasis at B.P. Koirala Institute of Health Sciences of Dharan (BPKIHS) and admitted to the urology division for treatment. The study period was one year from January to December 2017. Patients with urolithiasis having incomplete medical records were excluded. A brief explanation about the study was offered to the subjects and written informed consent was obtained from them or their parents in case of disabled, dependents or minority. A retrospective review of medical records was done to collect the data. The hospital medical records of patients who had received treatments for Urolithiasis at BPKIHS was reviewed using a Pro forma to record the epidemiological data. A continuous sequential number was given to each subject and available information collected was kept confidential in a separate file. The socio-demographic and epidemiological profile which contained the name, age, sex, caste along with the diagnosis was entered in a file. Type of calculus, mode of diagnosis, treatment method was considered. The data was entered into the Microsoft Excel software and analyzed using statistical package for social studies (SPSS) software 23.0 version. For descriptive statistics, percentage, proportion, ratio, mean, standard deviation, median and inter-quartile range was calculated along with graphical and tabular presentation being made. For inferential statistics, the chi-square test was used to find out the significant association between the site of stones and other demographic variables at a 95% confidence interval where p=0.05.

RESULTS

Table 1 shows the age and sex-wise distribution of patients with urolithiasis. The peak age group of the high burden of urolithiasis observed was 20-30 years (27.1%), followed by 30-40 years (25.9%) and then 40-50 years (15.6%).

Table 1: Age and sex wise distribution of urolithiasis patients (n=409).

Age in years	No.	%	Sex		Sex Ratio
			Male	Female	
0-10	3	0.7	3	0	3:0
10-20	27	6.6	10	17	0.58:1
20-30	111	27.1	61	50	1.22:1
30-40	106	25.9	59	47	1.25:1
40-50	64	15.6	37	27	1.37:1
50-60	47	11.5	28	19	1.47:1
60-70	35	8.6	16	19	0.84:1
70-80	13	3.2	6	7	0.85:1
80-90	3	0.7	1	2	0.5:1
Total	409	100.0	221	188	1.17:1

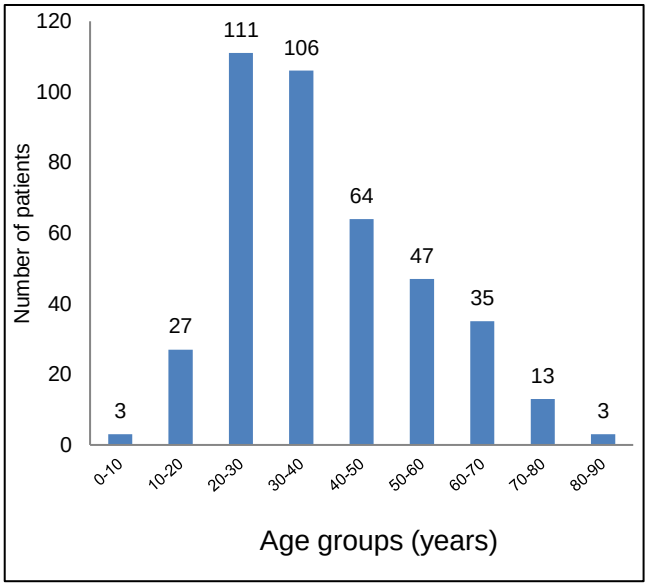

Figure 1: Distribution of urolithiasis in patients in different age groups.

The patient of maximum age encountered in the study was of 87 years and a minimum of 3 years. Out of a total of 409 patients, 328 patients belonged to the productive age group (20-60 years). The highest number of cases were 111 (27.1%) in the age group of 20-30 years. Subsequently, the age group with a high burden was 30-40 having cases 106 (25.9%) (Table 1, Figure 1). The mean age plus standard deviation of the patients was 39.60±15.67 years. The least number of stone formers was present beyond the 80s, and under 10s (0.7%).

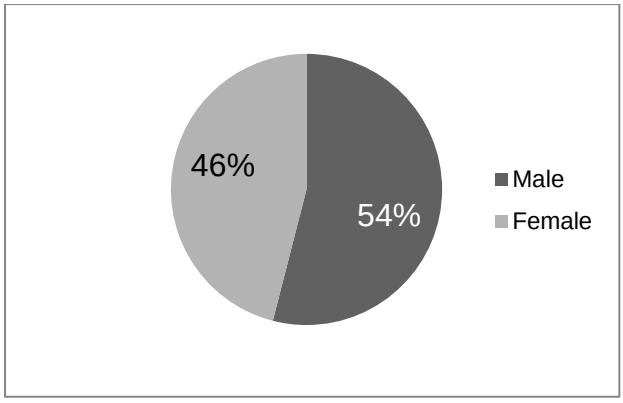

Figure 2: Sex wise distribution of patients with urolithiasis.

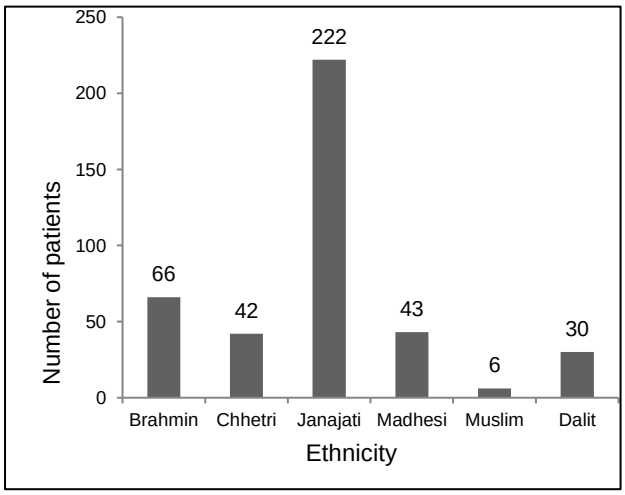

Figure 3: Burden of ethnically different patients with urolithiasis.

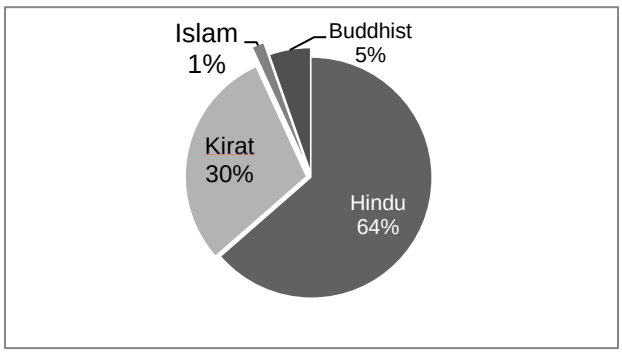

Figure 4: Distribution of patients with urolithiasis according to religion.

Out of 409 patients, 221 (54%) were male and 188 (46%) were female with a male to female ratio of 1.17:1. Urolithiasis in both males and females was observed highest in the age group 20-30 years (Table 1, Figure 2).

More than half of the patients were from Janajati ethnicity 222 (54%) as shown in Figure 3. Figure 4 shows that patients following the Hindu religion (64%) were the most with urolithiasis.

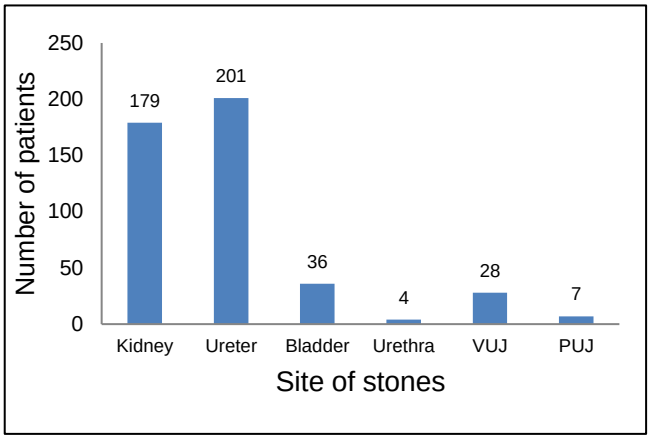

Figure 5: Site of stones in patients.

A total of 455 stones were detected in the study from 409 patients by history, clinical examination and investigations. The site of stones is shown in Figure 5. Of the total 455 stones, 39.3% stones were kidney stones, 1.5% stones were PUJ, 44.1% stones were ureter stones, 6.1% stones were VUJ, 7.9% stones were bladder stones and 0.87% stones were urethral stones.

Out of 409 patients, 364 (88.9%) patients had stones only on one site i.e. 140 (34.2%) had kidney stones, 4 (1%) had PUJ stones, 164 (40.1%) had ureter stones, 19 (4.6%) had VUJ stones, 33 (8.1%) had bladder stones and 4 (1%) had urethral stones. The rest (11%) had stones on more than one location i.e. 32 (7.8%) had kidney and ureter stones, 2 (0.5%) had kidney and bladder stones, 4 (1%) had kidney and VUJ stones, 3 (0.7%) had ureter and VUJ stones, 1 (0.2%) had ureter and PUJ stones, 2 (0.5%) had PUJ and VUJ stones and 1 (0.2%) had kidney, ureter and bladder stones.

The distribution of the site of stones concerning ethnic groups is shown in Table 2. Most of the Brahmins, Madhesi and Dalits suffered from kidney stones whereas most of the Chhetri and Janajati suffered from ureter stones and Muslims suffered from both kidney and ureter stones.

Due to the presence of empty cells in Table 2, the chi-square test was calculated to find associations among various ethnic groups and sites of stones that included kidney, ureter and others (bladder, urethra, VUJ, PUJ). The p-value at 95% confidence interval was 0.4335 i.e. there is no significant association between the aforementioned variables.

Of the 410 urolithiasis radiological investigations performed, 221 (53.9%) were conducted using CT scan, 177 (43.2%) with USG, 6 (1.5%) with X-ray KUB, 4 (1%) with DTPA, 1 (0.2%) with IV urography and Echo (Table 3).

Table 2: Distribution of patients with urolithiasis by the site of stones and ethnic groups.

Ethnicity	Site of stone						Total
	Kidney	Ureter	Bladder	Urethra	VUJ	PUJ	
Brahmin	33	32	5	0	6	0	76
Chhetri	18	21	4	1	3	0	47
Janajati	85	118	25	1	16	4	249
Madhesi	25	17	1	0	2	1	46
Muslim	3	3	0	1	0	0	7
Dalit	15	10	1	1	1	2	30
Total	179	201	36	4	28	7	455

A total of 308 surgical treatment procedures were performed on 409 patients, and the treatment procedures included Ureterorenoscopy (URS) and Intra-corporeal pneumatic lithotripsy (ICPL), Percutaneous Nephrolithotomy (PCNL), open surgery (nephrolithotomy, ureterolithotomy and cystolithotomy), Cystolitholapaxy and Lithotripsy (Per urethral Cystolithotripsy (PUCL) and Ureteroscopic Lithotripsy (URSL)). Of these PCNL was the most commonly used surgical treatment for the patients (Table 3).

Table 3: Urolithiasis patients' radiological investigations and surgical treatments.

	No. of patients	Percentage (%)
Radiological Investigations		
USG	177	43.2
CT Scan	221	53.9
X-Ray KUB	6	1.5
IV Urography	1	0.2
Echo	1	0.2
DTPA	4	1.0
Total	410	100.0
Surgical treatments		
URS and ICPL	107	34.7
PCNL	110	35.7
Open surgery	32	10.4
Cystolitholapaxy	9	3
Lithotripsy	50	16.2
Total	308	100.0

35.7% (110/308) of patients were treated by PCNL, 34.7% (107/308) were by URS and ICPL, 16.2% (50/308) by Lithotripsy, 10.4% (32/308) by open surgery and 3% (9/308) by Cystolitholapaxy.

DISCUSSION

Urolithiasis is the third most common disease of the urinary tract. It is becoming quite a frequent problem in developing countries like Nepal. In our present study, distribution concerning age, gender, ethnicity, religion along with the site of stones, radiological investigation and surgical investigations from patients with urolithiasis presenting to tertiary care center of Eastern Nepal was studied. The site of stones according to the ethnicity of patients was also determined.

Regarding age-specific distribution, our finding is close to that of Chand et al who published that urinary stones were most prevalent in the age group 20-29 years among the reported cases of urinary calculi in Teaching Hospital, Maharajgunj.[16] According to Ahmad et al, the maximum incidence of renal stones was in the age group 40-49 years.[14] Yu et al found the prevalence to be highest among 38-66 years.[12] The mean age of the patients of our study was 39.60 years which is close to the study done by Ahmad et al and Sreedharan et al who found out the mean age to be 41.5 years.[13,14]

In our present work, a higher preponderance of the urinary calculi was found in males than females. The male to female ratio in our study was 1.17:1. This result is in agreement with that of Chand et al who reported it to be 1.35:1 in urinary calculi patients in Teaching Hospital.[16] Ketabchi et al carried out the prevalence of symptomatic urinary calculi in Kerman, Iran and reported the male to female ratio 1.2:1 which is also close to our research.[11] Cook et al, Ahmad et al and Knoll found out the male dominance in their respective researches with a sex ratio of 2.5:1, 2.8:1 and 2.7:1 respectively.[8,14,15]

The male predominance can be described by the role of androgens in enhancing the oxalate excretion and deposition of calcium in the urinary system: both being the main risk factors of urolithiasis whereas in female, estrogen decrease oxalate excretion. Therefore, there is more burden of stones among males than in females.18

Data comparing stone disease between ethnicity within one nation were only available for United States.[9] From our research, the maximum number of patients were from the Janajati ethnicity. This might be explained by the dominance of the Janajati ethnicity especially Rai, Limbu, Magar, etc in the Eastern part of Nepal. Furthermore, it might be due to their different food habits and socio-economic status than other ethnic groups that led to a higher burden of stones which is yet to be studied.

In our study, most of the patients got admitted due to ureter stones which were the same as that of Yu et al research.[12] But in contrary to the research done by Chand et al and Lallas et al who stated kidney stones were common. Stone occurrence in the urethra was relatively less (1%).[16,17]

More than half of the patients were diagnosed using CT scan followed by USG. X-ray KUB is rarely used nowadays. As the patients visiting our hospital mainly suffered from renal and ureter stones, the majority of surgical operations done were PCNL and URS and ICPL.

Limitations

Our study had some limitations. Firstly, many factors affected this disease but due to the time limitation of our research, the study was conducted only using selected variables. Secondly, the study time period was only one year. Had it been some more years, better results with an adequate sample size could have been deduced. Lastly, not all patients with urolithiasis attend our hospital. This might affect the overall results of the study.

CONCLUSION

It is concluded that the highest prevalence of urolithiasis is in the age group 20-30 years with male predominance. The disease is more common in patients of Janajati ethnicity with the common site being ureteric stones. At this moment of time, urolithiasis is becoming a common disease in part of our world and yet our nationwide information on the prevalence of urolithiasis is lacking. However, we can make out the socio-demographic and clinical profile of patients of this disease from this research to improve management and prevention. Although a definite conclusion remains to be made as other factors affecting this disease is yet to be studied. Prospective research that includes a more diverse population is warranted to validate our findings and to provide more accurate findings.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Smith Y. 2016. What is urolithiasis? News medical life science. Available at: https://www.news-medical.net/health/What-is-Urolithiasis.aspx. Accessed on 04 May 2018.
2. Chataut C. Kidney stones. Nirogi Nepal. 2017. Available at: http://niroginepal.com/en/disease/kidney-urinary-stone/. Accessed on 04 May 20218.
3. Muslumanoglu AY, Binbay M, Yuruk E, Akman T, Tepeler A, Esen T et al. Updated epidemiologic. study of urolithiasis in Turkey. I: Changing characteristics of urolithiasis. Urol Res. 2011;39(4):309-14.
4. Alpers CE, Chang A. The Kidney: Urolithiasis (Renal Calculi, Stones). In: Kumar V, Abbas AK, Aster JC. Robbins & Cotran Pathologic Basis of Disease. South Asian edition. Elsevier. 2015;2:951-2.
5. Lee YH, Huang WC, Tsai JY, Lu CM, Chen WC, Lee MH et al. Epidemiological studies on the prevalence of upper urinary calculi in Taiwan. Urol Int. 2002;68(3):172-7.
6. Atan L, Andreoni C, Ortiz V, Silva EK, Pitta R, Atan F et al. High kidney stone risk in men working in steel industry at hot temperatures. Urology. 2002;65(5):858-61.
7. Rodgers A. Race, ethnicity and urolithiasis: a critical review. Urolithiasis. 2013 Apr 1;41(2):99-103.
8. Cook J, Lamb BW, Lettin JE, Graham SJ. The epidemiology of urolithiasis in an ethnically diverse population living in the same area. Urol J. 2016;13(4):2754-8.
9. Stamatelou KK, Francis ME, Jones CA, Nyberg LM, Curhan GC. Time trends in reported prevalence of kidney stones in the United States: 1976-1994. Kidney Int. 2003;63(5):1817-23.
10. Shrestha SM, Shrestha S, Bahadur S. Incidence of urolithiasis In Bir Hospital. Journal of Nepal Medical Association. 1971;9(4):201-6.
11. Ketabchi AA, Aziziolahi GA. Prevalence of symptomatic urinary calculi in Kerman, Iran. Urol J. 2008;5(3):156-60.
12. Yu DS, Yang YT, Lai CH. Epidemiology and treatment of inpatients urolithiasis in Taiwan. Formosan Journal of Surgery. 2016;49:136-41.
13. Sreedharan J, John L, Aly FH, Mutappallymyalil J. Urolithiasis in male patients: A pilot study on the ethnic differences and clinical profile. Nepal J Epidemiol. 2014;4(4):393-8.
14. Ahmad S, Ansari TM, Shad MA. Prevalence of renal calculi: type, age and gender specific in southern Punjab, Pakistan. Professional Medical Journal. 2016;23(4):389-95.
15. Knoll T. Epidemiology, pathogenesis and pathophysiology of urolithiasis. European Urology Supplements. 2010;9(12):802-6.
16. Chand R, Shah A, Pant D, Paudel S. Common site of urinary calculi in kidney, ureter and bladder region. Nepal Med Coll J. 2013;15(1):5-7.
17. Lallas CD, Liu XS, Chiura AN, Das AK, Bagley DH. Urolithiasis location and size and the association with microhematuria and stone-related symptoms. J Endourol. 2011;25(12):1909-13.
18. Fan J, Chandhoke PS, Grampes SA. Role of Sex Hormones in Experimental Calcium Oxalate Nephrolithiasis. J Am Soc Nephrol. 1999;10:376-80.

Cite this article as: Lageju N, Neupane D, Kafle A, Kumar H. Epidemiological profile of patients with urolithiasis in a tertiary care center of Eastern Nepal: a retrospective cross-sectional study. Int J Community Med Public Health 2022;9:1632-6.