

Clinico-Pathological Study of Urolithiasis with Special Reference to Urinary pH & Urinary Culture

Durgesh Kumar Pal¹, Brijesh Kumar Agarwal², Rehan Fareed³, Tanu agarwal⁴, Rahul Kumar Goyal⁵

¹Junior Resident-3, Dept. of General Surgery, SRMS-IMS, Bareilly, Uttar Pradesh, ²Professor Dept. of General Surgery, SRMS-IMS, Bareilly, Uttar Pradesh, ³Asst. Professor, Dept. of General Surgery, ⁴Professor & HOD, Dept. of Pathology, ⁵Professor & HoD, Dept. of Microbiology, SRMS-IMS, Bareilly

Abstract

Introduction- Urinary stone disease is one of the most common afflictions of modern society. It has been described since antiquity. With westernization of global culture, the site of stone formation has migrated from the lower to upper urinary tract. Urinary tract stones start to form in a kidney and may enlarge in a ureter or the bladder. Depending on location of stone, it may be called a renal stone, ureteral stone, bladder stone or urethral stone.

Aim and Objectives- To study the correlation of clinico-pathological factors in urolithiasis with special reference to urinary pH and urinary culture.

To study the relationship of age, sex, socio-economic, in incidence of urinary calculi formation.

To study the clinical presentation of urinary tract stone.

To study the importance & significance of urinary pH and urinary infection in patients of urolithiasis.

Material & Methods- The present study design will be of a prospective study, all the patients diagnosed as urinary lithiasis, in surgical OPD and admitted in surgical ward, of SRMS-IMS, Bareilly.

1-Inclusion Criteria- All the patients diagnosed as urinary lithiasis, reported in surgical OPD and admitted in surgical ward of SRMS, IMS, Bareilly.

2-Exclusion Criteria A- History of any surgery for urinary lithiasis. **B-** Urinary stone in congenital urinary disorders.

3-Sample Size- 100 Patients.

Results and Conclusions- With the precise knowledge on epidemiological profile on urolithiasis, the involved risk factors and knowledge of the stone constituents, it may be necessary to take certain precautionary steps like improving socioeconomic status, literacy, inculcating hygienic habits, avoiding and treating urinary tract infection, maintaining asepsis during urinary catheterization / instrumentation and low calcium containing diet, which may all probably decrease the incidence and morbidity of patients suffering from urolithiasis. The patients with an episode of stone disease or with a family history of the same are at high risk and should be closely screened for presence of metabolic disorders and routinely followed up to prevent further recurrences.

Discussion- Urinary tract calculus disease affects people in the most productive years of their life, and more commonly seen in males of lower socioeconomic status. Urinary tract infection is a very important independent risk factor for urolithiasis. Urea splitting bacteria e.g. Proteus and non-urease containing bacteria e.g. E. Coli, both have a role in urolithiasis. Urinary pH is a very important independent risk factor for urolithiasis, in my study pH was slightly acidic. And alkaline urine patients had struvite (infection) stones.

Keywords: Urinary Stone, Pathogenesis, Urinary Ph, Culture.

Corresponding Author:

Dr Durgesh Kumar Pal

Junior Resident-3, Dept. of General Surgery,
SRMS-IMS, Bareilly, Uttar Pradesh

Introduction

Urinary stone disease, despite being the most common afflictions of modern society, it has been described since antiquity. With westernization of

global culture, however, the site of stone formation has migrated from the lower to upper urinary tract and diseases once limited to men is increasingly gender blind. Urinary stones have plagued the members of human race since the earliest records of civilization. Anthropologic history suggested evidence that urinary calculi existed as long as 7000 years ago. They were detected in Egyptian mummies dated back to 4800 B.C. Urinary tract stones start to form in a kidney and may enlarge in a ureter or the bladder. Depending on location of stone, it may be called a renal stone, ureteral stone, bladder stone or urethral stone. The process of stone formation in urinary tract is called urolithiasis. Urinary pH in stone disease may vary from 4.5 to 8.0. The average pH in urolithiasis varies between 5.5 and 6.5. Acidic urinary pH ranges between 4.5 to 5.5, whereas alkaline pH is considered to be between 6.5 to 8.0. In presumed UTI patients, a pH of greater than 7.5 suggests infection most commonly with *Proteus*. When bacteria trapped in urine that pools above a blockage leads to urinary tract infections. Long time blockage of the urinary tract leads to urine backs up in the tubes inside the kidney, causing excessive pressure that can cause the pressure hydronephrosis and eventually damage the kidney. The earliest type of stone known to afflict human was the infection (struvite) stones. These account for 2 to 20% of all stones. *Proteus Mirabilis* is the most common organism associated with struvite calculi. Urease containing bacteria are frequently associated with stone formation.

Aims and Objective

Aim of study-

To study the correlation of clinico-pathological factors in urolithiasis with special reference to urinary pH and urinary culture.

Objectives of Study-

1. To study the relationship of age, sex, socio-economic, climate & water intake, in incidence of urinary calculi formation.

2. To study the clinical presentation of urinary tract stone.
3. To study the importance & significance of urinary pH and urinary infection in patients of urolithiasis.

Material & Methods

The present study design will be of a prospective study, all the patients diagnosed as urinary lithiasis, in surgical OPD and admitted in surgical ward, of SRMS-IMS, Bareilly.

1-Inclusion Criteria - All the patients diagnosed as urinary lithiasis, reported in surgical OPD and admitted in surgical ward of SRMS, IMS, Bareilly.

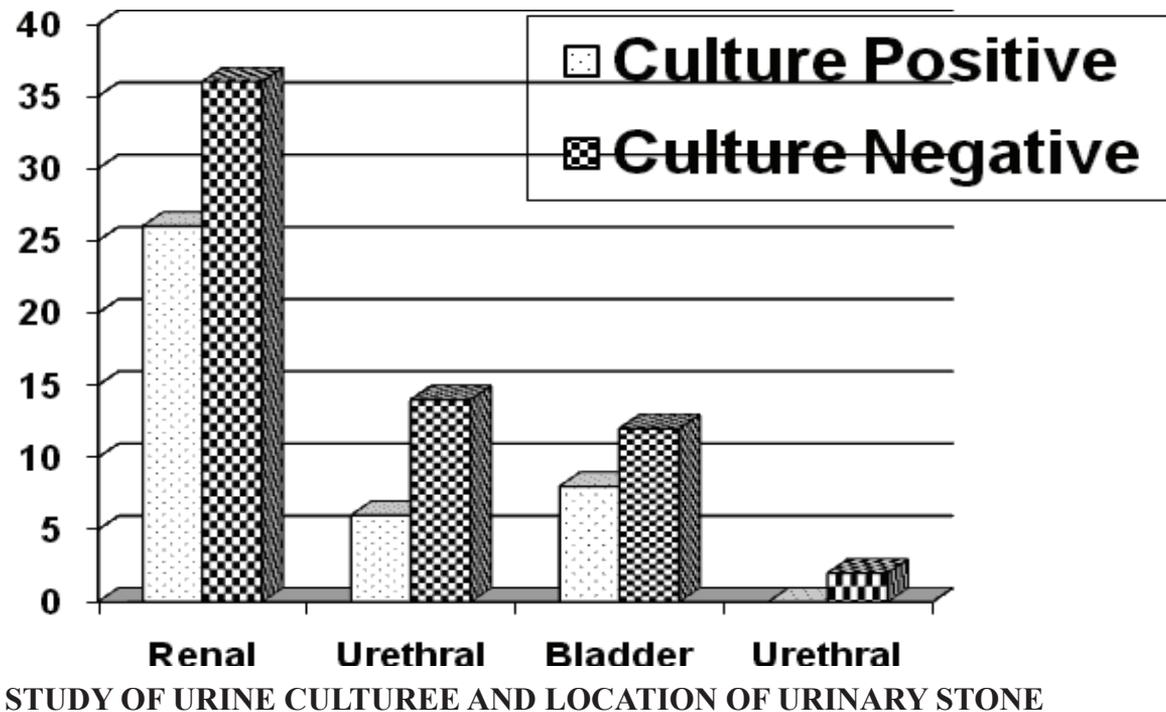
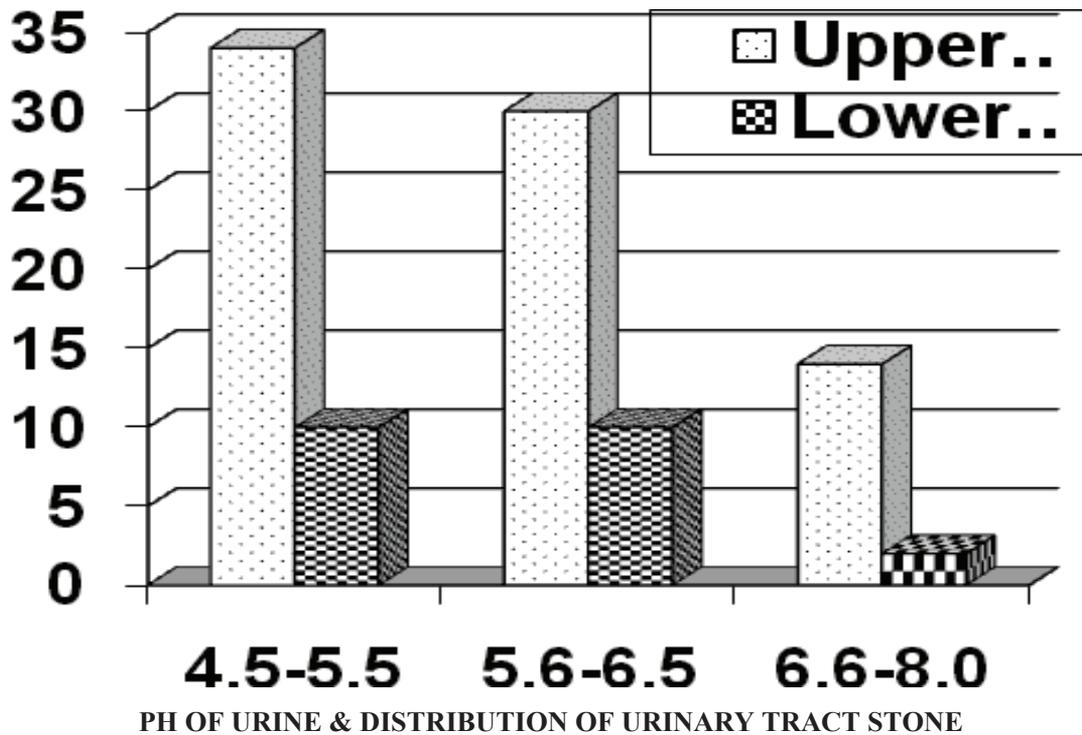
2-Exclusion Criteria- A-History of any surgery for urinary lithiasis. B-Urinary stone in congenital urinary disorders.

3-Sample Size- 100 Patients.

Results

• pH STUDY- 60% patients with urolithiasis had change in their urinary pH. Whereas 40% with urolithiasis had normal urinary pH. Maximum urinary stones occurred in the pH range of 4.5-6.5 were 84%. Upper urinary tract stones in this pH range were 64% and lower urinary tract stones constituted 20%. Total percentage of upper and lower urinary stones were 78% and 22% respectively.

• URINARY CULTURES- 40 patients positive for culture 60% had *E. coli* infection and 25% were positive for *Proteus*. 15% cultures were positive for other bacterial infection. 41% of the patients with upper urinary tract stone disease (Renal and urethral) and 36.5% of the patients with lower urinary tract (bladder and urethral) were positive on culture studies. The overall infection rate in the study group was 40%.



Discussion

1. **Age of presentation** : In our study majority of patients (68%) were in age group 21-50 years(Pak CYC(1987)¹.

2. **Distribution of calculi in urinary tract:** In the present study of 100 patients , Upper urinary tract stones constituted 78% (78) of which 58% (58) of stones were found in kidney where as the lower urinary tract constituted 22% of urinary stones(Sutor et al,(1974)².

3. Sex Distribution: The M: F ratio for upper urinary tract stone disease was 2.9 : 1(Kapadia and Vani (1992)³.

4. Socio-economic status: In my study 56% of the patients belong to lower and 38% to middle socio-economic strata with only 06% belongs to higher(1997)⁴.

5. IMAGING STUDY: In our study plain X-ray KUB region have sensitivity of 84%. In our study Intra venous urogram had sensitivity of 96%(Roth et al,(1985)⁵.

6. FAMILY HISTORY AND RECURENT STONE FORMER: In our study positive family history was found in 50% of patients(Fakhrossadat and Leila (2007)⁶.

7. URINARY pH IN UROLITHIASIS- The hydrolysis of urea by urease producing organisms in infected urine raises urinary pH. A pH of 7.2 must exist for crystallization of struvite stones to occur. Calcium phosphate stones form at a pH of 6.6 or higher. Upper urinary tract stones in this pH range(4.5-6.5) were 64% and lower urinary tract stones constituted 20%(Davidman and Schmitz, 1988)⁷.

8. URINARY TRACT INFECTION IN UROLITHIASIS-Bacterial infection promotes urolithiasis by promoting crystal adherence by damaging normal bladder mucosal cover (Parson et al, 1984)⁸. Patients with indwelling Foley's catheter or lower urinary tract voiding dysfunction are prone to develop these stones. (Comarr et at, 1962)⁹.Struvite calculi harbor bacteria within their interstices, which acts as source of continued urinary infection (Nemoy and Stamey, 1971)¹⁰.

Conclusion

- Urinary tract calculus disease affects people in the most productive years of their life, and more commonly seen in males of lower socioeconomic status.
- Urinary tract infection is a very important independent risk factor for urolithiasis
- Urea splitting bacteria e.g. Proteus and non-urease containing bacteria e.g. E. coli, both have a role in urolithiasis.

- Urinary pH is a very important independent risk factor for urolithiasis, in my study pH was slightly acidic. And alkaline urine patients had struvite (infection) stones.

- With the precise knowledge on epidemiological profile on urolithiasis, the involved risk factors and knowledge of the stone constituents, it may be necessary to take certain precautionary steps like improving socioeconomic status, literacy, inculcating hygienic habits, avoiding and treating urinary tract infection, maintaining asepsis during urinary catheterization / instrumentation and low calcium containing diet, which may all probably decrease the incidence and morbidity of patients suffering from urolithiasis. The patients with an episode of stone disease or with a family history of the same are at high risk and should be closely screened for presence of metabolic disorders and routinely followed up to prevent further recurrences.

- Further work on this subject will not only help to identify the role of these risk factors and actual nature of stone disease but also to understand lithogenesis and the interplay between various factors involved in urolithiasis.

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Ethical Clearance: The study was approved by the Institutional Ethics Committee.

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Conflict of Interest: The authors have no conflicts to disclose.

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