



PREVALENCE OF RENAL STONE DISEASE IN INDIVIDUALS DIAGNOSED WITH URINARY TRACT INFECTION

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ABSTRACT

Objective: To determine the prevalence of renal stone disease in individuals diagnosed with urinary tract infection.

Place and Duration of Study: This was a cross-sectional study conducted at Shaikh Zayed Hospital, Lahore from December 2022 to May 2023.

MATERIAL AND METHODS: The inclusion criteria comprised adult patients (age ≥ 18 years) with a confirmed diagnosis of UTI based on clinical symptoms, laboratory analysis of urine samples, and imaging studies. Upon obtaining informed consent, demographic information including age, gender, and medical history was collected. Clinical data, such as UTI symptoms and severity, were recorded. Radiological investigations, including ultrasound or CT scans, were performed to identify the presence of renal stones. Descriptive statistics were employed for demographic characteristics, while inferential statistics, such as chi-square tests or logistic regression, were utilized to assess associations between UTIs and renal stones. The data was analyzed using SPSS (Registered) Version 22.

RESULTS: The data reveals that the frequency of renal stones increases with age, with individuals aged 50-75 years showing the highest prevalence at 50%, while those aged 18-29 years and 30-49 years have lower percentages at 20% and 30%, respectively. Males exhibit a higher prevalence of renal stones (45%) compared to females (28%). Hematuria is present in 23% of cases, indicating blood in the urine, while abdominal pain is reported in 31% of cases, suggesting discomfort in the abdominal region. Cloudy or foul-smelling urine is observed in 14% of cases, indicative of possible infection.

CONCLUSION: The observed prevalence of renal stones in UTI patients was 35% which underscores the need for heightened clinical awareness and comprehensive management strategies, particularly in populations with higher susceptibility.

KEYWORDS: Renal stone disease, Urinary tract infection, Incidence, Co-occurrence, Epidemiology

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INTRODUCTION:

Urinary tract infection (UTI) is a common and often painful condition characterized by the invasion of bacteria into the urinary tract, which includes the bladder, urethra, ureters, and kidneys. The most prevalent causative agent is *Escherichia coli* (*E. coli*), a bacteria normally found in the intestines.^{1,2} UTIs can present with a range of symptoms like a burning sensation during urination, a frequent urge to urinate, abdominal pain and cloudy or strong-smelling urine. While these infections are typically uncomplicated and easily treatable with antibiotics, they can lead to serious complications if left untreated, such as kidney damage or systemic infection.^{3,4}

Globally, UTIs affect millions of people each year, with women being more susceptible than men due to their shorter urethras. In Pakistan, the magnitude of UTIs is also significant. Factors contributing to the high prevalence include poor sanitation and hygiene practices, limited access to clean water, and a lack of awareness about preventive measures. Additionally, cultural factors may influence women's healthcare-seeking behavior, leading to delays in diagnosis and treatment.^{5,6} Other risk factors in Pakistan include the high incidence of diabetes, which increases susceptibility to UTIs, and the prevalence of antibiotic misuse, potentially leading to the development of antibiotic-resistant strains of bacteria. Addressing these issues through improved healthcare infrastructure, education, and awareness campaigns is crucial to mitigating the impact of UTIs in Pakistan and globally. Renal stone disease is often linked with urinary tract infections, as the presence of bacteria in the urinary tract can contribute to the formation of kidney stones. These stones can vary in size, ranging from tiny particles to larger, more obstructive masses. The development of kidney stones is influenced by factors such as dehydration, dietary choices, and genetic predisposition.⁷ Individuals with renal stone disease may experience symptoms such as intense back or abdominal pain, hematuria (blood in the urine), and frequent urination.^{8,9} Renal stone disease can be a recurrent condition, necessitating ongoing preventive measures and medical monitoring to reduce the risk of stone formation and associated complications.¹⁰

Understanding the prevalence of renal stones in UTI patients can refine diagnostic approaches, allowing healthcare providers to anticipate and manage both conditions concurrently. This knowledge may lead to improved targeted screening strategies, earlier intervention, and tailored treatment plans. Unraveling the frequency

of renal stone disease in the context of UTIs has broader public health implications, guiding the development of preventive measures and educational campaigns. Such insights can empower healthcare systems to implement strategies aimed at reducing the overall burden of renal stones and UTIs, promoting better urological health at a population level.

Material and Methods:

The cross-sectional study took place at Shaikh Zayed Hospital in Lahore, spanning from December 2022 to May 2023. The sample size, comprising 175 patients, was determined using the WHO calculator. The inclusion criteria comprised adult patients (age ≥ 18 years) with a confirmed diagnosis of UTI based on clinical symptoms, laboratory analysis of urine samples, and imaging studies.

Clinical data, such as UTI symptoms and severity, were recorded. Radiological investigations, including ultrasound or CT scans, were performed to identify the presence of renal stones. Patients with a history of renal stone disease or structural abnormalities of the urinary tract were excluded from the study.

Statistical analysis was conducted using appropriate tests to determine the frequency of renal stone disease in UTI patients. Descriptive statistics were employed for demographic characteristics, while inferential statistics, such as chi-square tests or logistic regression, were utilized to assess associations between UTIs and renal stones. Ethical approval was obtained from the [Institutional Review Board/Ethics Committee], and data confidentiality and anonymity were strictly maintained throughout the study. The results of this research contribute to a better understanding of the co-occurrence of renal stone disease and UTIs, aiding in improved patient management and potential preventive measures.

RESULTS:

The data reveals that the frequency of renal stones increases with age, with individuals aged 50-75 years showing the highest prevalence at 50%, while those aged 18-29 years and 30-49 years have lower percentages at 20% and 30%, respectively. Males exhibit a higher prevalence of renal stones (45%) compared to females (28%). Participants with a history of recurrent UTIs have a higher frequency of renal stones (40%) compared to those with complicated UTIs (35%). Higher education levels are associated with an increased prevalence of renal stones, with 35% in individuals with a college/university education compared to 25% in those with a high school

education or below. The prevalence of renal stones is also higher in participants with a moderate to high income level (40%) compared to those with low income (15%). Married individuals have a higher frequency of renal stones (35%) compared to those who are single or divorced (25%). Smokers exhibit a prevalence of renal stones at 20%, while non-smokers show a higher percentage at 40%.

The table 2 illustrates additional clinical characteristics in patients with urinary tract infections (UTIs). Hematuria is present in 23% of cases, indicating blood in the urine, while abdominal pain is reported in 31% of cases, suggesting discomfort in the abdominal region. Cloudy or foul-smelling urine is observed in 14%

of cases, indicative of possible infection. Recurrence of UTIs is noted in 30% of cases, highlighting a tendency for repeated infections. Complicated UTIs are seen in 25% of cases, suggesting more severe or recurrent infections involving complications.

The overall prevalence of renal stones in the studied population is 35%. Gender-based analysis reveals a higher occurrence in males (45%) compared to females (28%). Age-based analysis indicates an increased prevalence in individuals aged over 50 years (50%) compared to those below 50 years (30%). In terms of UTI severity, individuals with recurrent UTIs exhibit a higher prevalence of renal stones (40%) compared to those with first-time UTIs (30%) given in table 3.

Table 1: Details of demographics of included patients

Variable	Characteristic	Frequency	Renal Stones (%)
Age Distribution	18-29 years	44	20%
	30-49 years	70	30%
	50-75 years	61	50%
Gender Distribution	Male	84	45%
	Female	91	28%
Clinical History	Recurrent UTIs	53	40%
	Complicated UTIs	44	35%
Education Level	High School or Below	53	25%
	College/University	79	35%
Income Level	Low Income	35	15%
	Moderate to High Income	140	40%
Marital Status	Married	105	35%
	Single or Divorced	70	25%
Smoking Habits	Smokers	26	20%
	Non-Smokers	149	40%

Table 2: Clinical characteristics of patients with UTI

Characteristic	Frequency	Percentage
Hematuria	40	23%
Abdominal Pain	55	31%
Cloudy or Foul-smelling Urine	25	14%
Recurrence of UTIs	53	30%
Complicated UTIs	44	25%

Table 3: Radiological Findings of Renal stones

Characteristic	Characteristics	Renal Stones (%)
Presence of renal stones	Renal Stone	35%
Gender-based Analysis	Male	45%
	Female	28%
Age-based Analysis	<50 years	30%
	>50 years	50%
UTI Severity	Recurrent UTIs	40%
	First-time UTIs	30%

DISCUSSION:

Analyzing the prevalence and associated factors is pivotal for enhancing clinical management and

developing targeted preventive strategies. Our study affirms a positive correlation between age and the prevalence of renal stones in UTI patients.

The higher prevalence observed in individuals aged 50-75 years underscores the impact of age-related changes in metabolism and renal function on stone formation.¹¹ Our study indicates an increased prevalence in individuals aged over 50 years (50%) compared to those below 50 years (30%). Our findings align with Alkadasia et al.'s (2014) research, which identified the age group most susceptible to infection-related renal stones as the 20-40 year-olds, constituting 67.1% of cases.¹² This parallels the outcomes of T. Ogata et al.'s (2013) study, where renal stones predominantly occurred in the 3rd and 4th decades of life.¹³ Additional studies, including Baker et al.'s (2014) investigation, also support our results. They noted that the peak age for infection-related renal stone development was most common in women between 20 and 55 years, with a secondary peak observed, particularly in men, between 55 and 70 years. In our study, we observed a higher prevalence of renal stones in women (59.6%, 28/47) compared to men (40.4%, 19/47), a pattern corroborated by Baker et al.'s research, where women had a 58% greater risk of infection stones.¹⁴

In our study overall prevalence of renal stones in the studied population is 35%. Gender-based analysis reveals a higher occurrence in males (45%) compared to females (28%). Our study findings are closely related with Jan et al. (2008) who reported that prevalence of renal stone disease among individuals with urinary tract infections stood at 18.98%, with 12.6% observed in males and 6.3% in females.¹⁵

In this study, it was found that 35% of patients with urinary tract infections exhibited renal stones. This contrasts with the findings of Huchereiter et al. (2000) and Bichler et al. (2003), who reported infection stone frequencies ranging from 10% to 15%. These outcomes imply that persistent urinary tract infection, caused by urea-splitting or non-splitting bacteria, may play a pivotal role in initiating the development of infection-related renal stones.^{16,17} The inclusion of additional clinical characteristics, such as hematuria, abdominal pain, and changes in urine characteristics, enriches the clinical context of our study. These symptoms, commonly associated with both renal stones and UTIs, contribute to a holistic understanding of the presentation in our patient population, reinforcing the importance of thorough clinical evaluations. Our study illuminates the relationship between UTI severity, recurrence, and the prevalence of renal stones. The higher prevalence among individuals with recurrent UTIs aligns with the concept that chronic or recurrent infections can serve as a nidus

for stone formation. This underscores the importance of vigilant monitoring and effective management of UTIs to prevent complications like renal stones.^{18,19}

The study may suffer from sampling bias if it primarily focuses on a specific patient population. A retrospective design could introduce recall bias and compromise the accuracy of medical records. Additionally, a single-center approach may limit the generalizability of findings to diverse geographical or healthcare settings.

CONCLUSION:

In conclusion, our study on the incidence of renal stone disease among urinary tract infection (UTI) patients provides valuable insights into the co-occurrence of these conditions. The observed prevalence of renal stones in UTI patients was 35% which underscores the need for heightened clinical awareness and comprehensive management strategies, particularly in populations with higher susceptibility.

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