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ORIGINAL ARTICLE

Prevalence of Urinary Tract Infection among Patients Presenting with Complex Renal Stones at SIUT

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ABSTRACT

Introduction: The link between stone formation and urinary tract infections (UTIs) is complicated; research has primarily focused on bacteria's potential to stimulate the formation of kidney stones. Infective urolithiasis has long been thought to be the result of a urinary tract infection (UTI) caused by bacteria, most commonly belonging to the Proteus genus. Staghorn stone, which is characterised by a massive calculus entirely occupying the renal pelvicalyceal system, is one of the most common kinds of infective lithiasis. This study can serve in identifying the risk of UTI in a patient with complex renal stones, as well as preventing and intervening early.

Objective: The goal of this study was to investigate the prevalence of urinary tract infections (UTIs) among patients with complex renal stones who were sent to the Sindh Institute of Urology and Transplantation.

Subject and Methods: This cross-sectional study was conducted at Sindh Institute of Urology and Transplantation's out-patient urology department. This study included a total of 113 patients with complex renal stones. Culture and sensitivity (C/S) tests were performed on a urine sample supplied to the SIUT microbiology lab. The C/S results were gathered and categorized as positive or negative according to the operational criteria.

Results: The patients' average age was 30.83±8.29 years. There were 45 females (39.82 %) and 68 males (60.18 %). A urinary tract infection was observed in 22.12 % (25/113) of patients with complex renal stones.

Conclusion: We discovered a high prevalence of urinary tract infection in individuals with complex renal stones, and we propose that patients with acute nephrolithiasis have urine cultures taken and be monitored closely. Empiric therapy should be considered for patients with pyuria, women, or those with clinical characteristics suggestive of infection if sensitivity to diagnose urinary tract infection is to be prioritized because of the potentially serious consequences of under-treatment

Keywords: Nephrolithiasis, Urinary tract infections, Complex renal stones, Staghorn Stones.

INTRODUCTION

The link between nephrolithiasis and urinary tract infections (UTIs) is complicated, with most research focusing on bacteria's potential to induce the formation of kidney stones. In particular, kidney stones are traditionally divided into two groups: I calcium kidney stones (70-80 %), which are characterized by calcium oxalate and/or calcium phosphate stones, and (ii) non-calcium kidney stones (15-20 %), which are characterized by uric acid, cysteine, rare forms (such as drugs, dihydroxyadenine, and ammonium urate), and infectious stones (10-15 %). The latter are often made up of ammonium triphosphate and magnesium (struvite) [1]. Infective nephrolithiasis has long been thought to be the result of a urinary tract infection (UTI) caused by bacteria, most commonly belonging to the Proteus genus [2,3]. Staghorn nephrolithiasis is one of the most common types of infective lithiasis, which is defined by a huge calculus that completely occupies the renal pelvicalyceal system [4,5,6]. In a retrospective examination of calcium stone patients, 70% were found to have a urinary infection (mainly E.coli and Proteus spp) [6]. Recently, it has been stressed that the link between UTIs and nephrolithiasis is significantly more complicated than earlier research has revealed [7,8]. The clinical issues that struvite stones can cause, including as sepsis and kidney damage, are higher than those that any other stone type can cause. In a study conducted in Pakistan, stone formers were found to have a frequency of infection of roughly 79 % [8]. Infection prevalence may also vary based on the pathogenic mechanism of nephrolithiasis as well as the geographical, social, and economic milieu [9,10]. The prevalence of urinary tract infection (UTI) was found to be 12 percent in patients with complicated renal stones [11].

The goal of this study is to determine the prevalence of urinary tract infection in patients with complicated renal stones who present to a Pakistani tertiary care hospital. The positive findings of this study will aid in identifying the risk of UTI in a patient with complicated renal stones, as well as preventing and intervening early.

Objective: The goal of this study was to see how common urinary tract infections (UTIs) were among patients who had complex renal stones at Sindh Institute of Urology and Transplantation.

MATERIALS AND METHODS

After receiving approval from the SIUT Ethics Review Committee, this cross-sectional study was carried out at the Sindh Institute of Urology and Transplantation's out-patient department of urology (ERC). After receiving informed written consent, 113 patients with complex renal stones who met the inclusion criteria were enrolled in this study. A sample of midstream urine was sent to the SIUT microbiology lab for culture and sensitivity testing (C/S). C/S results were collected and categorised as positive if they contained >100,000cfu/ml of bacteria + >10 pus cells [12]. For categorical variables like gender, kidney involvement, kind of stone (partial staghorn or total staghorn), UTI, and quantitative variables like number and size of stones, as well as duration of disease, prevalence and percentage were calculated. For quantitative variables including age, stone size, and sickness duration, mean and standard deviation were calculated. Effect modifiers were controlled by stratification of age, gender, and kind of stone, as well as the size of the stone, the kidney affected, and the length of time the disease had been present. In strata, the Chi square test was used. P-values of less than 0.05 were considered significant.

RESULTS

This study included a total of 113 patients with complex renal stones. Table 1 shows that the average age of the patients was 30.83±8.29 years. 45 (39.82 %) of the 113 cases were female, whereas 68 (60.18 %) were male. The partial staghorn was found in 53.98 % and complete staghorn was found in 46.02 % of the cases. The right side of the kidney was affected in 50.44 % of cases, while the left side was affected in 49.56 %. Figure 1 shows the prevalence of urinary tract infection in patients with complicated renal stones, which was determined to be 22.12 %

(25/113). Table 2 shows that the rate of UTI in patients with complex renal stones did not differ significantly by age group (p=0.71). Similarly, the rate of UTI was 20% in males and 23.5 % in females, with no statistically significant findings (table 3). Prevalence was also evaluated in relation to stone type, stone size, disease duration, and kidney involved, but no significant influence was detected, as shown in tables 4.

Table 1: Descriptive statistics of the characteristics of the patients

Statistics		AGE (Years)	Duration of Disease (Weeks)	Stone Size (cm)
Mean		30.83	3.54	3.273
95% Confidence Interval for Mean	Lower Bound	29.29	3.29	3.192
	Upper Bound	32.38	3.79	3.353
Median		30	3	3.4
Std. Deviation		8.29	1.31	.4304
Minimum		18	1	2.3
Maximum		50	6	4.5
Interquartile Range		12	2	.4

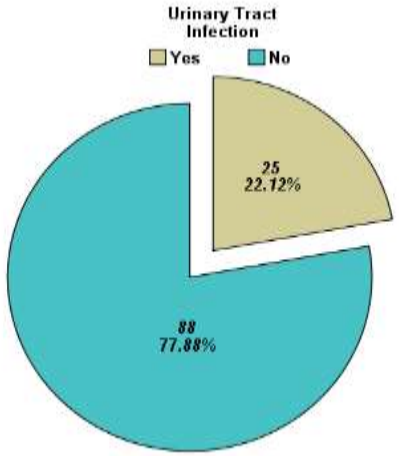

Figure 1: Prevalence of urinary tract infection among patients with complex renal stones n=113

Table 2: Prevalence of urinary tract infection among patients with complex renal stones with respect to age groups

Age Groups (Years)	Urinary Tract Infection		Total
	Yes	No	
≤ 20	2(15.4%)	11(84.6%)	13
21 to 30	15(32.6%)	31(67.4%)	46
31 to 40	4(10%)	36(90%)	40
>40	4(28.6%)	10(71.4%)	14

Chi-Square= 7.02 p=0.71

Table 3: Prevalence of urinary tract infection among patients with complex renal stones with respect to gender

Gender	Urinary Tract Infection		Total
	Yes	No	
Female	9(20%)	36(80%)	45
Male	16(23.5%)	52(76.5%)	68

Chi-Square= 0.196 p=0.65

Table 4: Prevalence of UTI with respect to stone type, size of stone and duration of disease

Stone Type	Urinary Tract Infection		Total
	Yes	No	
Partial staghorn	14(23%)	47(77%)	61
Complete staghorn	11(21.2%)	41(78.8%)	52
Size of Stone	Urinary Tract Infection		Total
	Yes	No	
≤ 3 cm	8(32%)	17(68%)	25
3.1 to 3.5 cm	14(22.2%)	49(77.8%)	63
>3.5 cm	3(12%)	22(88%)	25
Duration of disease	Urinary Tract Infection		Total
	Yes	No	
1 to 3 Weeks	14(24.6%)	43(75.4%)	57
4 to 6 weeks	11(19.6%)	45(80.4%)	56

Chi-Square= 0.529 p=0.52

DISCUSSION

Urinary tract infections (UTIs) and associated complications are one of the most prevalent causes of medical evaluation, resulting in substantial medical costs as well as high morbidity and mortality. Urinary lithiasis are another medical problem that can manifest as an acute or chronic clinical situation for patients, necessitating active therapy, either invasive or non-invasive, and therefore raising costs and hazards. In a 7000-year-old Egyptian mummy, evidence of urinary calculi (probably bladder) was discovered. [13] Its prevalence has risen dramatically in the modern period. Pakistan is part of the stone belt region, which has an increasing incidence of urolithiasis on a continuous basis. [14]

This study comprised 113 patients with complicated renal stones, the majority of whom were between the ages of 21 and 40, with an average age of 30.83±8.29 years. My findings are comparable to those of T. Ogata et al. [15], who found that renal stones were most common in the third and fourth decades of life. There was a little male majority in our analysis, with 45 (39.82 %) of the 113 instances of complex renal stone being female and 68 (60.18 %) being male. These findings are consistent with M. Okuyama's observations. [16] However, Rajput PA et al. found a male to female ratio of 4:1 in Baluchistan, indicating a substantial male preponderance. [17] Staghorn calculus accounts for 10 to 20% of all instances of nephrolithiasis. However, due to prevention, early diagnosis and intervention of urinary infections, this prevalence has fallen significantly (4%) in developing nations [18]. Its pathogenesis is linked to urease-producing bacteria, which cause urinary tract infection (UTI). In our study, partial staghorn was found in 53.98 % of the cases while total staghorn was found in 46.02 % of the cases. In their study[19], Carmen et al discovered that out of 630 individuals with stone disease, 37 (5.8%) had staghorn calculus. Out of 37 patients, fifteen had complete staghorn calculus and twenty-two had incomplete staghorn calculi.

The prevalence of urinary tract infection was reported to be 22.12% (25/1130) among individuals with complex renal stones in our study. According to Hizbullah Jan et al [9], urinary tract infection was found in 79 percent of patients. In their investigation, the incidence of renal stones was found to be 18.98 percent in individuals with urinary tract infection. Infection stones were found in 10–15 percent of patients, according to Huchereiter W[20] and Bichler KH[21]. In a study of 177 patients with acute nephrolithiasis, Yilmaz et al [22] discovered urinary tract infection in 15% of the patients, and pyuria levels greater than 10 WBCs/hpf had a sensitivity and specificity of 78 percent and 72 percent, respectively, for urinary tract infection. Fredrick et al [23] found that women made up just one-third of patients with acute nephrolithiasis but more than 90% of those with a concurrent urinary tract infection. It is commonly known that women are more susceptible to urinary tract infections than men, and there has previously been a link between female gender and infected kidney stones. [24] In our study, however, the rate of UTI was 20% in males and 23.5 % in females, indicating a modest female gender preponderance.

One of our study's weaknesses is that it was a single-center study, so the results may not be indicative of other populations or contexts. It's improbable that every patient with acute nephrolithiasis was included in the study. Because clinicians were aware of the study's goal, there may have been a bias in enrolling and sending urine and culture samples to patients with suspected illness. As a result, rates of concurrent urinary tract infection may have been overstated, and patients with advanced infection may

have been enrolled more selectively than would have been expected. We also did not follow up with patients, so we don't know what happened to individuals who were not given antibiotics but later discovered to have a urinary tract infection. The number of patients with acute nephrolithiasis who develop problems as a result of delayed treatment of a urinary tract infection is unclear.

CONCLUSION

We discovered a high prevalence of urinary tract infection in individuals with complex renal stones, and we urge that patients with acute nephrolithiasis have urine cultures taken and be monitored closely. Empiric therapy should be considered for patients with pyuria, women, or those with clinical characteristics suggestive of infection. Sensitivity to diagnose urinary tract infection is to be prioritized because of the potentially serious consequences of under treatment.

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