







Evaluation of Renal Functions in Patients with Genitourinary System Tuberculosis Involving the Kidney/Ureter: Single Center Experience

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ABSTRACT

Objective: Genitourinary Tuberculosis (GU-TB) is one of the most common types of extrapulmonary tuberculosis. This study aims to evaluate changes in renal function in patients diagnosed with GU-TB at our clinic after a 12-month follow-up.

Materials and Methods: Patients aged 18 to 70 years treated between 2015 and 2021 were included in this study. Exclusion criteria were a prior history of GU-TB, other etiological factors affecting renal function, ureter-kidney involvement, and incomplete follow-up or treatment. Demographic and clinical data, the need for urinary diversion, types of diversions performed, most common symptoms, and renal functions at diagnosis, the 3rd month, and the 12th month were compared.

Results: A total of 34 patients were included in the study. The most common symptom was urgency (70%). Urinary diversion was necessary for 22 patients (64.7%). Kidney function evaluation revealed that the glomerular filtration rate, initially 53.9 ± 24.8 , increased to 63.5 ± 19.1 after treatment ($p < 0.001$).

Conclusion: In patients with GU-TB involving the kidneys and ureters, appropriate diversion methods and treatment may lead to some improvement in renal function. However, it should be noted that patients with GU-TB constitute an extremely heterogeneous group, and symptoms and clinical findings may vary depending on the selected patient group.

Keywords: Genitourinary tuberculosis, renal functions, urinary diversion.

INTRODUCTION

Tuberculosis is one of the most common causes of infection-related deaths worldwide.¹ Genitourinary system tuberculosis (GU-TB) is one of the most typical and frequent examples of extrapulmonary tuberculosis, peaking especially in the 4th–5th decades of life.^{2,3}

Genitourinary system tuberculosis often presents with nonspecific urinary symptoms. Renal colic, abdominal pain, dysuria, urgency, voiding problems, and infertility are typically the most common genitourinary symptoms.^{4,5} The nonspecific nature of these symptoms can lead to delayed diagnosis and complications such as renal failure.^{6,7}

Genitourinary system tuberculosis can also present with clinical findings such as inflammation in the urogenital system, leading to hydronephrosis, dilation in the ureters, fibrosis in the ureters and bladder, obstruction in the vas deferens, and fibrosis.⁸ The diagnosis of GU-TB is based on clinical symptoms, radiological findings, acid-fast bacilli staining of urine samples using Ziehl-Neelsen stain, and tuberculosis cultures.⁹

This study aims to present the general demographic and clinical characteristics of patients diagnosed with GU-TB in our clinic and to evaluate the preservation rates of renal functions in 12-month follow-ups.

MATERIALS AND METHODS

Study Design and Patient Selection

Patients diagnosed with GU-TB in our clinic between January 2015 and January 2021 were included in this retrospective study. Approval for the study was received from the Erciyes University Clinical Research Ethics Committee (approval date: 28/02/2024, approval number: 2024/156). The study included patients aged between 18 and 70 years who had at least two positive clinical, radiological, or microbiological diagnostic tests for GU-TB and had received treatment for GU-TB after diagnosis. Exclusion criteria included missing clinical or demographic data, less than 12 months of follow-up data, a history of GU-TB at the time of diagnosis, known renal failure, urogenital pathology that could cause relevant symptoms, previous tuberculosis treatment for other reasons, and renal function loss due to other urinary causes during follow-up.

Data Collection and Analysis

Data collected included age, gender, history of tuberculosis or recent contact in the last year, presence of urinary symptoms (dysuria, urgency, abdominal pain, renal colic, urinary incontinence at admission), immunosuppression status, involved urinary anatomical structures, presence of pelvic calyceal ectasia, serum creatinine, and glomerular filtration rate (GFR) values at diagnosis and at 6, 12, and 24 months. Additionally, data were recorded on the development of chronic kidney failure (CKF), the need for urinary diversion (ureteral J stent or nephrostomy), tuberculosis treatment, diagnostic methods for GU-TB, and various demographic and clinical characteristics of the patients. Descriptive statistics and changes in serum creatinine and GFR values over time were analyzed.

KEY MESSAGES

- Renal dysfunction was detected in over half of the patients presenting with genitourinary tuberculosis at our clinic.
- Ureteral diversion is crucial for patients with urinary system involvement.
- Renal functions showed some improvement following appropriate urinary diversion in patients with early renal dysfunction.

Statistical Analysis

The distribution characteristics of the data were evaluated using the Shapiro-Wilk test and histogram graphs. Numerical data showing a normal distribution were expressed as mean±standard deviation, while those not showing normal distribution were expressed as medians (1st–3rd quartile). Categorical data were expressed as percentages (%). The Friedman test was used to compare numerical data with non-normal distribution involving multiple measurements within dependent groups. Repeated Measures Analysis of Variance (ANOVA) was utilized for numerical data showing normal distribution. Post hoc analysis using the Bonferroni test was performed after the Repeated Measures ANOVA. The Cochran Q test was used for comparing repeated nominal data. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 34 patients were included in the study, consisting of 16 (47.1%) females and 18 (52.9%) males. The mean age of the patients was 44.4±6.2 years. When evaluated for urinary symptoms such as dysuria, urgency, abdominal pain, and renal colic at the time of admission, urgency was the most common symptom in both genders, as shown in Figure 1. At 12 months of follow-up and treatment, urinary incontinence and urgency symptoms persisted, while other symptoms significantly decreased (Fig. 2).

At the time of diagnosis, unilateral dilation was present in 14 (41.2%) patients and bilateral dilation of the ureter or renal pelvis in 8 (23.5%) patients. Twenty (58.9%) of these patients had serum creatinine levels above the normal limits, indicating signs of renal failure. At the 12-month follow-up, serum creatinine levels were above normal (>1.2 mg/dL) in 12 (35.3%) patients, with five of these patients exhibiting levels above 2.0 mg/dL.

Regarding urinary diversion methods at the time of diagnosis, a total of 22 ureteral J stents were inserted into 18 patients' renal units and eight percutaneous nephrostomies were performed on four patients. By the end of the 12 months, only four renal units (in three patients) retained a permanent ureteral J

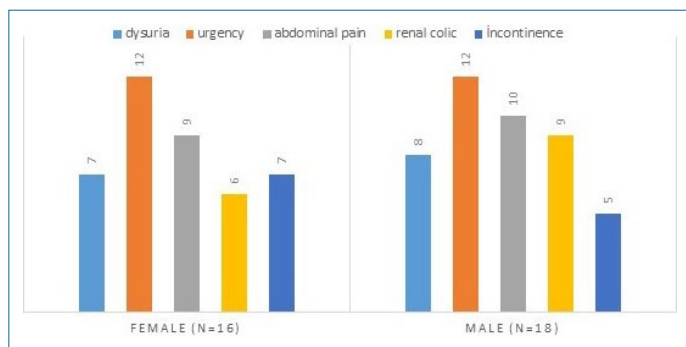


Figure 1. Distribution of patients by symptoms at presentation and gender.

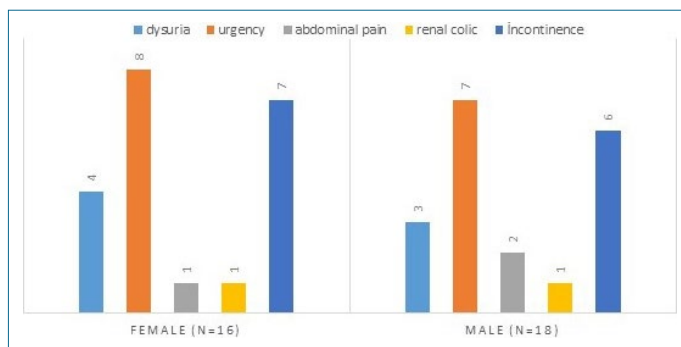


Figure 2. Symptoms at 12 months post-diagnosis and distribution by gender.

Table 1. Comparison of patients’ renal functions at diagnosis and at the end of 12-month follow-up

Variable	At diagnosis	3 rd month	12 th month	p
Serum creatinine (mg/dL) ^x	1.40 (1.00–2.45) ^a	1.10 (1.00–1.60) ^b	1.05 (1.00–1.62) ^b	<0.001
Serum GFR (mL/min) ^y	53.9±24.8 ^a	63.0±19.4 ^b	63.5±19.1 ^b	<0.001
Ureteral J stent inserted (n, %) ^z	18/34, 53.0% ^a	9/34, 26.5% ^b	3/34, 8.8% ^b	<0.001
Percutaneous nephrostomy inserted (n, %) ^z	4/34, 11.8%	2/34, 5.9%	1/34, 2.9%	0.097

GFR: Glomerular filtration rate; *: Different superscripts in the same row indicate statistically significant differences; **: Values are expressed as mean±standard deviation, n/%, or median (1st quartile–3rd quartile) based on their distribution or type; x: The Friedman test was used to compare numerical data showing non-normal distribution with multiple measurements of dependent groups; y: The Repeated Measures Analysis of Variance (ANOVA) test was used for numerical data displaying a normal distribution. A Bonferroni test was conducted for post hoc analysis following the Repeated Measures ANOVA; z: The Cochran Q test was used to compare repeated nominal data.

stent, while two renal units (in one patient) continued with a permanent percutaneous nephrostomy. A decrease in bladder capacity was detected in 12 (35.2%) patients.

When serum creatinine values of the patients included in the study were evaluated, it was observed that they were highest at the time of diagnosis. Conversely, serum GFR values increased over time (Table 1). Although a GFR level of 19 mL/min was detected in one (2.9%) patient, none of the patients included in the study required permanent dialysis.

DISCUSSION

In this study, we evaluated the 1-year follow-up results of our patients diagnosed and treated for GU-TB. The data showed that renal function was impaired in more than half of the patients at the time of diagnosis, yet only five patients displayed moderate renal failure after 1 year of treatment and follow-up, with none requiring permanent dialysis. Figueiredo et al.¹⁰ reported the rate of end-stage renal failure due to genitourinary tuberculosis as 5.7%, while Kim et al.¹¹ reported this rate as 7.1%. According to data from the European Dialysis and Transplant Association, approximately 0.65% of patients requiring dialysis have a GU-TB etiology.¹² A study conducted in Korea reported this rate as 0.1%.¹³ The absence of any need for dialysis in the patients in our study may be attributed to the relatively short follow-up period and the small sample size.

Approximately 65% of the patients in our study were found to have dilation in the ureter or renal pelvis. A recent study published in 2021 detected urinary system anomalies in 79% of 72 patients on computed tomography.¹⁰ In another study, the rate of ureter or kidney involvement in GU-TB was reported as 69%.¹¹ These findings suggest that our results are consistent with the literature and that there are high rates of ureter and/or kidney dilation in patients with GU-TB.

In a study by Lee et al.,¹⁴ urinary diversion was necessary for only 13 out of 101 patients (13%): eight patients required a ureteral stent and five required a nephrostomy. However, unlike our study, which included only cases of ureteral and kidney involvement, their study encompassed all genitourinary tuberculosis cases, covering the entire genitourinary system (testis, prostate, bladder, etc.). In another similar study, the rate of urinary diversion was reported as 13.4%.¹⁵ Ramanathan et al.¹⁶ detected upper urinary system obstruction in 46.3% of the patients included in their study, reporting that more than half of these patients required ureteral stents. In a study involving 41 children and adolescents, urinary stent or nephrostomy was applied in 56% of the patients.¹⁷ Considering that approximately 65% of the patients in our study required urinary diversion, it can be said that patients with GU-TB are an extremely heterogeneous group, and the inclusion criteria directly affect study results.

Kim et al.¹¹ reported that the rates of nonspecific symptoms, urinary symptoms, and abdominal pain were approximately 11%, 49%, and 40%, respectively. Another study involving 41 children and adolescents found that the most common symptoms were abdominal and flank pain.¹⁷ In our study, although patients generally presented with multiple symptoms, urgency was the most common urinary symptom (approximately 70%), followed by abdominal-renal pain (approximately 55%). This may be due to both urinary system obstruction and bladder involvement in GU-TB.

The most significant limitation of our study may be the small number of patients included. Additionally, the retrospective nature of the study, the short follow-up period, the inability to create patient subgroups for evaluating other risk factors for kidney failure, and the non-standardization of treatments applied to patients are other important limitations of our study.

CONCLUSION

In conclusion, considering the literature and our results, it can be said that patients with GU-TB constitute an extremely heterogeneous group, and symptoms and clinical findings may vary depending on the selected patient group. However, the common consensus is that this disease can have quite adverse effects on renal functions and the urinary system, and timely and necessary renal replacement is crucial, especially considering nonspecific symptoms.

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Ethics Committee Approval: The Erciyes University Clinical Research Ethics Committee granted approval for this study (date: 28.02.2024, number: 2024/156).

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