

Dual burden of renal tuberculosis and renal stones: A diagnostic dilemma

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Abstract

Objective: To review concurrent renal tuberculosis and nephrolithiasis as a diagnostic dilemma in clinical practice.

Method: The descriptive, prospective follow-up study was conducted at the Department of Urology, Sindh Institute of Urology and Transplantation, Sukkur, Pakistan, from May 2024 to February 2025, and comprised a retrospectively identified cohort from January 2020 to April 2024 of patients aged 4-70 years who had undergone nephrectomies and were subsequently found to have renal tuberculosis on histopathology reports compared to the initial diagnosis of non-functioning kidneys secondary to nephrolithiasis. Data was analysed using SPSS 27.

Results: Of the 394 patients who underwent nephrectomies, 61 (15.5%) were later identified as having renal tuberculosis; 34 (55.7%) males and 27 (44.6%) females with overall mean age 29.5±17 years. Profound risk factors included family history of tuberculosis 15 (24.9%), malnutrition 33 (54%), chronic renal failure 2 (3.2%) and overcrowding 41 (67.2%). Symptoms included frequency 19 (29.5%), nocturia 11 (18%) and fever 14 (23%). Nephrocutaneous fistula was found in 7 (12.9%) cases. Calculi with perinephric collection were identified in 33 (54.1%) cases, and calculi with hydronephrosis in 28 (45.9%).

Conclusion: The dilemma in diagnosing renal tuberculosis in the presence of urolithiasis was likely due to the masking of classical tuberculosis symptoms, particularly in endemic regions.

Keywords: Renal tuberculosis, Nephrolithiasis, Malnutrition, Risk factors. (JPMA 76: 1674; 2026)

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Introduction

Genitourinary tuberculosis (GUTB) is an insidious disease. Concurrent renal stones can further confound an accurate diagnosis of background tuberculosis (TB). Hence, TB was described by Sievers in 1961 as “a great imitator” after syphilis.¹

The World Health Organisation (WHO) does not offer specific data on GUTB occurrence, but provides an overall TB incidence rate of 259 per 100,000 people in Pakistan in 2022, with eight nations representing almost two-thirds of global TB infections, and Pakistan ranking fifth at 5.7%.² Among extra-pulmonary TB, GUTB incidence is 15-40% of all the 10 million TB cases.³

TB is caused by bacilli of the mycobacterium tuberculosis complex (MTBC). Human immunodeficiency virus (HIV) infection is known to increase the risk of active TB 30-fold due to decreased immunity. In about one-third of GUTB patients, the secondary infection organism caused by escherichia (*E. coli*)⁴ is usually isolated in urine culture, often leading to misdiagnosis. Other risk factors include

malnutrition, chronic liver disease (CLD), smoking, poor housing, pneumoconiosis, immunosuppressive drugs, renal transplantation and end-stage kidney disease (ESKD).

Diagnosis of latent TB infection can involve serological tests and light-emitting diodes (LED) microscopy as an alternative to Ziehl-Neelsen (ZN) microscopy. Interferon-gamma release assays (IGRAs) are immunological tests that can identify mycobacterium tuberculosis (MTB).⁵ Molecular diagnostics are crucial in rapidly and accurately detecting TB and drug resistance.⁶ Polymerase chain reaction (PCR) can quickly identify MTB even when smear and culture tests are negative.⁷ MTB culture remains the gold standard, with 65% sensitivity and 100% specificity, but it takes up to six weeks for conclusive results.⁸ GeneXpert has shown the highest sensitivity (99.1%), but lower specificity (96%).⁹ Diagnosing GUTB is challenging because the disease often progresses while kidney cavities are sealed off, leading to negative urine cultures. Chest and spine radiographs are utilised to diagnose primary pulmonary TB, while intravenous pyelography (IVP) has an accuracy of 88%.¹⁰

Dolev et al. in 1985 found that 24.5% of patients with renal TB developed renal stones, although no correlation was found between renal stones and secondary infections.¹¹ This contradicts previous assumptions and prompts further research that secondary infection leads to calcium stone formation in the kidney.

Ozturk et al. concluded that in cases of complicated fistulas following percutaneous nephrolithotomy (PCNL), TB

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should be considered a primary diagnosis due to its difficulty in detection.¹²

To our knowledge, only a few studies, mainly case reports, have been conducted regarding the concomitant existence of renal stones and TB. Even though the presence of urolithiasis can mask GUTB.

The current study was planned to report concurrent renal TB and nephrolithiasis cases as a diagnostic dilemma in clinical practice in endemic areas.

Patients and Methods

The descriptive, prospective follow-up study was conducted at the Department of Urology, Sindh Institute of Urology and Transplantation (SIUT), Sukkur, Pakistan, from May 2024 to February 2025, and comprised a retrospectively identified cohort from January 2020 to April 2024 of patients who had undergone nephrectomies. After approval from the institutional ethics review committee, medical records were retrieved of all patients of both genders aged 4-70 years who had undergone nephrectomy due to non-functioning kidneys secondary to stone disease, and pelvi-ureteric junction obstruction. Data of patients who were subsequently found to have GUTB on histopathology reports compared to the initial diagnosis of non-functioning kidneys secondary to nephrolithiasis was included. Nephrectomies done secondary to renal mass and renal trauma were excluded as they were oncological and emergency procedures, respectively. The included patients were followed up prospectively from May 2024 to February 2025 after taking informed written consent from all of them.

All the patients were called as outpatients in clinic for the reassessment of potential risk factors and course of disease. Malnutrition was defined as per the WHO criterion,¹³ deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. The term covers three broad groups of conditions: undernutrition, stunting (low height for age), wasting (low weight for height), and underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). And overweight, obesity and diet-related non-communicable diseases (such as heart disease, stroke, diabetes and cancer).¹³ Body mass index (BMI) < 18.5kg/m² was taken as underweight, BMI 18.5-22.9kg/m² indicated normal weight, BMI 23-24.9kg/m² was overweight, and BMI ≥25kg/m² was taken as obese. Also noted was history of TB or contact with TB, a family history of TB, chronic renal failure, overcrowding (defined as >3 people per habitable room), use of immunosuppressive drugs, and HIV status. Additionally, symptoms such as urinary frequency, haematuria, nocturia, fever, and weight-loss, as well as

specific symptoms, such as non-healing wounds and nephrocutaneous fistulas, were evaluated. Laboratory findings reviewed retrospectively included sterile pyuria on urine analysis and culture. A radiological review was done with the assistance of a qualified radiologist, focussing on ultrasound and computed tomography (CT) scans of kidney-ureter-bladder (KUB). This review revealed common findings associated with GUTB, primarily pyonephrosis with calculi and perinephric collections (spontaneous rupture). Patients who were not already on anti-TB therapy (ATT) were placed on ATT following re-assessment. All the patients were monitored at three months and after treatment completion for symptom resolution or worsening. Follow-up tests were performed for patients exhibiting persistent symptoms, including CT urography, sputum analysis and urine GeneXpert.

Data was analysed using SPSS 27. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as means +/- standard deviations.

Results

Of the 394 nephrectomies, 317(80.5%) related to non-functioning kidneys secondary to stone, and 77(19.5%) to pelvi-ureteric junction obstruction. Of the nephrectomies related to non-functioning kidneys secondary to stone, 61(15.5%) were in patients who were later identified as having renal TB on histopathology report. Among them, 34(55.7%) were males and 27(44.6%) were females. The overall mean age was 29.5±17 years, and 38(62.3%) of the patients belonged to rural areas, predominantly from Sindh province 60 (91.6%). There were 24 (39.3%) patients already on ATT, while therapy was initiated in the remaining 37 (60.7%). After the completion of therapy, none of the patients showed worsening of symptoms.

Risk factors identified for renal TB with nephrolithiasis included a family history of TB 15(24.9%) cases, malnutrition 33(54%), and substandard/overcrowded living conditions 41(67.2%) (Table 1).

The most common presenting symptom was frequency 19(29.5%), while the least common symptom was

Table-1: Significant risk factors in renal tuberculosis (TB) patients (n=61).

Risk factors	n (%)
Malnutrition	33 (54)
Family history of TB	15 (24.9)
Overcrowding	41 (67.2)
Chronic renal failure	2 (3.2)
HIV	-
Immunosuppressive drugs	-
Alcohol addiction	-

HIV: Human immunodeficiency virus.

nephrocutaneous fistula 7(12.9%). Urine cultures were positive in 34(55.7%) patients, with *E. coli* 19(31.1%) being the most frequently isolated pathogen. The presence of pus cells >10 in urine was noted in 28(45.9%) cases and red blood cells (RBCs) in 24(39.4%) (Table 2). Imaging scans identified calculi with perinephric collections in 33(54.1%) cases. None of the cases showed any specific radiological finding (Figure) suggestive of renal TB before the operation (Figure).

Table-2: Symptomatology, laboratory and imaging investigations in renal tuberculosis (TB) patients.

Parameters	n (%)
Symptoms	
Frequency	19 (29.5)
Nocturia	11 (18.0)
Fever	14 (23.0)
Nephrocutaneous fistula	7 (12.9)
Laboratory investigation	
Urine Culture organism(positive)	27 (44.3)
Escherichia (<i>E.</i>) coli	17 (27.9)
Klebsiella	4 (6.6)
Pseudomonas (<i>P.</i>) aueruginosa	2 (3.3)
Urine Detailed Report (D/R)	
Pus cells (>10)	28 (45.9)
Red blood cells (RBCs)	36 (59.0)
Imaging studies (CT scan)	
Calculi with Perinephric collection	33 (54.1)
Calculi with hydronephrosis (no collection)	28 (45.9)

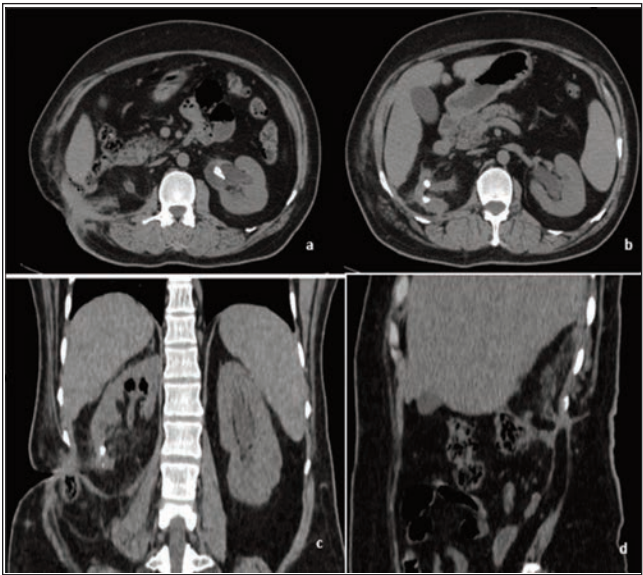


Figure: Plain computed tomography (CT) images of abdomen show (a) a non-healing scar in the right lateral abdominal wall secondary to prior surgery, showing thickening and fat stranding; (b) mild residual hydronephrosis in the right kidney with residual calculi in lower pole calyx along with (c) air in right pelvicalyceal system seen. (d) perinephric location along with non-healing scar in left flank (post-nephrectomy).

Discussion

Literature on the concurrent existence of renal TB and kidney stones, to our knowledge, is limited. In a case series published in 1971, Richard et al. studied 30 patients with GUTB treated over 25 years. Most of the patients were asymptomatic, suggesting that GUTB can remain latent for long periods, potentially leading to misdiagnosis.¹⁴

This aligns with Obran et al.'s theory, which proposed that latent foci of TB in the urinary tract may reactivate after 2-20 years¹⁵ and postulated that GUTB is uncommon in children because of a long latent period to spread from pulmonary to GUTB. However, the current study found 10(16.3%) cases in children aged <10 years. There is a need to be more vigilant in diagnosing this age group of patients.

The most common causes of late GUTB diagnosis include the absence of a typical pattern and the tendency to manifest under the guise of other diseases.¹⁶ A case report from Indonesia described a two-year-old boy with GUTB and malnutrition, managed with ATT.¹⁷ Family history of TB and recurrent urinary infections was significant, as was observed in the current study as well.

In 1971, Gow conducted a 24-year study, revealing that 12% of urine specimens with MTB lacked pyuria.¹⁸ Additionally, renal calcification emerged as a severe complication of GUTB, highlighting the importance of early diagnosis and intervention to avoid such serious outcomes. However, Bloom et al. contested this, reporting they could not culture tubercle bacilli from caseous material in non-functioning kidneys.¹⁹

A study²⁰ described with disease progression, chronic inflammation involving the renal tubules and medulla leads to caseous necrosis and fibrosis, creating an alkaline milieu that predisposes to infective stone formation. This process is frequently compounded by *Escherichia coli* infection, as observed in our cases. These findings might have led to a misleading impression of pyonephrosis secondary to the calculi observed in the current study.

In 1962, Apperson et al. observed that calcium deposits in renal TB patients could form in the renal parenchyma or collecting system. Among 161 patients, 18% had calculi, 9.3% had TB calcifications, and 8.7% had TB stones.²¹ The current study presents very similar findings, with 15.5% patients postoperatively diagnosed TB calculi, which can be explained by the imbibition of calcium salts in the caseous renal cavity that mimics renal calculi.

Amaresan et al. reported that 33% of their patients experienced loin pain and 42% had dysuria.²² The current study found frequency of urine in 19(29.5%) patients,

nocturia in 11(18.0%) and fever in 14(23.0%), while the specific symptom, nephrocutaneous fistula, was found in 7(12.9%) patients.

Early treatment is critical to preserving kidney function, and even in cases of non-functioning kidneys (auto-nephrectomy or "putty" kidney), ATT is the preferred treatment to decrease the burden of disease.²³ In the present study, all patients presented late and required nephrectomy, which further points out the complexity of the disease and the dilemma in diagnosis.

The current study has limitations as the data was collected retrospectively and the patients were followed prospectively. Three patients out of 64 were lost to follow-up, among whom two were reported to have expired. Secondly, vaccination status was not documented; given that Bacille Calmette-Guérin (BCG)-induced protective immunity typically persists for 15-20 years²⁴ the occurrence of disease in a children raises concern regarding either lack of vaccination or possible early vaccine failure, both of which are alarming. Further, pus/urine culture for acid-fast bacilli (AFB) and GeneXpert testing was missing. Stone analysis in GUTB patients was not performed to confirm infective calculi potentially related to an alkaline milieu secondary to caseous necrosis.²⁵

Conclusion

In clinical urology practice, physicians continue to observe the co-occurrence of renal TB and urolithiasis. The dilemma in diagnosing renal TB with concomitant urolithiasis is likely due to the masking of classical TB symptoms, particularly in regions where both the diseases are endemic. Clinicians should adopt a comprehensive evaluation approach, considering risk factors, such as malnutrition, a family history of TB, and cardinal symptoms, like increased urine frequency and nocturia, and they should opt for special investigation, like urine GeneXpert, AFB smear and culture, and a high index of suspicion in characteristic CT findings, such as pyonephrosis and perinephric abscess in order to improve timely diagnosis and prompt treatment.

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Author Contribution:

NM: Concept, literature search and data collection.

NAM: Data analysis, literature review and drafting.

MH: Drafting, revision and final approval.

SUNA: Interpreting radiological findings and data collection.

SS: Agreement to be accountable for all aspects of the work.

MM: Histopathological diagnosis, critically reviewed and final approval.