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Renal suppurative infections: Analysis of a series of 32 cases

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Summary

Introduction: Renal suppurative infections (RSIs), including pyonephrosis, renal abscess, and perinephric abscess, are rare but potentially life-threatening conditions. This study aimed to evaluate the epidemiological, diagnostic, therapeutic, and outcome aspects of RSIs.

Materials and methods: We conducted a retrospective descriptive study of patients admitted for renal suppurative infections in the urology department of CHU Yalgado Ouédraogo between November 2021 and December 2023. Epidemiological, clinical, biological, radiological, and therapeutic data were analyzed.

Results: Among 1,377 admitted patients, 32 cases of RSIs were identified (hospital prevalence: 2.32%). The mean age was 37.48 ± 15.68 years, with a female predominance (sex ratio 1.4).

Fever-associated flank pain was the main presenting symptom (84.38%). Obstructive uropathy, particularly urolithiasis and schistosomiasis-related ureteral lesions, was the main etiological factor. Pyonephrosis was the most frequent diagnosis (68.75%). All patients underwent ultrasonography, complemented by computed tomography in 78.12% of cases. Biological findings showed anemia, leukocytosis, and impaired renal function in a substantial proportion of patients. *Escherichia coli* was the most frequently isolated pathogen. Management combined broad-spectrum antibiotic therapy and systematic percutaneous drainage. Secondary etiological surgery was performed in 56.06% of cases. The mean hospital stay was 30.13 ± 26.83 days. The mortality rate was 12.9%, mainly associated with underlying malignancy.

Conclusions: RSIs remain severe infections requiring prompt diagnosis and multidisciplinary management. Early antibiotic therapy combined with effective drainage improves outcomes; however, prognosis is strongly influenced by underlying comorbidities. Optimizing the management of obstructive uropathies and associated conditions is essential to reduce morbidity and mortality.

KEY WORDS: Kidney diseases; Suppurative; Pyonephrosis; Renal abscess; Urinary tract obstruction.

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INTRODUCTION

Renal suppurative infections are rare but potentially severe pyogenic infections. They encompass all suppurative infections involving the renal collecting system, renal parenchyma, and the perirenal space. They include

pyonephrosis, renal abscess, and perinephric abscess.

Classically, pyonephrosis is defined as a purulent collection within the renal collecting system associated with partial or complete destruction of the renal parenchyma and accompanied by pyelitis (2, 3). In recent years, the terms pyonephrosis and infected hydronephrosis have been used interchangeably (4).

A renal abscess is a localized purulent collection within the renal parenchyma, which may be cortical or corticomedullary (5). Perinephric suppuration is located between the renal capsule and Gerota's fascia (5).

In the 1950s, mortality rates reached up to 50% (6), mainly due to delayed diagnosis (6, 7). Approximately 25% to 30% of cases were only diagnosed at autopsy (8). These conditions lack specific clinical symptoms; however, diagnosis has significantly improved with the widespread use of ultrasonography and computed tomography (6, 8).

Treatment has also benefited from the development of percutaneous drainage techniques associated with low morbidity (9), as well as the availability of a wide range of antibiotics.

The aim of this study was to review our experience in the diagnostic and therapeutic management of renal suppurative infections.

MATERIALS AND METHODS

This was a retrospective, descriptive, cross-sectional study based on the review of hospitalization records and operative reports of patients admitted for renal suppurative infections in the Department of Urology of Yalgado Ouédraogo University Hospital (CHU Yalgado Ouédraogo), Ouagadougou, Burkina Faso, between November 2021 and December 2023. An exhaustive sampling method was used. The variables studied included epidemiological, clinical, and therapeutic parameters.

Data collected from individual records were entered and analyzed using Epi Info version 7.2.4. Quantitative variables were expressed as mean $\pm$ standard deviation, and qualitative variables as frequencies and percentages.

RESULTS

During the study period, 1,377 patients were admitted to the urology department of CHUYO. Among them, 32

Table 1.
Socio-demographic characteristics.

Characteristic	Number	Percentage (%)
Age < 20	4	12.5
20-40	12	37.5
40-60	13	40.62
≥ 60	3	9.38
Female	19	59.38
Male	13	40.63

Table 2.
Clinical findings.

Clinical feature	Number	Percentage (%)
Febrile flank pain	27	84.38
Burning micturition	10	31.25
Hematuria	7	21.88
Pyuria	6	18.75

patients were hospitalized for *renal suppurative infection* (RSI), corresponding to a hospital prevalence of 2.32%. The sex ratio was 1.4 in favor of females. The mean age of patients was 37.48 ± 15.68 years. The socio-demographic characteristics are presented in Table 1.

Fever-associated flank pain was reported in 84.38% of patients. General condition and severity of sepsis were assessed using the WHO performance status and the qSOFA score, respectively.

Physical examination revealed flank tenderness in 68.75% of cases and an enlarged kidney in 50% of patients. The distribution of symptoms and clinical signs is shown in Table 2.

One case of diabetes was identified. Overall, 37.5% ($n = 12$) of patients reported a history of urogenital schistosomiasis during childhood.

Ultrasound was performed in all cases and was supplemented by CT scan in 78.12% ($n = 25$). Risk factors are illustrated in Figure 1.

Pyonephrosis, renal abscess, and perinephric abscess accounted for 68.75% ($n = 22$), 22% ($n = 7$), and 9% ($n = 3$) of cases, respectively.

Hemogram data were available for 24 patients and revealed marked abnormalities consistent with severe infection and systemic involvement. The mean hemoglobin level was 8.74 ± 2.59 g/dL, with 41.67% of patients presenting with severe anemia (hemoglobin < 7 g/dL). Leukocytosis was observed in 62.5% of cases, while thrombocytopenia was present in 20.83%. Renal function was significantly impaired, with a mean serum creatinine level of 590.92 ± 722.02 $\mu\text{mol/L}$, and 37% of patients exhibiting creatinine levels above 240 $\mu\text{mol/L}$.

Microbiological investigations included urine cultures in 31 patients and pus cultures in 29 patients. A pathogen was identified in 9 cases, predominantly *Escherichia coli* ($n = 5$).

Figure 1.
Risk factors.

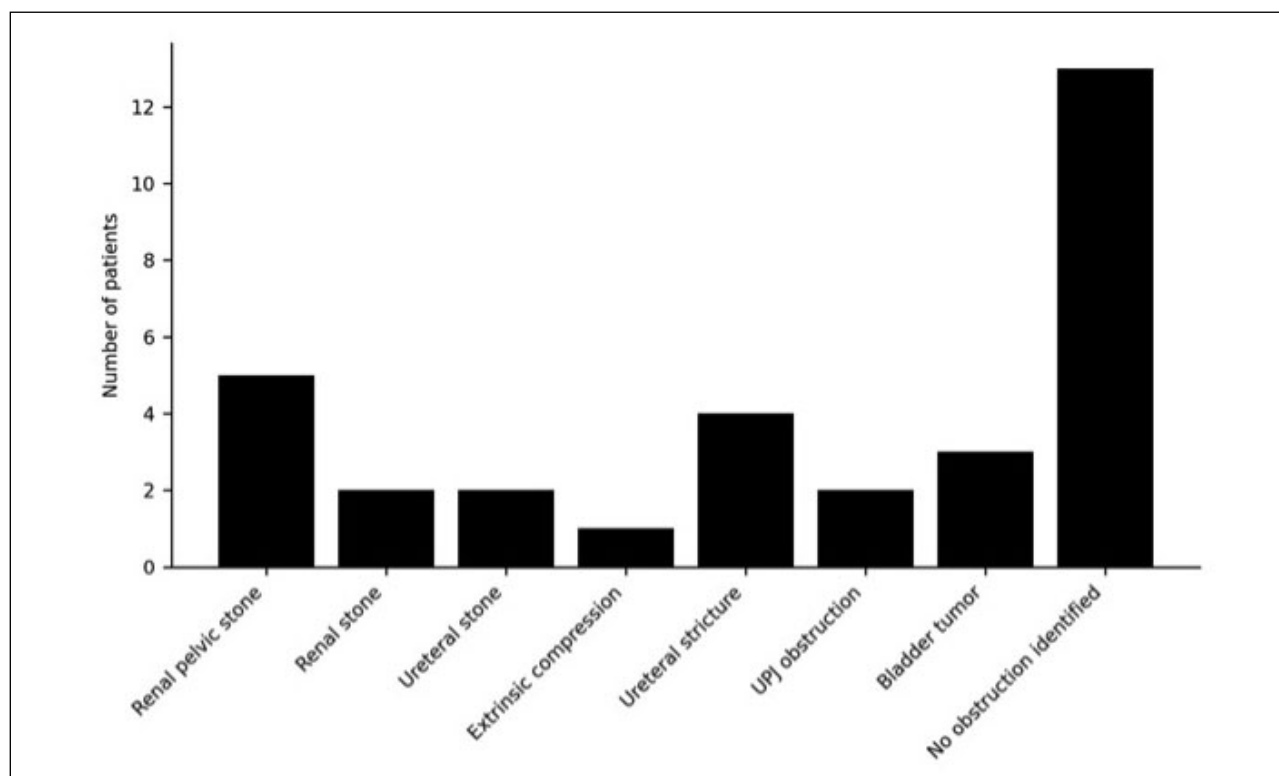
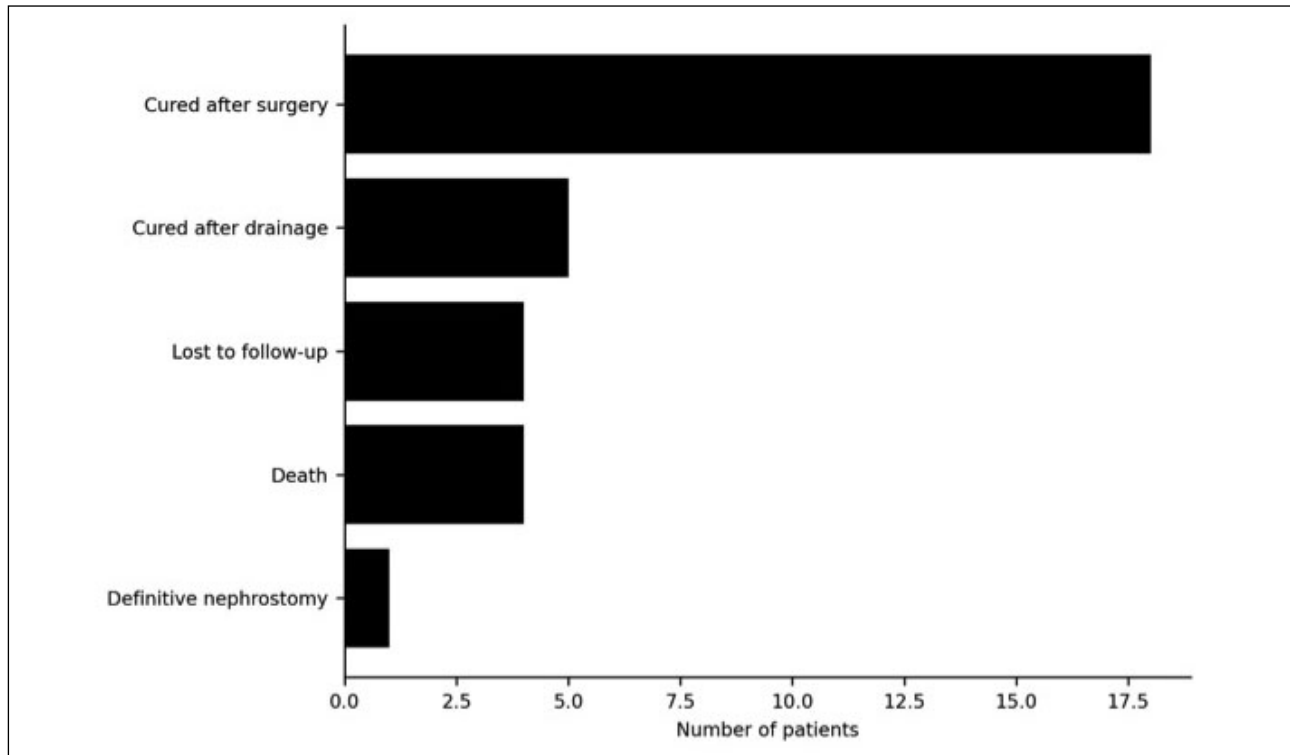


Figure 2.
Outcomes of management.



Notably, testing for acid-fast bacilli was negative in all patients. (Table 3).

Medical treatment consisted of dual antibiotic therapy combining a third-generation cephalosporin (ceftriaxone) and an aminoglycoside (gentamicin or amikacin) when renal function allowed. Blood transfusion and hemodialysis were required in 58.06% (n = 18) and 3.22% (n = 1), respectively. All patients underwent percutaneous drainage under ultrasound or CT guidance. No complications were observed.

Table 3.
Microbiological findings.

Test	Number	Percentage (%)
<i>E. coli</i>	5	9.68
<i>Staphylococcus aureus</i>	2	6.46
<i>Enterococcus faecalis</i>	1	3.23

Table 4.
Etiological treatment.

Procedure	Number	Percentage (%)
Total nephrectomy	7	38.89
Pyelolithotomy	4	22.2
Pyeloplasty	2	11.11
Ureterolithotomy	2	11.11
Ureteral reimplantation	2	11.11
Nephrolithotomy	1	5.56

Etiological treatment was performed in 56.06% (n=18) of cases, exclusively by open surgery, after infection control (Table 4).

Mean hospital stay: 30.13 ± 26.83 days (range: 1-96 days). The mortality rate was 12.9% (n = 4). All deceased patients had bladder cancer. Complete recovery after drainage alone was observed in 15.62% (n = 5).

DISCUSSION

The hospital frequency of renal and perinephric suppurations varies across studies (3, 10, 11). In our series, we reported 32 cases over a two-year period, corresponding to a hospital prevalence of 2.32%. Regardless of their proportion among urological diseases, any renal suppurative infection represents a potentially serious condition. It may threaten either renal function or the patient's vital prognosis.

Renal suppurative infections (RSIs) are most often a consequence of urinary tract infections (3, 10, 12). These infections are among the most common bacterial infections worldwide, affecting nearly 150 million people annually (13). They can occur at any age (14, 15); however, in most series, the mean age of occurrence is beyond the fourth decade (14-17). In the present study, the mean age was 37.48 years. Female predominance has been reported by several authors, as was also observed in our series (11, 14-17).

The typical clinical presentation includes spontaneous or elicited flank pain associated with fever, reported in proportions ranging from 76% to 100% (18-20). This symptom combination was observed in 84% of our patients.

The severity of infection depends on several factors, including pathogen virulence, host response, comorbidities, and the duration of disease progression. At admission, a qSOFA score greater than 2 was found in 33.3% (n = 6) of cases. This score reflects the severity of infection and the high risk of mortality (21).

The known risk factors for RSIs include diabetes and obstructive uropathies (14, 16). Contrary to most reports, only one case of diabetes was identified in our series. However, nearly half of the patients had an underlying obstructive uropathy. Urolithiasis, as in most studies, was the most frequent urological risk factor (14-16). Approximately 37.5% (n = 12) of our patients had a history of urogenital schistosomiasis. In endemic areas, sequelae of schistosomiasis should be systematically investigated in cases of acquired ureteral obstruction. This was also reported in two cases in the series by *Ondongo et al.* in Congo (15). Ureteral sequelae of this parasitic disease may include strictures or segmental impairment of peristalsis leading to functional obstruction.

Before the antibiotic era, renal and perinephric abscesses were mainly secondary to bacteremia, with *Staphylococcus aureus* responsible for nearly 80% of cases (22). Currently, RSIs are most often caused by Gram-negative bacteria ascending from the lower urinary tract (11, 21). *Escherichia coli* remains the most frequently isolated pathogen in both urine and pus cultures (16, 17, 21). In the present study, *E. coli* was identified only in urine cultures (9.68%). According to the literature, pus cultures are sterile in 14% to 74% of cases (4, 16, 17). In our study, 88.24% of drainage fluid cultures were sterile. This high rate can be explained by the widespread and often inappropriate use of antibiotics in peripheral healthcare facilities prior to referral to specialized centers.

No cases of tuberculosis were identified in our series, although some authors have reported such cases (23, 24). The largest series of renal suppuration of tuberculous origin are historical. In 1971, Cukier reported 16 cases of tuberculous pyonephrosis in a study of 50 patients (25). Nevertheless, it should be emphasized that any chronic suppuration resistant to appropriate antibiotic therapy should raise suspicion for tuberculosis, particularly in the presence of a cutaneous fistula, as reported by Elkihal (24). The routine use of ultrasonography and computed tomography has significantly improved the diagnosis of RSIs. In our study, ultrasonography was performed in all patients. In our practice, it is a first-line imaging modality, as recommended by *Liu et al.* (16), due to its availability and lack of radiation exposure. However, it may fail to detect abscesses smaller than 3 cm (22). In the study by *Coelho et al.*, the diagnostic accuracy of ultrasonography and computed tomography was 93% and 96%, respectively (17). CT scan is more sensitive and allows identification of the underlying cause of suppuration (2).

The prognosis of RSIs has improved significantly with the advent of antibiotics and percutaneous drainage techniques. Once the diagnosis is established, antibiotic therapy should be initiated as early as possible, taking into account the most commonly involved pathogens and their antimicrobial susceptibility (21). In our study, we systematically used dual antibiotic therapy consisting of a third-generation cephalosporin (ceftriaxone) combined

with an aminoglycoside (gentamicin or amikacin), provided renal function was preserved.

Drainage of suppuration is not always mandatory. It is generally indicated for abscesses larger than 3 cm in diameter, whereas smaller abscesses may be managed with antibiotics alone (17, 22). Percutaneous drainage is a minimally invasive procedure with several advantages. It allows evacuation of purulent material, thereby reducing the risk of infection spread, enables bacteriological analysis for targeted antibiotic therapy, and permits delayed etiological surgical management. It also contributes to reducing hospital stay, morbidity, and the need for immediate surgery (4, 16).

This supports our management approach, particularly since some patients were followed on an outpatient basis after drainage. In our series, percutaneous drainage was systematically performed due to the severity of suppuration. No complications related to the procedure were observed. In contrast, *Watson et al.* reported a complication rate of 9% associated with percutaneous drainage (4).

In all cases, etiological treatment was delayed and performed after control of infection. This approach allows surgery to be carried out away from an active infectious process, thereby reducing the risk of systemic dissemination.

In our series, all etiological procedures were performed by open surgery. This approach reflects not only the complexity of the underlying conditions but also the constraints related to limited technical resources in our setting. Minimally invasive techniques such as endourology and laparoscopy remain insufficiently available in many sub-Saharan centers. Consequently, open surgery remains a reliable and widely practiced option, particularly in emergency or delayed management contexts.

Only one postoperative complication (1/14) was recorded in our series.

The mortality rate in our study remained high at 12.5%

DECLARATIONS

Ethical approval and consent for participate: This study was approved by the institutional ethics committee of CHU Yalgado Ouédraogo (protocol number: 2026CHUYO075). Given the retrospective design, the requirement for informed consent was waived.

Consent for publication: Not applicable.

Availability of data and material: The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Authors' contributions: BK: study conception, data collection, manuscript drafting; CMKY, OJDZ: data analysis and interpretation; OI, AKO: clinical management and data validation; YJRPT, FAK: manuscript revision and supervision; All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

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(4/32), compared to 1% reported by Liu *et al.* in China. All patients who died in our series had malignant bladder tumors. In such cases, prognosis is more strongly influenced by the underlying malignancy than by the suppuration itself.

Renal suppurative infections are, in most cases, complications of underlying urological conditions. Therefore, optimal management should address both the suppuration and its cause. In our series, investigations were insufficient to systematically identify conditions such as vesicoureteral reflux or lower urinary tract obstruction.

CONCLUSIONS

Renal suppurative infections remain uncommon but clinically significant, with persistent morbidity and non-negligible mortality. They occur predominantly in the setting of obstructive uropathy, particularly urolithiasis and schistosomiasis-related disease. Early imaging and prompt broad-spectrum antibiotic therapy combined with percutaneous drainage enable effective initial infection control. However, outcomes remain heterogeneous, with prognosis largely influenced by underlying comorbidities, especially malignancy. A staged management approach with early source control followed by delayed definitive treatment appears appropriate. Nevertheless, the systematic use of drainage in all cases warrants reconsideration in light of emerging evidence favoring selective strategies. The retrospective design and limited sample size of this study restrict the generalizability of our findings. Incomplete etiological assessment further highlights gaps in diagnostic evaluation. Future research should focus on optimizing risk stratification and refining indications for intervention. Ultimately, improving outcomes will depend on early diagnosis and effective management of underlying urological conditions.

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