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Rat Bite Fever: The First Case Report from Qatar

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Study Design A
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Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Conflict of interest: None declared

Patient: Male, 37-year-old
Final Diagnosis: Rat bite fever
Symptoms: Acute gastroenteritis • fever • headache • loose stools • vomiting
Medication: —
Clinical Procedure: —
Specialty: Critical Care Medicine • Dermatology • Infectious Diseases • Public Health

Objective: Rare disease

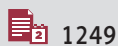
Background: Rat bite fever (RBF) is a rare but fatal zoonotic disease caused by infections with various bacteria, which are transmitted from rats or other rodents. Only a few patients worldwide are diagnosed with RBF annually. RBF can be fatal if left untreated, with a mortality rate of about 10% in patients with severe RBF.

Case Report: A case 37-year-old previously healthy man presented to the emergency department with acute gastroenteritis, sepsis and multi-organ failure requiring ventilatory support. He was later diagnosed with RBF due to *Streptobacillus moniliformis*. He recovered rapidly after administration of intravenous penicillin G and was discharged from the hospital 10 days later.

Conclusions: This report describes a patient with RBF and multi-organ involvement requiring ventilatory support. He was successfully treated with intravenous penicillin G. To our knowledge, this is the first report of a patient from Qatar with RBF.

MeSH Keywords: Moniliformis • Penicillin G • Rat-Bite Fever • Zoonoses

Full-text PDF: <https://www.amjcaserep.com/abstract/index/idArt/925647>



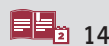
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Background

Rat bite fever (RBF) is a rare zoonotic illness caused by infection with *Streptobacillus moniliformis*, *S. notomytis*, or *S. minus*. Historically, over 50% of reported cases occurred in children, with RBF being more likely to occur in subjects living in poverty [1]. Most patients present with mild to moderate symptoms, which subside after treatment with commonly used antibiotics, and are discharged without a diagnosis. This report describes an adult male industrial worker with no known comorbidities, who presented with features of sepsis and multi-organ failure requiring ventilator support. He had no history of rat bite, but his blood culture showed significant growth of *S. moniliformis*, a bacterium known to cause RBF in humans. The patient responded rapidly to intravenous penicillin G. To our knowledge; this is the first report of a patient from Qatar with RBF caused by infection with *S. moniliformis*.

Case Report

A 37-year-old man with no significant previous medical history presented to the emergency department of Hazm Mebaireek General Hospital in Doha, Qatar, with a history of fever for 4 days and vomiting, loose stools, abdominal cramps, and headache for 1 day. His fever was intermittent and low grade, his headache was generalized and 3-4 episodes of nonbilious vomiting and loose stools. This man was unmarried, lived with a cousin, and had worked in a plastics factory in Qatar for the previous 3 years. On admission, he had tachycardia and mild tachypnea with a blood pressure (BP) of 100/70 mmHg and a macular erythematous rash over both feet (Figure 1). His Glasgow coma scale (GCS) score was 15 with no neck stiffness. Laboratory tests revealed thrombocytopenia ($103 \times 10^3/\mu\text{l}$; reference, $150\text{--}400 \times 10^3/\mu\text{l}$) and high serum concentrations

of creatinine ($155 \mu\text{mol/L}$; reference $62\text{--}106 \mu\text{mol/L}$), urea (11 mmol/L ; reference $2.76\text{--}8.07 \text{ mmol/L}$), total bilirubin ($100 \mu\text{mol/L}$; reference $0\text{--}21 \mu\text{mol/L}$), aspartate aminotransferase (AST; 80 U/L ; reference $0\text{--}40 \text{ U/L}$), alanine aminotransferase (ALT 98 U/L ; reference $0\text{--}41 \text{ U/L}$), and C-reactive protein (CRP; 355 mg/L ; reference $0\text{--}5 \text{ mg/L}$). Chest X-rays showed a mild bilateral haziness. He was started on empirical treatment with ceftriaxone 2 gm in 2 liters of IV fluids over 6 hours. He was provisionally diagnosed with acute gastroenteritis with acute kidney injury and was admitted to the hospital, where he continued to receive fluids and antibiotics. On day 2, the patient became more tachypneic and tachycardic with a fever spike of 38.3°C and 1 episode of hypoglycemia (2.9 mmol/L ; reference $3.3\text{--}5.5 \text{ mmol/L}$). On day 3, the patient was found to have worsening tachycardia, tachypnoea, and hypotension and was transferred to the Intensive Care Unit (ICU). A blood culture showed gram-negative bacilli (GNBs), and he was started on treatment with piperacillin/tazobactam. The same day he was intubated and ventilated due to respiratory distress. On day 4, the patient required vasopressors and a higher positive end-expiratory pressure (PEEP) to maintain his BP and partial pressure of oxygen (PaO_2) within acceptable ranges. On day 5, his blood culture was positive for *S. moniliformis*, and he was diagnosed with RBF. After consultations with a microbiologist and infectious disease specialist, he was started on intravenous penicillin G, at a dose of 2 million units every 4 hours. He showed rapid improvement and was weaned off the ventilator on day 6. The vasopressor was also tapered on the same day. His renal functions and acidosis improved, and he was extubated. He was discharged from the hospital 10 days later. His clinical course and normal findings on echocardiography indicated that heart failure and infective endocarditis were unlikely.

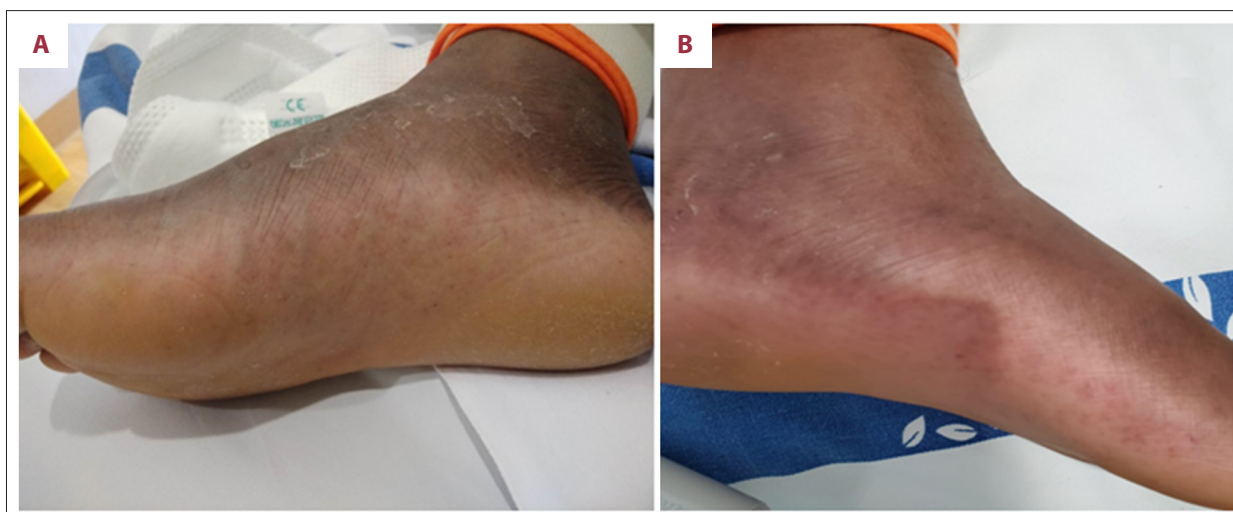


Figure 1. Skin manifestations of RBF on the (A) right foot and (B) left foot of the affected patient.

A further history taking suggested that rats may have been present in his house and workplace. Moreover, he frequently leaves food uncovered at both sites.

Discussion

RBF is a rare zoonotic bacterial infection being reported only a few times throughout the world. Infections can be transmitted directly to humans by rats, gerbils, and mice through a bite or scratch, or can be passed from rodent to rodent [2]. Approximately 30% of patients diagnosed with RBF do not report having been bitten or scratched by rodents [3].

RBF can be caused by 2 types of gram-negative, anaerobic bacteria, *S. moniliformis* and *S. minus*. *S. moniliformis* is a highly pleomorphic, filamentous nonmotile gram-negative rod. It has been estimated that 1 in 10 individuals bitten by rats develop signs of RBF due to *S. moniliformis* [4]. RBF due to *S. notomytis*, however, is unusual in humans despite having a similar clinical presentation [5].

In addition, the ingestion of water or food contaminated by rodent feces might lead to other types of fever such as Haverhill fever [6]. Based on his history, we suspect this mode of transmission in our patient. The most common presentations of RBF include abrupt fever (92%), migrating polyarthralgia (66%), rash (61%), and nausea/vomiting (40%) [7]. Our patient had a fever, rash, and vomiting at presentation. Patients may also present with more serious conditions, such as disturbed consciousness [8], which might lead to several types of critical complications, including spinal epidural abscess [9], mitral valve endocarditis and septic arthritis [10], acute tetraplegia [11], and vertebral osteomyelitis [12].

The illness usually presents about 2 weeks after initial transmission, typically with fever, arthralgias, and a rash, which may be macular, papular, or petechial, but seems to be more prevalent in the hands and feet. Complications of RBF can include endocarditis, myocarditis, pericarditis, systemic vasculitis, polyarteritis nodosa, meningitis, hepatitis, nephritis, amnionitis, pneumonia, and focal abscesses. Most fatalities occur in patients who develop endocarditis, usually those with pre-existing valvular heart disease [3].

RBF is usually diagnosed by detecting the causative bacteria in the skin, blood, synovial fluid, or lymph nodes, although the presence of anti-bacterial antibodies tests may

be diagnostic [13]. Our patient was diagnosed through a positive blood culture.

If left untreated, RBF has fatality rate of 7–10%. Two previously healthy adults in the United States developed fulminant sepsis and died in 2003, one from a rat bite in a pet store and the other most likely from a sick pet rat [6]. Moreover, a 76-year-old man living in a rural area in Japan died of RBF after presenting with disturbed consciousness [8].

The antibiotic of choice for the treatment of RBF, especially in the absence of complications, is intravenous penicillin G, at a recommended dose of 400,000–600,000 IU/day for 1 to 2 weeks. Because our patient presented with severe complications, he was treated with 2 MIU of IV penicillin G every 4 hours. Patients allergic to penicillin can be treated with 100 mg b.i.d. doxycycline [9]. A recent case report described a 54-year-old Chinese man who was successfully cured with penicillin [14]. Other possible options include clindamycin, erythromycin, and ceftriaxone, although the dosage and standard treatment durations need to be established [7].

Zoonotic diseases in general and RBF in particular are causes of concern due to their ambiguous presentation and the difficulty of identifying the causative microorganism, which may result in a significant risk of delay or failure in diagnosis.

Conclusions

In conclusion, this report describes the first documented case of an uncommon zoonotic infection, RBF, from Qatar. Unlike most previously described patients, our patient presented with sepsis and multi-organ failure requiring ventilatory support. He showed rapid improvement, however, following treatment with high doses of penicillin G. Educating individuals about animal contact and other preventive measures are required to prevent RBF and other zoonotic diseases in Qatar.

Ethics statement

The study was approved by the Institutional Review Board of Hamad Medical Corporation (MRC-04-20-082), which waived the requirement for informed consent.

Conflict of interests

None.

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