

GENERALIZED TETANUS OF MODERATE SEVERITY FOLLOWING A RUSTY NAIL INJURY: A CASE REPORT

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Abstract

Introduction: Tetanus is an acute infectious disease caused by *Clostridium tetani*, characterized by muscle rigidity and spasms. **Case Presentation:** We report the case of a 9-year-old boy who presented with generalized body stiffness, difficulty opening his mouth, and seizures triggered by sound and movement. Two days before the onset of symptoms, the patient sustained a puncture wound from a rusty nail without receiving adequate medical treatment. Physical examination revealed trismus, risus sardonicus, generalized muscle rigidity, and reflex spasms. The diagnosis was established based on the patient's clinical presentation and classified as moderate tetanus using the Ablett, Phillips, and Dakar scoring systems. The patient was treated with intravenous metronidazole, tetanus immunoglobulin, diazepam, supportive therapy, and intensive care unit management. **Conclusion:** This case highlights the importance of early diagnosis and prompt comprehensive management in reducing tetanus-related morbidity and mortality.

Keywords: tetanus, *Clostridium tetani*, trismus, muscle spasm, ICU.

Abstrak

Latar Belakang: Tetanus merupakan infeksi akut akibat *Clostridium tetani* yang ditandai oleh rigiditas otot dan spasme. **Presentase Kasus:** Dilaporkan kasus anak laki-laki usia 9 tahun dengan keluhan kaku seluruh tubuh, kesulitan membuka mulut, dan kejang yang dipicu rangsangan suara maupun gerakan. Dua hari sebelumnya, pasien mengalami luka tusuk akibat paku berkarat tanpa penanganan medis adekuat. Pemeriksaan fisik menunjukkan trismus, risus sardonicus, rigiditas otot generalisata, dan spasme refleks. Diagnosis ditegakkan berdasarkan anamnesis dan gambaran klinis khas dengan derajat tetanus sedang berdasarkan skor Ablett, Phillips, dan Dakar. Pasien ditatalaksana dengan metronidazol intravena, tetanus immunoglobulin, diazepam, terapi suportif, dan perawatan intensif di ICU. **Kesimpulan:** Kasus ini menegaskan bahwa diagnosis dini dan tata laksana yang cepat serta komprehensif berperan penting dalam menurunkan morbiditas dan mortalitas tetanus.

Kata kunci: tetanus, *Clostridium tetani*, trismus, spasme otot, ICU.

INTRODUCTION

Tetanus is an acute neurological disorder caused by the toxin produced by *Clostridium tetani*, known as tetanospasmin. This toxin is neurotropic and inhibits the release of inhibitory neurotransmitters, including gamma-aminobutyric acid (GABA) and glycine. As

a result, it leads to increased reflex muscle activity, manifesting as tonic spasms or muscle spasms, which may be localized, cephalic, or generalized.^{1,2}

Tetanus is distributed worldwide, with incidence varying with population immunization status, environmental sanitation, and the level of exposure risk

from injuries. It is not a communicable disease transmitted from person to person; however, it remains a significant public health problem, particularly in developing countries with suboptimal immunization coverage. Global data estimate approximately 1 million cases of tetanus annually, with a mortality rate of 300,000–500,000 deaths per year, the majority of which are neonatal tetanus cases. In 2016, an estimated 48,000–80,000 deaths were attributed to tetanus worldwide. In Indonesia, cases of neonatal tetanus are still reported. For example, in 2019, 17 cases were documented with a case fatality rate (CFR) of 11.76%.⁵

Clostridium tetani, the causative microorganism of tetanus, is a Gram-positive, rod-shaped bacterium that is an obligate anaerobe and capable of forming highly resistant spores. These spores are widely distributed in soil, dust, and animal feces, and can survive in the environment for extended periods. Infection occurs through contaminated wounds, including minor injuries that are often unnoticed, and the risk is increased in individuals with incomplete immunization status.^{6,7}

The primary pathophysiology of tetanus is related to the entry of tetanospasmin into the central nervous system via retrograde axonal transport or hematogenous spread. This toxin inhibits inhibitory neurotransmission at the level of interneurons, resulting in muscle rigidity, spasms, and autonomic instability, which are characteristic features of the disease⁸. The clinical manifestations include trismus, risus sardonicus, opisthotonus, and generalized spasms, which may progress to respiratory failure and death if not managed promptly and intensively^{9,10}

Although the management of tetanus includes wound debridement,

antibiotic therapy, administration of antitoxin, and supportive care in intensive care settings, the mortality rate remains high, particularly in cases with rapid onset or limited access to adequate healthcare facilities⁸. Therefore, prevention through tetanus toxoid immunization, particularly among women of reproductive age and infants, remains the most effective strategy for reducing morbidity and mortality associated with tetanus¹¹

METHODS

This case report was prepared to describe the clinical course of a patient with tetanus who received treatment at RSUD Benyamin Guluh, Kolaka Regency. Patient monitoring was performed, followed by documentation and recording of the patient's clinical condition.

RESULTS

History and Patient Presentation

A 9-year-old male patient presented to the emergency department with a chief complaint of generalized body stiffness for approximately 11 hours before admission, which progressively worsened. The patient experienced difficulty opening his mouth, resulting in reduced oral intake. Symptoms were exacerbated by exposure to loud sounds and physical movement. Two days before symptom onset, the patient sustained a puncture wound from a rusty nail in the yard. The wound was self-treated using medication obtained from a pharmacy without further medical care. The patient had a history of two episodes of seizures at home, each lasting less than one minute.

Physical Examination

The patient appeared moderately ill but was conscious and alert. Trismus was present, with a maximal mouth opening of approximately 2 cm. Other findings

included risus sardonicus, mild dysphagia, and generalized muscle rigidity. A puncture wound measuring 2×3 cm was observed on the left foot, appearing erythematous, clean, and without contamination. Vital signs revealed a respiratory rate of >30 breaths per minute, while blood pressure and heart rate were within normal limits.



Figure 1. General condition of the patient and visible wound site.

Supporting Examinations

Routine laboratory examinations were within normal limits, and wound culture was not performed. The diagnosis was established based on characteristic clinical findings. According to the Ablett scoring system, the patient was classified as grade 2 (moderate). Based on the Phillips scoring system, the calculated score was 17 (moderate). The Dakar score of 2–3 indicated moderate severity with an estimated mortality rate of 10–20%.

Management and Follow-Up

The patient was immediately admitted to the intensive care unit (ICU), where a quiet and low-light environment was maintained to minimize stimulus-induced spasms. Pharmacological therapy included intravenous paracetamol 300 mg every 8 hours as symptomatic treatment, intravenous metronidazole with an initial dose of 180 mg followed by 360 mg every

6 hours for bacterial eradication, human tetanus immunoglobulin (TETAGAM) 4,000 IU administered intramuscularly for toxin neutralization, and intravenous diazepam 2.5 mg every 4 hours for muscle spasm control.

During ICU care, the patient experienced brief episodes of generalized tonic spasms; however, these were gradually controlled with diazepam administration. Respiratory function remained stable, and there were no signs of multiorgan failure. The patient was closely monitored for potential complications, including laryngospasm, autonomic dysfunction, and acute kidney injury.

DISCUSSION

Tetanus is an acute infectious disease caused by *Clostridium tetani*, a Gram-positive obligate anaerobic bacterium that produces a potent neurotoxin known as tetanospasmin^{1,2}. This infection remains a significant public health problem in developing countries, including Indonesia, particularly due to low immunization coverage and suboptimal wound management^{3,4}. Although the global incidence has declined, the World Health Organization (WHO) continues to report new cases annually, particularly neonatal and non-neonatal tetanus in countries with limited access to immunization services^{1,3}. In Indonesia, several reports of adult tetanus cases indicate that the mortality rate remains high, particularly in patients with rapid onset and a history of inadequate immunization^{4,5}.

This case describes a patient with generalized tetanus presenting with initial symptoms of trismus, risus sardonicus, generalized muscle rigidity, and stimulus-induced spasms. The portal of entry was a puncture wound from a rusty nail on the left

foot, which had previously been treated only with over-the-counter medication without active or passive tetanus prophylaxis. This finding is consistent with the mechanism of *Clostridium tetani* entry through puncture wounds that often appear macroscopically clean but provide an anaerobic environment that supports bacterial growth^{2,6}. Literature reports that in up to 20% of tetanus cases, no obvious wound can be identified as the portal of entry^{6,7}.

Pathophysiology and Its Relationship to Clinical Manifestations

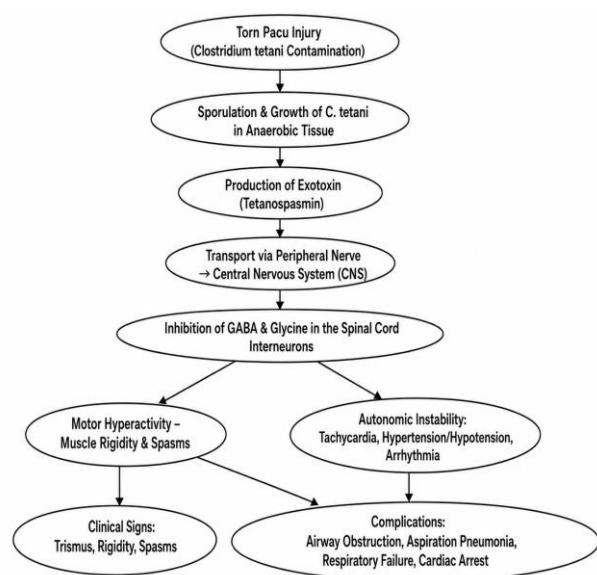


Figure 2. Pathophysiology of Tetanus

Tetanus pathogenesis is associated with the tetanospasmin toxin released by *Clostridium tetani*. After being produced at the inoculation site, the toxin diffuses to the motor nerve endings and is subsequently transported retrogradely to the central nervous system^{2,6}.

Tetanospasmin exerts its effect by inhibiting the release of the inhibitory neurotransmitters gamma-aminobutyric acid (GABA) and glycine at interneurons, resulting in loss of spinal reflex inhibition.

Consequently, sustained muscle hyperactivity occurs, manifesting as rigidity, muscle spasms, and generalized convulsions while consciousness is preserved^{2,6,8}. The characteristic manifestations observed in patients, including trismus, risus sardonicus, neck and abdominal rigidity, as well as tonic spasms triggered by sensory stimuli (light, sound, and touch), are highly consistent with this mechanism. In addition to spasms, tetanus may also cause autonomic instability, manifested by tachycardia, hypertension, excessive sweating, and even sudden bradycardia or asystole due to a catecholamine storm^{2,9}. This condition worsens the patient's prognosis, as reported in various clinical studies^{7,9}.

Prognosis and Clinical Scoring

Important factors in determining the prognosis of tetanus include the incubation period and the onset period. An incubation period of <7 days and a spasm onset period of <48 hours are associated with high mortality rates. In this case, the incubation period was only 2 days from the puncture wound to the onset of symptoms, representing a poor prognostic factor despite the clinical scores indicating moderate severity.

Several scoring systems are used to assess tetanus severity. The Ablett classification categorizes tetanus into grades I–IV based on the degree of trismus, spasms, dysphagia, and respiratory impairment. This patient was classified as grade II (moderate), characterized by moderate trismus, mild dysphagia, and intermittent spasms. The Phillips score (total score: 17) also categorized the case as moderate, while a Dakar score of 2–3 predicts a mortality rate of 10–20%. The combination of these findings supported the

decision for ICU management with close monitoring.

Management and Compliance with Guidelines

The management of tetanus is multimodal, consisting of bacterial eradication, toxin neutralization, spasm control, and intensive supportive therapy^{1,3,7,9}

Bacterial Eradication – Metronidazole

The patient received an initial dose of 180 mg IV, followed by 360 mg IV every 6 hours. Assuming a body weight of approximately 50–60 kg, this regimen is equivalent to approximately 30 mg/kg/day. The World Health Organization recommends metronidazole 500 mg IV every 6–8 hours (30–40 mg/kg/day) for 7–10 days¹. Therefore, the administered dosage was consistent with current guidelines and appropriately adjusted to the patient's body weight

Toxin Neutralization – Human Tetanus Immunoglobulin (TETAGAM)

The patient received 4,000 IU of TETAGAM administered intramuscularly. The World Health Organization recommends a single dose of human tetanus immunoglobulin (HTIG) 3,000–10,000 IU administered via the intramuscular or intravenous route^{1,7}. 4,000 IU IM dose administered to this patient was within the recommended range and was therefore consistent with current standards of care. An alternative option when HTIG is unavailable is Anti-Tetanus Serum (ATS) at a dose of 100,000 IU (50,000 IU IV plus 50,000 IU IM); however, ATS is associated with a higher risk of anaphylaxis⁷

Spasm Control – Diazepam

The patient received diazepam 2.5 mg IV every 4 hours. The literature recommends diazepam at a dose of 0.1–0.3 mg/kg/day administered every 2–4 hours or

as a continuous infusion^{3,6}. In a patient weighing 50–60 kg, the effective dose range is approximately 5–15 mg every 3–4 hours. Therefore, the dose administered in this patient was considered relatively low, possibly to minimize the risk of respiratory depression; however, it remained a rational approach with close monitoring in the ICU

WHO			
Guideline /			
Therapy	Patient Dose	Literature Recommendation	Remarks
Metronidazole	180 mg IV loading dose, followed by 360 mg IV every 6 hours (approximately 30 mg/kg/day for a body weight of 50–60 kg)	500 mg IV every 6–8 hours (30–40 mg/kg/day) for 7–10 days	Consistent with recommendations and adjusted to the patient's body weight
Tetanus Immunoglobulin (TETAGAM)	Single dose of 4,000 IU IM	Single dose of 3,000–10,000 IU IM/IV	Appropriate and within the recommended range
Diazepam	2.5 mg IV every 4 hours	0.1–0.3 mg/kg every 2–4 hours or continuous infusion (5–15 mg every 3–4 hours for a body weight of 50–60 kg)	Relatively low dose, considered rational to reduce the risk of respiratory depression, with ICU monitoring

Table 1. Administered Management

Symptomatic Therapy – Paracetamol

The patient received paracetamol 300 mg IV every 8 hours. In healthy adults, the usual recommended dose is 500–1,000 mg every 6–8 hours, with a maximum daily dose of 4 g/day⁶. The administered dose was relatively low, possibly adjusted according

to the patient's body weight or to reduce the risk of hepatotoxicity.

Supportive Therapy in the ICU

The patient was managed in a dark and quiet room to minimize sensory stimulation. Monitoring of respiratory function, vital signs, autonomic status, and prevention of complications, including aspiration pneumonia, sepsis, pressure ulcers, and thromboembolism, were carried out in accordance with ICU protocols^{2,10}

Potential Complications

The complications of tetanus may involve the respiratory, cardiovascular, neuromuscular, and systemic systems. Laryngeal or chest wall spasms may result in acute airway obstruction. Autonomic instability associated with a catecholamine storm may lead to labile hypertension, arrhythmias, and even sudden asystole⁹. Furthermore, prolonged muscle spasms may result in rhabdomyolysis, acute kidney injury, and hyperkalemia. Other commonly reported complications include aspiration pneumonia, urinary tract infection, deep vein thrombosis, pulmonary embolism, and sepsis^{8,10,11}. In this case, ICU management with close monitoring was expected to prevent these severe complications.

Prevention and Immunization

Prevention remains the primary strategy for reducing tetanus-related morbidity and mortality. Active immunization with tetanus toxoid has been proven effective in providing long-term protection^{1,3}.

The World Health Organization recommends five primary doses during childhood, followed by booster doses during adolescence and adulthood every 10 years¹. In Indonesia, adult tetanus cases commonly occur in individuals with incomplete immunization status or in those who did not receive booster vaccinations

after school age^{4,11}. This case highlights the importance of public education regarding proper wound care and the urgency of tetanus prophylaxis for all puncture wounds, particularly those at risk of contamination^{5,11}

Lessons Learned from the Case

This case provides several important clinical insights: a short incubation period (<7 days) should be considered a poor prognostic indicator, even when the clinical severity scores appear moderate; tetanus management should be comprehensive, including bacterial eradication, toxin neutralization, spasm control, and intensive supportive care. The ICU is the ideal setting for managing patients with moderate to severe tetanus, given the risk of respiratory spasms and autonomic instability. , Prevention through complete immunization and periodic booster vaccination remains the key strategy for reducing tetanus incidence.

Overall, this case demonstrates the importance of early recognition, assessment of disease severity using clinical scoring systems, and implementation of evidence-based multimodal management. When adequate therapy is available and complications can be prevented, the prognosis of tetanus patients may improve, although a short incubation period remains a significant clinical challenge.

CONCLUSION

This case highlights that tetanus remains a serious health problem, particularly in patients with open wounds who do not receive adequate prophylaxis. The characteristic clinical manifestations, including trismus, risus sardonicus, muscle rigidity, and spasms triggered by sensory stimuli, are key features for diagnosis. The management provided in this patient,

consisting of intravenous metronidazole, administration of tetanus immunoglobulin, spasm control with diazepam, symptomatic therapy, and intensive care in the ICU, was consistent with current World Health Organization guidelines. Prompt, appropriate, and supportive treatment plays an important role in reducing morbidity and mortality.

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