

Tetanus patient profiles and factors affecting clinical outcomes at Dr. Soedono general hospital, Madiun in 2019-2020



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ABSTRACT

Introduction: Tetanus is a disease that can be diagnosed clinically. However, there is a lack of research data on tetanus patients and their clinical outcomes, especially in adult tetanus patients in Indonesia. This study aims to determine the factors that influence the outcome of tetanus patients.

Method: A cross-sectional study was performed from May to June 2021 at Dr. Soedono Madiun General Hospital. Subjects were recruited by total sampling. The data that will be taken in this study are gender, age, immunization history, incubation period, onset, port of entry, Phillips score, and clinical outcomes of patients.

Result: Were 112 patients diagnosed with tetanus at Dr. Soedono General Hospital from January 2019 to December 2020. The male subjects outnumbered female subjects by 81.3%. The youngest subject was 19 years old, and the oldest was 81 years old. The tetanus immunization status showed that 2 patients were known to be fully immunized, 21 were not fully immunized, and 89 (79.5%) had unknown immunization status. This study showed that the port of entry of the wound is most often the entry point for tetanus in the inferior extremity of 72 patients (64.3%). Most onset occurred in 1-7 days, with a mean onset for generalized tetanus was 2.3 ± 1.8 days. The mean incubation period for the appearance of tetanus symptoms in this study was 9.4 ± 5.6 days. The most common comorbid disease in this study was diabetes mellitus (11.6%). This study's clinical outcome of tetanus showed that 74 patients (66.1%) had improved, while 38 patients (33.9%) died during treatment.

Discussion: This study's most common port of entry was on the inferior extremities. This lower limb predominance as the port of entry could be explained by the fact that *C. tetani* exists in soil; hence, any lower limb injury would be open to contamination and infection by this organism. Based on the Dakar and Phillips score system, tetanus has a worse prognosis when there is a faster incubation period, faster onset, more proximal port of entry location, immunization status, comorbidities and signs of muscle spasm, fever, and tachycardia are obtained.

Conclusion: In this study, tetanus still has a high mortality rate. Male gender, age over 45, a moderate to severe disease degree (considering a relatively short incubation time, short onset period, and unknown immunization status) are a few factors that may affect this high mortality rate.

Keywords: tetanus; clinical outcome; patient profile.

Cite This Article: Setiyandari, B.H., Winantyo, T., Ali, I. 2023. Tetanus patient profiles and factors affecting clinical outcomes at Dr. Soedono general hospital, Madiun in 2019-2020. *Bali Medical Journal* 12(3): 3101-3104. DOI: 10.15562/bmj.v12i3.4849

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Received: 2023-07-26

Accepted: 2023-10-15

Published: 2023-11-01

INTRODUCTION

Tetanus is a disease that can be diagnosed clinically, so it does not require laboratory examination to confirm the diagnosis. Tetanus can be diagnosed by excluding other seizure-causing diseases and the presence of wounds as the port of entry for *Clostridium tetani*, which generates a neurologic toxin.¹ Furthermore, tetanus can be categorized based on its severity and symptoms. Based on the severity according to the Phillips Score, tetanus is divided into mild, moderate, and severe as assessed by the location of the port of entry, incubation period, immunization,

and aggravating factors. Tetanus is divided into local, cephalic, and generalized based on location.²⁻⁴

Globally, tetanus is estimated at one million cases per year. However, tetanus mortality rates in different places vary depending on the region's availability and access to healthcare.⁵ Based on data from the World Health Organization (WHO), the tetanus mortality rate has decreased in recent years related to the promotion of vaccination. However, research shows a disproportionate difference in prevalence rates between one region and another, up to 135 times higher, with mortality rates varying between 20% and 45% of cases.

In this case, the mortality rate is strongly related to the availability of mechanical ventilation, invasive blood pressure monitoring, and early treatment.⁶

There is a lack of research data on tetanus patients and their clinical outcomes, especially in adult tetanus patients in Indonesia. Therefore, it is necessary to research to determine what factors are proven to affect the clinical outcomes of tetanus patients in terms of clinical, sociodemographic, and biological aspects. More specifically, this study was aimed at tetanus patients at Dr. Soedono general hospital, Madiun during 2019-2020. The selection of the year was also

used to evaluate and avoid bias from the impact of the pandemic on the number of tetanus patients who came to Dr. Soedono general hospital, Madiun. It is expected that the results of this study can be useful for further research and, most importantly, play a role in reducing morbidity and mortality rates in tetanus patients.

METHOD

A cross-sectional study was performed from May to June 2021 at Dr. Soedono Madiun General Hospital. Subjects were recruited by total sampling. The inclusion criteria in this study were patients diagnosed with tetanus by surgeons or residents. Meanwhile, the exclusion criteria for this study are patients with incomplete medical records. The data that will be taken in this study are gender, age, immunization history, incubation period, onset, port of entry, Phillips score, and clinical outcomes of patients. Statistical tests were performed using the Social Sciences (SPSS) 25.0 software for Windows. The data were analyzed using univariate analysis. Univariate analysis was performed to see the frequency distribution of the data in this study.

RESULTS

Were 366 patients diagnosed with tetanus at Dr. Soedono General Hospital from January 2019 to December 2020, but only 112 patients fit the inclusion and exclusion criteria. The characteristics of the study participants can be seen in Table 1. The male subjects outnumbered female subjects by 81.3%. The youngest subject was 19 years old, and the oldest was 81 years old. There were 2 subjects (1.8%) who were under 45 years old, 67 patients (59.8%) in the 45-65 years age group, and 43 patients (38.4%) in the over 65 years age group.

The tetanus immunization status showed that 2 patients were known to be fully immunized, 21 were not fully immunized, and 89 (79.5%) had unknown immunization status. This study showed that the port of entry of the wound is most often the entry point for tetanus in the inferior extremity of 72 patients (64.3%). Dental complaints were found in 19 patients (16.9%). The port of entry from

Table 1. Characteristics of the subjects

Variables	Frequency N (%)
Gender	
Male	91 (81.3%)
Female	21 (18.8%)
Age	
<45 years	2 (1.8%)
45-65 years	67 (59.8%)
>65 years	43 (38.4%)
Immunisation Status	
Unknown	89 (79.5%)
Complete	2 (1.8%)
Incomplete	21 (18.8%)
Port d' entry	
Teeth	19 (16.9%)
Superior extremities	18 (16.1%)
Inferior extremities	72 (64.3%)
Truncal	3 (2.7%)
Onset	
1-7 days	108 (96.4%)
8-14 days	3 (2.6%)
> 14 days	1 (1.8%)
Incubation period	
1-7 days	25 (22.3%)
8-14 days	76 (67.9%)
> 14 days	11 (9.8%)
Comorbidities	
Diabetes Mellitus	13 (11.6%)
Cardiovascular disease	2 (1.8%)
Hypertension	7 (6.3%)
CVA	4 (3.6%)
Renal disease	1 (0.9%)
Pulmonary disease	5 (4.5%)
Electrolyte disturbances	2 (1.8%)
Phillips Score	
Mild (< 9)	0 (0%)
Moderate (9-18)	109 (97.3%)
Severe >18	3 (2.7%)
Clinical Outcome	
Survive	74 (66.1%)
Died	38 (33.9%)

the superior extremity was 18 patients (16.1%). The least number of entry wounds is the trunk, 3 patients (2.7%).

Most onset occurred in 1-7 days, with a mean onset for generalized tetanus was 2.3 ± 1.8 days. The shortest onset interval was 1 day, and the longest onset interval was 15 days. This study's incubation period was mostly 8-14 days (67.9%). The mean incubation period for the appearance of tetanus symptoms in this study was 9.4 ± 5.6 days. The shortest incubation period in

this study was 1 day, and the longest was 30 days.

The most common comorbid disease in this study was diabetes mellitus (11.6%). In addition, there was heart disease in 2 patients (1.8%), hypertension in 7 patients (6.3%), CVA in 4 patients (3.6%), pulmonary disease in 5 patients (4.5%), electrolyte disorders in 2 patients (1.8%) and renal disorders in 1 patient (0.9%). This study showed that 97% (109) of tetanus patients treated at RSUD Dr.

Soedono Madiun had a degree of severity in the moderate group with a score of 9-18. There were no samples that had mild severity. This study's clinical outcome of tetanus showed that 74 patients (66.1%) had improved, while 38 patients (33.9%) died during treatment.

DISCUSSION

According to this study, 81.3% of the samples were men, the majority. These findings are consistent with data from a study by Meena in 2020 when tetanus incidence was higher in men (71%).⁷ Tetanus infection affects more men than women because men tend to work in more physically demanding occupations than women, making wounds more common in men than women.⁸ Prompt and adequate wound management and protective equipment, such as protective shoes and gloves, are crucial for lowering the risk of male tetanus infection. In addition, men typically have lower tetanus immunization rates than women.⁹ Most participants' ages ranged from 45 to 65, with an average age of 62.9. These findings support earlier research from Ethiopia's Felege Hiwot Hospital, which found that the age range of 36 to 45 years has the highest incidence of tetanus, with 31 cases (28.2%). Young people tend to get involved in more activities, increasing their risk of developing tetanus.¹⁰ According to Polish research, 100% of tetanus patients are over 60. This is reflected because older individuals are more susceptible to trauma from falls or accidents, and a tetanus vaccine is currently unavailable at a young age.¹¹ In line with the CDC, age >60 is a higher risk factor for poor clinical outcomes because advanced-age people tend to have low immunity to tetanus infection, especially those who have never received tetanus vaccination.¹² The increasing economy of developing nations may be responsible for the rise in adults suffering tetanus, as adults working in the construction industry are more likely to be exposed to wounds while at work due to their age group's tendency for hard labor.¹³

The diagnosis of tetanus is based on clinical examination by looking at the symptoms of tetanus. Trismus or lockjaw is typically the first symptom, followed by neck stiffness, swallowing

issues, and abdominal muscular rigidity.¹⁴ The incubation period is the time for symptoms to develop from the entry of bacteria through the wound, and the onset period is the time for muscle spasms to occur from the onset of symptoms.¹⁵ Patients with tetanus typically experience an average incubation period of 14 days, ranging from 24 hours to several months. The incubation period of less than 7 days was associated with a significantly increased mortality risk.¹⁶ The farther the wound site is from the central nervous system (CNS), the longer the incubation period.¹⁵ There are differences in the period of onset and clinical symptoms when comparing mild, moderate and severe tetanus. The shorter the period of onset, the more severe the clinical symptoms of tetanus. Tetanus is neglected because of the significant decrease that followed mass vaccination, but sporadic instances show that the illness is still present. Particularly, those not immunized or fully immunized have higher risks; hence, vaccination in youngsters and pregnant women should be emphasized. This could have been brought about by a lack of understanding and public awareness of the importance of tetanus immunization.^{17,18} In this study, it was discovered that only two samples (less than 2%) had a complete immunization record, whereas the majority of samples had uncertain immunization status.

This study's most common port of entry was on the inferior extremities (64.3%). This result follows the literature, which states that the most frequent sources of tetanus infection are wounds in the inferior extremities (68.2%), followed by the upper extremities and others (13.6%).¹⁹ Other studies state that the most common wound site for the port of entry tetanus was extremities, presented in 85.07% of patients, followed by face/nose/mouth in 12.65%.²⁰ However, even minor trauma can lead to tetanus infection, and up to 30% of tetanus patients do not have a clear port of entry.²¹ This lower limb predominance as the port of entry could be explained by the fact that *C. tetani* exists in soil; hence, any lower limb injury would be open to contamination and infection by this organism. Wounds on the lower limbs as possible portals of entry for tetanus infection are common because of

poor protective footwear.¹⁹

In this study, it was found that most of the samples did not have comorbidities. In samples that had comorbidities, the most common disease was diabetes mellitus. This result follows data from CDC observations that show the prevalence of diabetes in tetanus patients reached 15%, almost 3 times the prevalence of diabetes in the general population in America in 2001 – 2008.¹⁴ Diabetic foot could result in tetanus because immunopathy, vasculopathy, and ulceration increase the risk. According to data from Thwaites et al., in Asian and African countries, the most frequent complications are cardiovascular complications in the form of bradycardia, arrhythmia, and tachycardia.²²

According to the severity of tetanus based on the Phillips score, the group with moderate tetanus was the largest group with 109 samples (97.3%). This was followed by the severe degree group as many as 3 people (2.7%), with no samples having a mild degree. The results of this study also following the results of research at Prof. Dr. R. D. Kandou Hospital Manado, stated that tetanus patients with moderate tetanus classification groups occupy the highest position, namely 19 people (47.5%), followed by the severe degree group as many as 12 people (30.0%).²³ Based on the clinical outcome, 38 people died, which made up 33.9% of the total population, whereas 74 people (66.1%) survived. The more severe the degree of tetanus the patient suffers, the worse the clinical outcome will be because the patient has long spasms, severe trismus, apnea, pulse rate >120, and severe autonomic instability.²⁴ The study in Manado also experienced the same thing; the clinical outcome group died only 6 people (15.0%) out of 40 research samples.²³ The sooner a patient is treated, the more likely the patient is to survive. According to Khakeli *et al.* (2015), tetanus mortality is approximately 10-50%; however, in certain age groups, e.g., neonates, it is as high as 90-95%.¹⁹

Based on the Dakar score system, tetanus has a worse prognosis when there is a faster incubation period, faster onset, more proximal port of entry location, and signs of muscle spasm, fever, and tachycardia are obtained. In addition, the

Phillips score system also adds variables of immunization status and comorbidities that can worsen patient outcomes. Phillips score has a high sensitivity (89%) but a low specificity (20%). The Dakar score has a high specificity of 98% but a low sensitivity of 13%.²⁵ In this study, some characteristics indicated that the patient had a severe degree of tetanus. This can be seen from the samples, most of which had a fairly short incubation period (8-17 days), a short onset period (<7 days), and unclear and incomplete immunization status. Even so, most of the samples had the location of the port of entry in the distal region, namely in the inferior extremities, where tetanus patients with the distal port of entry locations have a better prognosis. Based on the Phillips score calculation, it was also found that none of the samples had a mild degree of tetanus. This resulted in a high mortality rate of 33.9%.

This study can be useful for academics and students as it provides observations on the profile of tetanus patients. Compared to studies that investigated larger populations, this study was rather small. Based on the results of this study, additional research can be done to understand better and prevent the occurrence of tetanus among communities.

CONCLUSION

In this study, 33.9% of tetanus patients died at Dr. Soedono general hospital, Madiun in 2019–2020. Male gender, age over 45, and a moderate to severe disease degree (considering a relatively short incubation time, short onset period, and unknown immunization status) are a few factors that may affect this outcome. The entrance port was typically found on the inferior extremities of the samples. Comorbidities can worsen the patient's condition and are another factor that can affect it. The clinical outcome has a bad outlook for severe Phillips scores.

ACKNOWLEDGMENT

The authors would like to thank the Research and Community Service Unit of Dr. Soedono Madiun General Hospital, Indonesia.

CONFLICT OF INTEREST

No competing interests were declared.

ETHICAL CLEARANCE

The study was ethically approved on 17th June 2021 by the Research and Community Service of Dr. Soedono Madiun General Hospital, Indonesia, with the approval letter No: 070/25.145/303/2021.

FUNDING

The author(s) received no financial support for this article's research, authorship, and publication.

AUTHOR CONTRIBUTION

The study's design and methodology were developed by RNA, who also carried out formal research and analysis and wrote the initial draught of the paper. IA and TWO read and edited the manuscript, curated the data, supplied resources, oversaw project administration, and validated and supervised the study.

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