

Clinical Features and Outcomes of Patients with Tetanus at Dr. Hasan Sadikin General Hospital Bandung 2015–2019

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Abstract

Background: Tetanus is a disease characterized by painful muscle spasms all over the body, which still becomes an important health issue worldwide, particularly in developing countries due to the high mortality rate. The clinical features also affect the mortality rate of adult tetanus patients. Tetanus severity score (TSS) is a prognostic scoring system developed in Vietnam that uses clinical features to predict the mortality rate in adult tetanus patients. The aim of this study was to describe the clinical features and outcomes of adult tetanus patients using TSS.

Methods: A descriptive, cross-sectional study with a total sampling method was conducted between 2015 and 2019. A total of 71 medical records of adult generalized tetanus patients in the Department of Neurology Dr. Hasan Sadikin General Hospital Bandung were collected to analyze the clinical features and outcomes using TSS. Statistical analysis was performed using SPSS software ver. 25.0.

Results: Among seventy-one tetanus patients, 62 (87%) were male, and the average age was 55.2±11.2 years. More than half of the patients (71%) were having grade III or worse and experienced dysautonomia complications (58%). The mortality rate was 38% and those who survived at discharge, 89% had TSS score <8, where as 37% who died had TSS score ≥8.

Conclusion: Tetanus in Bandung has a high mortality rate. Those who have died have high TSS scores, while the survivors have low TSS scores, suggesting that the TSS is a prospective scoring to predict the mortality rate in patients with tetanus in Indonesia.

Keywords: Clinical features, outcomes, tetanus, tetanus severity score

Introduction

Tetanus, a disease caused by a neurotoxin released by the causative bacterium *Clostridium tetani*, is characterized by painful muscle spasms all over the body.^{1,2} Clinically, tetanus may be classified into 4 forms, including generalized, localized, cephalic, and neonatal tetanus.³ Even though tetanus is a vaccine-preventable disease, tetanus still becomes an important health issue worldwide, particularly in developing countries due to high mortality rates and low immunization coverage.⁴ About one million new cases of tetanus are reported in the world each year, with mortality in up to a quarter of the cases.⁵ However, the mortality rate has shown a decline after the immunization

programs were performed in many countries.⁶ Indonesia has performed the Extended Program on Immunization (EPI) since 1979 to eradicate tetanus, through Tetanus Toxoid (TT) immunization among couples, pregnant women, and infants.⁷ Elementary school students also become the population target of the tetanus vaccination program in Indonesia, with the vaccination scope has reach >90% since 1990.⁸ This strategy gives protection to both women and men until young adult age.⁸ Moreover, women of reproductive age receive additional vaccination as prevention of neonatal tetanus since 1996.⁸ The mortality rate of adult tetanus patients in Indonesia after performing EPI remains high, compared with other Southeast Asian countries.⁶

Besides vaccination history, clinical

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features like age, the onset of symptoms, and port of entry also affect the mortality in adult tetanus patients.⁹ Tetanus severity score (TSS) is a prognostic scoring system developed in Vietnam and introduced in the year 2006 by Thwaites et al.¹⁰ which uses certain clinical features to predict the mortality rate of adult tetanus patients. Studies about clinical features

and outcomes among adult tetanus patients using TSS in the world, including in Indonesia are still lacking. The aim of this study was to describe the clinical features and outcomes of adult tetanus patients using TSS.

Methods

This was descriptive research with a cross-sectional study design. Secondary data from medical records of all adult generalized tetanus patients aged 18 years old and older admitted to the neurology ward of Dr. Hasan Sadikin Bandung hospital between 2015 to 2019 were collected. Medical records with incomplete and missing data were excluded.

The characteristic variables used in this study were age, sex, presence of autonomic dysfunction, grade of tetanus, blood pressure on admission, heart rate on admission, the temperature on admission, and patient status at discharge. Grade of tetanus was classified into five grades according to Patel and Joag grading.¹¹

The clinical feature variables were classified based on the TSS scoring system (Table 1). Due to a lack of operational definition in the original article, difficulty breathing on admission was then defined as respiratory rate >30 times/minute on admission. All patients with punctured wounds, incised wounds, torn wounds, excoriation wounds, and other types of injuries, except post-operative wound, postpartum wounds, and open fractures were classified as other entry sites.¹⁰ The variable co-existing medical conditions are defined according to the American Society of Anesthesiologists (ASA) physical status scale.¹⁰ Those clinical features are then calculated individually. In the original article, the cut-point of TSS was 8, with a score ≥ 8 indicated a high mortality or predicted death (53%) and score <8 indicated a low mortality (6.3%).¹⁰

The present study was approved by Research Ethics Committee Universitas Padjadjaran with ethical number 731/UN6. KEP/EC/2020. Data analysis was performed using SPSS software ver. 25.0.

Results

During the study period, a total of 141 adult patients were admitted with generalized tetanus. Out of 141 patients, 71 patients with complete medical records were included. The average age was 55.2 ± 11.2 years, with predominantly male (87%). More than half of the patients (58%) experienced autonomic

Table 1 Tetanus Severity Score¹⁰

Clinical Features	Score
Age (years)	
≤70	0
71–80	5
>80	10
Time from the first symptom to admission (days)	
≤2	0
3–5	-5
>5	-6
Difficulty breathing on admission	
No	0
Yes	4
Co-existing medical conditions	
Fit and well	0
Minor illness or injury	3
Moderately severe illness	5
Severe illness not immediately life-threatening	5
Immediately life-threatening illness	9
Entry site	
Internal or injection	7
Other or unknown	0
Highest blood pressure recorded during the first day in the hospital (mmHg)	
≤130	0
131–140	2
>140	4
Highest heart rate recorded during the first day in the hospital (bpm)	
≤100	0
101–110	1
111–120	2
>120	4
Lowest heart rate recorded during first day in hospital (bpm)	
≤110	0
>110	-2
Highest temperature recorded during the first day in the hospital (°C)	
≤38.5	0
38.6–39	4
39.1–40	6
>40	8

Table 2 Characteristics of Adult Tetanus Patients (n=71)

Characteristics	n	%
Gender		
Male	62	87
Female	9	13
Presence of autonomic dysfunction		
Present	41	58
Absent	30	42
Grade of tetanus		
Grade I	4	6
Grade II	6	8
Grade III	29	41
Grade IV	22	31
Grade V	10	14
Systolic blood pressure on admission (mmHg)		
Median (IQR)		130 (120–140)
Diastolic blood pressure on admission (mmHg)		
Median (IQR)		80 (80–90)
Heart rate on admission (bpm)		
Median (IQR)		88 (80–100)
Temperature on admission (°C)		
Median (IQR)		36.8 (36.6–37.3)
Patient status at discharge		
Survived	44	62
Died	27	38

dysfunction. Based on the grading of Patel-Joag, most patients (41%) had a grade 3. In-hospital mortality was 38%. The highest proportion of mortality was found in the patient with grade V (80%) with the second highest was grade IV (68%), followed by grade II (17%).

Half of the patients (51%) were admitted to the hospital quickly which was ≤ 2 days after the first symptom. Almost all patients (97%) had no difficulty breathing on admission, and mostly (88%) had no underlying systemic disease. The most common entry site (99%) was unknown. The frequency of the highest systolic blood pressure recorded during the first day in the hospital varied. Almost half of the patients (45%) had the highest systolic blood pressure ≤ 130 mmHg. Many patients (68%) had the highest heart rate recorded during the first day in the hospital ≤ 100 times/minute. Almost all patients (99%) had the lowest heart rate of ≤ 110 times/minute. The majority of patients had the highest temperature recorded during the first day in hospital $\leq 38.5^\circ\text{C}$ (94%). All characteristics of the study subjects were shown in Table 2.

Fifty-six subjects had scores < 8 , while the

remaining 15 subjects had scores ≥ 8 . The distribution of clinical features according to Tetanus Severity Score was shown in Table 3. Further, 39 of 44 survived patients (89%), had scores < 8 . Ten of 27 subjects (37%) who died at discharge had score ≥ 8 (Table 4).

Discussion

In this study, the average age of the subjects was 55.2 ± 11.2 years. This is nearly similar to the previous study which showed the average age of 57.9 ± 18.4 years,¹² and another study from China with the average age of 55.53 ± 15.39 years.¹³ Male patients (87%) were higher than female patients (13%). This is also parallel with other previous studies.^{14,15} Male patients are more likely to have tetanus because of their outdoor work which can increase the risk of injuries.⁴ In addition, women are more likely to receive more vaccination for tetanus than male, for example before getting married and during pregnancy, which may contribute to more protection against tetanus for the sex group.^{4,16}

More than half of patients experienced

Table 3 Distribution of Clinical Features according to Tetanus Severity Score (n=71)

Clinical features	Score	n (%)
Age (years)		
≤70	0	63 (89)
71-80	5	6 (8)
>80	10	2 (3)
Time from first symptom to admission (days)		
≤2	0	36 (51)
3-5	-5	19 (27)
>5	-6	16 (22)
Difficulty breathing on admission		
No	0	69 (97)
Yes	4	2 (3)
Co-existing medical conditions		
Fit and well	0	62 (87)
Minor illness or injury	3	5 (7)
Moderately severe illness	5	4 (6)
Severe illness not immediately life-threatening	5	0
Immediately life-threatening illness	9	0
Entry site		
Internal or injection	7	1 (1)
Other or unknown	0	70 (99)
Highest blood pressure recorded during the first day in the hospital (mmHg)		
≤130	0	32 (45)
131-140	2	12 (17)
>140	4	27 (38)
Highest heart rate recorded during the first day in the hospital (bpm)		
≤100	0	48 (68)
101-110	1	7 (10)
111-120	2	8 (11)
>120	4	8 (11)
Lowest heart rate recorded during the first day in the hospital (bpm)		
≤110	0	70 (99)
>110	-2	1 (1)
Highest temperature recorded during the first day in the hospital (°C)		
≤38.5	0	67 (95)
38.6-39	4	3 (4)
39.1-40	6	0
>40	8	1 (1)

Table 4 Discharge Outcome of Adult Tetanus Patients (n=71)

TSS score	Status at Discharge	
	Survived (n=44) n (%)	Death (n=27) n (%)
<8	39 (89)	17 (63)
≥8	5 (11)	10 (37)

Note: TSS= Tetanus severity score

autonomic dysfunction (58%), similar to previous study showing that autonomic dysfunction was common in generalized tetanus.⁵ The presence of autonomic dysfunction, shown by episodes of tachycardia, sweating and hypertension, is due to the involvement of preganglionic nerve terminals of the sympathetic nervous system by the neurotoxin.⁵ Most patients were presented with generalized tetanus grade 3 (41%), consistent with the previous study, showing that most patients presented with tetanus grade 3 according to Patel and Joag's grading.¹⁶

After reclassifying the clinical parameters into what is asked in the TSS and calculating the individual score of the subjects in the study, it is found that most patients are admitted to the hospital quickly, ≤ 2 days after the first symptom, mostly had no systemic disease nor difficulty breathing on admission. A case report from East Nusa Tenggara, Indonesia showed a similar result, i.e patient was admitted quickly, 2 days after the first symptom, had no systemic disease, and had no difficulty breathing on admission.¹⁸ The most common entry site includes superficial wounds on the head and neck, trunk, and extremities (99%). Vital signs of this study, such as highest blood pressure, highest heart rate, lowest heart rate, and highest temperature which recorded during the first day in the hospital as differentiating factors for the prediction of mortality, hence it is difficult to compare these parameters with other studies.

In-hospital mortality was 38%, similar to other study.¹⁹ The highest proportion of mortality was found in the patient with grade V (80%), followed by grade IV (68.1%). Higher grades can predict a higher mortality rate.¹¹ Among subjects who survived, around 80% had TSS score < 8 . This is in line with what has been found in the study in Vietnam¹⁰, that score of TSS < 8 can predict a better outcomes. On the other hand, most patients who died also had a score < 8 . These low scores may be caused by several factors, i.e difference in population between Vietnam and Indonesia, and the entry site as one parameter in the TSS scoring system is quite different from the usual prone wound for tetanus, which in this scoring system was categorized as another category with score 0.²⁰

This study has some limitations: (1) due to its design, this study can not analyze the correlation between the TSS score and the discharge outcome directly; (2) some parameters in the scoring system were difficult to be calculated using available data

in the medical records; (3) due to limited time, the sample size in this study was small; and (4) other parameters outside the TSS, like infection during hospitalization, which may affect mortality in tetanus patients were not analyzed in this study.

In conclusion, tetanus in Bandung, Indonesia has a high mortality rate. One-third of patients who died had high TSS scores, while the survivors had low TSS scores, suggesting that the TSS is a prospective scoring to predict the mortality rates in patients with tetanus in Indonesia. Further prospective study with regular and accurate vital signs measurements and better entry site categorizing is needed to evaluate the performance of TSS.

References

1. Mahieu R, Reydel T, Maamar A, Tadié JM, Jamet A, Thille AW, et al. Admission of tetanus patients to the ICU: a retrospective multicentre study. *Ann Intensive Care*. 2017;7:12.
2. Yen LM, Thwaites CL. Tetanus. *Lancet*. 2019;393:1698.
3. Narang M, Khurana A, Gomber S, Choudhary N. Epidemiological trends of tetanus from East Delhi, India: A hospital-based study. *J Infect Public Health*. 2014;7(2):121–4.
4. Fan Z, Zhao Y, Wang S, Zhang F, Zhuang C. Clinical features and outcomes of tetanus: A retrospective study. *Infect Drug Resist*. 2019;12:1289–93.
5. Hassel B. Tetanus: pathophysiology, treatment, and the possibility of using botulinum toxin against tetanus-induced rigidity and spasms. *Toxins (Basel)*. 2013;5(1):73–83.
6. Kyu HH, Mumford JE, Stanaway JD, Barber RM, Hancock JR, Vos T, et al. Mortality from tetanus between 1990 and 2015: findings from the global burden of disease study 2015. *BMC Public Health*. 2017;17(1):179.
7. Sugiharto M, Ristrini R. Profil tetanus neonatorum dalam rangka kebijakan eliminasi tetanus maternal dan neonatal di Kabupaten Bangkalan Provinsi Jawa Timur, Tahun 2012–2014. *Bul Penelit Sistem Kesehat*. 2016;19(2):149–56.
8. Pusat Data dan Informasi Kementerian Kesehatan RI. Eliminasi tetanus maternal dan neonatal. *Bul Jendela Data Informasi Kesehat*. 2012;1:1–22. [cited 2021 Jan 08]. Available from: <https://pusdatin.kemkes.go.id/resources/download/pusdatin/buletin/buletin-mnte.pdf>
9. Saltoglu N, Tasova Y, Midikli D, Burgut R,

- Dündar IH. Prognostic factors affecting deaths from adult tetanus. *Clin Microbiol Infect.* 2004;10(3):229–33.
10. Thwaites CL, Yen LM, Glover C, Tuan PQ, Nga NTN, Parry J, et al. Predicting the clinical outcome of tetanus: The tetanus severity score. *Trop Med Int Health.* 2006;11(3):279–87.
 11. Patel JC, Joag GG. Grading of tetanus to evaluate prognosis. *Indian J Med Sci.* 1959;13:834–40.
 12. Sun C, Zhao H, Lu Y, Wang Z, Xue W, Lu S, et al. Prognostic factors for generalized tetanus in adults: A retrospective study in a Chinese hospital. *Am J Emerg Med.* 2019;37(2):254–9.
 13. Wang X, Yu R, Shang X, Li J, Gu L, Rao R, et al. Multicenter study of tetanus patients in Fujian Province of China: A retrospective review of 95 cases. *Biomed Res Int.* 2020;2020:8508547.
 14. An VT, Khue PM, Yen LM, Phong ND, Strobel M. Tetanus in Ho Chi Minh City, Vietnam: epidemiological, clinical and outcome features of 389 cases at the Hospital for Tropical Diseases. *Bull Soc Pathol Exot.* 2015;108(5):342–8.
 15. Derbie A, Amdu A, Alamneh A, Tadege A, Solomon A, Elfu B, et al. Clinical profile of tetanus patients attended at Felege Hiwot Referral Hospital, Northwest Ethiopia: a retrospective cross sectional study. *Springerplus.* 2016;5(1):892.
 16. Demicheli V, Barale A, Rivetti A. Vaccines for women for preventing neonatal tetanus. *Cochrane Database Syst Rev.* 2015:2015(7):CD002959.
 17. Khrisnan L, Anam, Panigoro R. Factors affecting mortality in adult tetanus patients. *Althea Med J.* 2015;2(2):157–61.
 18. Surya R. Skoring prognosis tetanus generalisata pada pasien dewasa. *CDK.* 2016;43(3):199–203.
 19. Tosun S, Batirel A, Oluk AI, Aksoy F, Puca E, Bénézit F, et al. Tetanus in adults: results of the multicenter ID-IRI study. *Eur J Clin Microbiol Infect Dis.* 2017;36(8):1455–62.
 20. Diaye DSN, Schwarzing M, Obach D, Poissy J, Matheron S, Casalino E, et al. Effectiveness and cost of quick diagnostic tests to determine tetanus immunity in patients with a wound in French Emergency Departments. *BMC Infect Dis.* 2014;14:603.