Factors Affecting Mortality in Adult Tetanus Patients

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Abstract

Background: Tetanus is a devastating disease that is associated with high mortality. The aim of this study was to analyze the prognostic factors that were associated with high mortality in tetanus.

Methods: This was an analytical study and the data was collected retrospectively from 1 January 2010–31October 2012 in the Department of Neurology, Dr. Hasan Sadikin General Hospital.

Results: Out of hundred thirty two cases only 87 cases of tetanus patient have complete medical records. There were 54 male and 33 female. The age range was 35-49 years old. Mortality rate was high (32.18%). The most frequent wound site is extremities (85.07 %). The absence of post-injury tetanus vaccination was 75.86%, period of onset <48 hours was 67.82% and the use of mechanical ventilation and tracheostomy 36.07%. Mortality was significantly associated with an incubation period <7 days ($p<0.05$), presence of fever ($p <0.05$), co morbidity of autonomic storm ($p<0.01$), and the severity of the disease by grade 5 ($p<0.05$).

Conclusions: Factors affecting the mortality in adult tetanus patients were significant for incubation period, fever, co morbidity and severity of the disease by grade. [**AMJ**.2015;2(1):157–61]

Keywords: Mortality, prognostic factors, tetanus

Introduction

Tetanus, described by Hippocrates as "a timeless human misery", still exists in the 21st century especially in the developing countries. Even with the invention of anti tetanus serum and tetanus toxoid by P. Descombey in 1924, as prevention tetanus immunization is not well practiced in most of the countries. Meanwhile, tetanus still remains as a public health problem in Indonesia. This disease is triggered by a microbiological organism called clostridium tetani which causes muscle spasm and lock jaw. Furthermore, in severe cases with increasing severity and frequency of spasms can lead to death.

In 1995, the World Health Organization (WHO) had an intention to eradicate tetanus however, in developing countries it still remains as endemic.[1] In Indonesia, the surveillance data by the Ministry of Health showed the incidence of tetanus is about 0.2 per 100,000 populations annually. It is regarded as an even distribution of the disease in all provinces in the country.[2] The incidence for the year 2011 in Indonesia is 210, as stated by the WHO.

However, the incidence has shown a decline since 2003.[3]

Tetanus is treated with intensive care, muscle relaxant drugs, and often assisted ventilation. Besides, anti-tetanus serum, tetanus toxoid and metronidazole are also administered. Proper wound debridement and management are also carried out. Active immunization of tetanus toxoid is given during childhood and continued with booster after 5 years to eradicate this disease. Furthermore, passive immunization is given following wound or injury.[4] Despite the help of the current modern medical advances, the mortality for generalized tetanus is still high. Therefore, this research was to analyze the prognostic factors affecting the mortality in adult tetanus patients.

Methods

Adult tetanus patients admitted in the Department of Neurology in Dr. Hasan Sadikin General Hospital, Bandung, from 1 January 2010-31October 2012 were included in this analytical study. Data were collected

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retrospectively. Diagnosis of tetanus was based on Patel and Joag grading. Patients were divided into five grades based on the criteria such as incubation period, period of onset, fever, and spasm and lock jaw. Fever is defined as temperature > 37.5. Grade I consisted of one of these criteria. For every additional criterion there will be alteration of the grade by one criterion. If all five criteria were present, it indicated grade V. While mild is range from grade I-II, moderate range from III-IV and severe was grade V.

The collected data included patient's details, age and sex, incubation period, period of onset, site of wound, immunization background, passive immunization, classification, grading, the comorbidity such as autonomic storm, cardiac arrest, aspiration pneumonia, and stress ulcer; and the use of mechanical ventilation. The incubation period was defined as a time period from time of injury to onset of symptoms, and the period of onset was defined as the time period from onset of symptoms to time of full blown disease / onset

of general spasms. The patients also received passive immunization with anti tetanus serum 10,000 IU and active immunization with tetanus toxoid. Patients were graded based on the severity of the disease: mild, moderate and severe according to Patel and Joag.5 The data will be analyzed using Chi-squared tests or, when needed, the Fisher's exact test was used, to analyze the association between mortality and categorical variables.[6]

Results

Out of a total of 132 cases of tetanus only 87 patients with complete records were included in this study. Out of the 87 patients, 86 of them had generalized tetanus and only one of them had cephalic tetanus. All patients had spasms and lockjaw. There were 54 (67.07%) male and 33 (37.93%) female patients. The age range was between 20–80 years. The highest number of patients presented with tetanus was between 35–49 years which was 34 (39.08%).

Table 1 The Distribution of the Demographic data of Tetanus Patients

Demographic data	No. of patients	%
Sex		
Male	54	67.07
Female	33	37.93
Age (years old)		
20–34	10	11.49
35–49	34	39.08
50–64	29	32.18
>65	14	16.09
Wound site		
Extremities	74	85.07
Face/nose/mouth	11	12.65
Trunk	2	2.30
Vaccine after injury		
Yes	21	24.14
No	66	75.86
Grading*		
2	12	13.79
3	45	51.72
4	23	26.44
5	7	8.05

Notes: * Grading is according to Patel and Joag: 0-2=mild, 3-4=moderate, 5=severe

Table 2 The Relationship between Mortality and Prognostic Factors for Tetanus

Factors	Total (n=87)	Died (n=28)	Mortality rate (%)	P-value
Sex				
Male	54	23	42.59	0.189
Female	33	5	15.15	
Age				
<50	45	14	16.09	0.503
≥50	42	14	16.09	
Wound site				
Extremities	74	24	85.72	0.850
Face/nose/mouth	1	4	14.28	
Trunk	2	0	0.00	
Vaccine after injury				
Yes	21	9	42.86	0.286
No	66	19	28.79	
Incubation period*				
< 7days	32	15	46.88	0.033
>7days	55	13	23.64	
Period of onset*				
< 48 hours	59	21	35.59	0.28
>48 hours	28	7	25.00	
Fever				
yes	27	14	51.85	0.013
no	60	14	23.33	
Co morbidity				
stress ulcer	13	6	46.15	0.002
respiratory distress	2	0	0.00	
respiratory failure	9	9	100.00	
autonomic storm	15	12	80.00	
cardiac arrest	2	2	100.00	
aspiration pneumonia	2	2	100.00	
none	44	0	0.00	
Grading				
2	12	2	16.67	0.031
3	45	11	24.44	
4	23	10	43.48	
5	7	5	71.43	
Use of mechanical ventilation or tracheostomy				
yes	61	22	36.07	0.318
no	26	6	23.08	

Note:*Incubation period is the period from injury to first symptom. Period of onset is the duration of time between first symptom and occurrence of spasm

The second highest was between 50–64 years which was 29 (32.18%). The lowest was presented between 20–34 years which was 10 (11.49%), followed by the age > 65 years which was 14 (16.09%). The most common wound site was extremities which were presented in 74 (85.07%) patients, followed by face/nose/mouth 11 (12.65%). The least common wound site was trunk which was two (2.30%). The absence of post-injury vaccination was shown as majority 66 (75.86%). Only 21 (24.24%) were vaccinated after injury. Based on the grading, most patient were presented with tetanus grade 3 which is 45 (51.73%) of them. It was followed by tetanus grade 4 which was 23 (26.44%), grade 2 which was 12 (13.79%) and grade 5 which was 7 (8.05%) of them.

The mortality rate among cases with an incubation period of < 7 days was higher (46.88%). Fourteen (51.85%) patients died with the presence of fever. In several co-morbidities of autonomic storm have shown the highest mortality rate with 12 (80%) patients. Mortality was high in patients for the period of onset < 48 hours which was 21 (35.59%). Patients who had been through mechanical ventilation and tracheostomy and died were 22 (36.07%).

Table 2 showed the relationship between mortality and prognostic factors for tetanus. Higher mortality rate was significantly associated with incubation period <7 days, presence of fever, co-morbidity of autonomic storm and more sever disease according to Patel and Joag grading. There were no significant association between age and sex, wound site, vaccine after injury, period of onset, and use of mechanical ventilation.

Discussion

Even though with the invention of tetanus toxoid, tetanus still cannot be eradicated in developing countries.[7,8] The mortality rate is considered high at 32.18%. Mortality was also proven high in a previous study by Polhaupessy.[9] A high rate of tetanus is shown in male than in female which is in line with the study by Patel and Mehtra[10], also in the study by Polhaupessy.[9] This is due to higher exposure rate in dirty environment at work in male than in female.[9,11] Besides, female are immunized before pregnancy.[1,12] In this study, gender was not shown significant to mortality rate. It is only common that tetanus occurres more in male than in female.

The highest mortality rate of tetanus was shown in the age range between 35–49 years, 39.08%. This may be due to the patients' activities at this age. Therefore, they are more prone to risk of injury which can be related to their work or other causes.13 In previous studies it was shown that there were associations of older age with mortality due to the poor adherence to immunization schedule.[6] The study by Udwadia[11] has stated that the response towards tetanus immunization declines at age more than 50 years old.

Vaccination after injury is important for preventing tetanus but in this study, the number of patients who were absence of post-injury vaccination is high (75.86%).6 It is also proven in the study by Widjaya.[13] Post-injury vaccinations are important in tetanus patients to prevent complications.

The factor wound site showed the highest number of patients was extremities with mortality rate 85.72%. The results differences could be because the patients in this study who were from allow socioeconomic background and also had low education were not aware about the safety at work. Therefore, they were more likely to injure their extremities. Usually tetanus is more severe if the site of wound is at the face or cranial than at extremities.

The factor incubation period <7 days (46.88 %; p 0.033) had a higher mortality compared to >7 days. This result was in line with the previous studies by Saltoglu et al.[5,6,10] The shorter the incubation period, the higher the risk of getting an infection showed that the toxin production by C. tetani had not neutralized. This factor was proven to be significant.

The patients who were presented with fever were higher than those without fever. It is significantly related to mortality in tetanus as the previous studies also showed presence of fever is related to mortality.6 In this study, fever was present because of the presence of microbiological organisms. Therefore, until the C. tetani was not eradicated the fever would not subside.

The co morbidity of autonomic storm had a p value of 0.002. This showed it was significantly related to mortality. The study by Polhaupessy has proven that autonomic storm is significant to mortality with p<0.001.[9] For severity of the disease by grade which is tetanus grade V shows as the highest mortality which is in line with the previous studies, the severer the disease the higher the mortality rate.[6,10,14] Grade V is the severest stage where there is presence of the five criteria as stated earlier. Therefore, this shows the patient is

in critical condition that will possibly lead them to further complications. This is proven significant to the mortality in tetanus.

The deaths from tetanus can be related to the prognostic factors. The factors which were significantly related to mortality were incubation period, presence of fever ($p<0.05$), co morbidity ($p<0.01$) and severity by grade ($p < 0.05$). Hopefully, this study could provide guidance for the physician to put much more effort on the prevention aspect of tetanus to reduce the mortality rate.

The limitation to this study was management as a factor was not identified. A multivariate logistic analysis could be performed to identify the most significant factors affecting the mortality simultaneously.

In conclusion, the mortality rate of adult tetanus was high (32.18%). The factors that were significantly affecting the mortality were incubation period less than 7 days, presence of fever, co morbid of autonomic storm and severity based by grade.

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