Clinical Characteristics and Epidemiology of Tetanus at Burirum Hospital

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ABSTRACT

Tetanus was expected to be a rare disease in Thailand after the implementation of the expanded program of immunization, however, there still are tetanus patients all year round. To study the clinical characteristics, clinical outcomes, and predictive factors for death in tetanus patients, we did a retrospective cohort study in all hospitalized patients who were diagnosed with tetanus at Burirum Hospital, a provincial hospital in northeastern, Thailand, from January 2001 to April 2005. There were 32 tetanus patients including a two-year-old boy and 31 others with a mean age of 57.4 ± 16.4 years of which 71 percent were male. All adult patients did not recall a history of tetanus immunization, and only 45.5 percent had cleaned wounds or had sought medical care after the injury (primary wound care). The overall mortality rate was 21.9 percent. The dead patients had a lower proportion of primary wound care than the survivors (0 % versus 66.7 %, p=0.038). The elderly patients are more likely to have inadequate tetanus immunization, injuries with open wounds, and lack of postexposure tetanus vaccination and appropriate primary wound care. Therefore, education and tetanus vaccination programs for the older population in Burirum province are clearly indicated.

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INTRODUCTION

Tetanus was expected to be a rare disease in Thailand after successful implementation of expanded program of immunization. However, there still are tetanus patients all year round. In 2004, there were 199 cases in Thailand reported to the World Health Organization.1 In countries where primary immunization programs are not effective, tetanus remains a major problem and approximately 800,000 to 1 million deaths from tetanus occur worldwide each year.2

Tetanus is caused by the toxins produced by Clostridium tetani, a gram-positive, spore-forming, obligate anaerobic bacillus. The characteristic muscle spasms are caused by a neurotoxin, tetanospasmin.3
C. tetani forms a stable terminal spore that is resistant to moisture, to some chemical disinfectants, and to variations in temperature including boiling. C. tetani is a common soil bacterium and its spores are ubiquitous in nature and are found in the soil, the intestines, and feces of domestic animals and humans. Wounds contaminated by soil with a low oxygen tension are optimal locations for germination of C. tetani. The spores are noninvasive and require a skin break for germination. The incubation period for tetanus varies from 1 or 2 days to a month or more. Most cases have onset of symptoms within 7 to 14 days after the injury.

In Burirum, where most people work as farmers, cases of tetanus occur all year round. Among these patients, some experience severe clinical symptoms and die. Given tetanus is a totally preventable disease, this study aimed to describe the clinical characteristics and determine the risk factors for death in tetanus patients at Burirum Hospital.

MATERIAL AND METHODS
A retrospective cohort study was conducted to determine the clinical characteristics and the epidemiology of tetanus at Burirum Hospital, a provincial hospital in northeastern, Thailand. All hospitalized patients who were diagnosed with tetanus at Burirum Hospital from January 1, 2001 to April 30, 2005 were studied. Medical records were retrieved and reviewed. Possible risk factors and patients’ demographics were collected. All patients were followed through the course of the disease until discharge from the hospital or death. The primary objective of the study was to determine the risk factors for death in tetanus patients. The secondary objectives were to describe the clinical characteristics, clinical outcomes, and determine the mortality rate of tetanus patients.

Mean (± standard deviation, SD), median (interquartile range, IQR), and frequencies (%) were used to describe patients’ characteristics. Chi-square test and Mann Whitney-U test were used to compare categorical and continuous variables, respectively, between surviving and dead patients. A p-value of less than 0.05 was considered statistically significant. All analysis were performed using the SPSS program version 11.5.

RESULTS
There were 32 tetanus patients during the study period. One patient was a two-year-old boy, and the other 31 patients had a mean age of 57.4 ± 16.4 (median 55, range 15-87) years and 71 percent were male. Most patients (37.5%) presented in winter between December and January. Figure 1 demonstrates the distribution of tetanus patients in each month. The diagnosis of tetanus was made on a clinical basis, and laboratory tests were used to exclude other possible diseases. Thirty-one

![Figure 1. Distribution of tetanus patients in each month.](image-url)
patients (96.9%) had generalized tetanus, and one patient had localized tetanus. Clinical manifestations included trismus (96.8%), opisthotonus (50%), fever (34.4%), abdominal rigidity (28.1%), and risus sardonicus (21.8%). Twenty-five patients (78.1%) had leucocytosis on complete blood counts.

None of the 31 adult patients could recall a history of tetanus immunization. Twenty-two of 32 patients (68.8%) could recall an injury with cut or punctured wound, but only 10 of these patients (45.5%) received primary wound care (self-cleaning the wound or sought medical care after the injury). Among 10 patients who received primary wound care, only seven patients received tetanus toxoid as postexposure prophylaxis.

The incubation period (injury to the onset of tetanus) was 11.2 ± 5.7 (median 11, range 3-21) days. The majority of patients (28, 87.6%) were cared in intensive care. Treatment for tetanus included intermittent intravenous diazepam (100%), oral diazepam (93.8%), early tracheostomy (84.4%), a tetanus antitoxin (93.8%), a tetanus toxoid booster (59.4%), and antibiotics (100%). The average duration of admission was 30.5 ± 17.6 days, and the average cost of treatment was 101,015 Baht (2,525 USD) per patient. Overall mortality rate was 21.9 percent. Respiratory failure is the most common direct cause of death. The demographics, baseline characteristics, incubation period, and treatment between the dead and surviving patients were similar (Table 1). The dead patients had a lower proportion of primary wound care than the surviving patients (0% versus 66.7%, p=0.038).

DISCUSSION
The present study has demonstrated that tetanus is not a rare disease as expected. We still see tetanus patients all year round. Although the reported cases of tetanus declined from 1,455 cases in 1985 to 199 cases in 2004,1 the successful implementation of expanded program of immunization should have eradicated this disease. Given that all adult patients could not recall tetanus vaccination; this reflects the inadequacy of real-life tetanus immunization in adults. Patients in the

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Dead patients (N=7)</th>
<th>Surviving patients (N=24)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean ± SD (years)</td>
<td>61.1 ± 15.3</td>
<td>56.3±16.8</td>
<td>0.521</td>
</tr>
<tr>
<td>Gender (N%)</td>
<td></td>
<td></td>
<td>0.360</td>
</tr>
<tr>
<td>Male</td>
<td>4 (57)</td>
<td>18 (75)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3 (43)</td>
<td>6 (25)</td>
<td></td>
</tr>
<tr>
<td>Occupation (N%)</td>
<td></td>
<td></td>
<td>0.781</td>
</tr>
<tr>
<td>Farmers</td>
<td>4 (57)</td>
<td>12 (50)</td>
<td></td>
</tr>
<tr>
<td>Retired from work</td>
<td>2 (29)</td>
<td>9 (38)</td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>1 (14)</td>
<td>3 (12)</td>
<td></td>
</tr>
<tr>
<td>Recall of tetanus immunization before the injury (%)</td>
<td>0</td>
<td>0</td>
<td>1.000</td>
</tr>
<tr>
<td>Primary wound care* (%)</td>
<td>0/7 (0)</td>
<td>10/15 (66.7)</td>
<td>0.038</td>
</tr>
<tr>
<td>Incubation period, mean ± SD (days)</td>
<td>7.0±3.6</td>
<td>12.2±5.8</td>
<td>0.108</td>
</tr>
<tr>
<td>Hospitalized in intensive care</td>
<td>7 (100)</td>
<td>21 (88)</td>
<td>0.325</td>
</tr>
</tbody>
</table>

*Self-cleaning the wound or sought medical care after the injury, in patients who had wound
The present study were mainly elderly patients. Inadequate
tetanus immunization is a recognized problem in geriatric
populations particularly in developing countries, and
among the poor and street people in developed regions
as well. In previous studies from Belgium, less than
50 percent of elderly patients were protected against
tetanus.

We found that almost all patients had generalized
tetanus, which is the most common form. More than
one-third of the patients presented between December
and January possibly because a large percentage of
the population in Burirum are farmers, and the harvest
season in winter leads to more injuries and cut wounds.
However, less than 50 percent of the patients who had
wounds had primary wound care, and not all of them
were appropriately evaluated and given tetanus
vaccination. The present study has demonstrated that
the lack of primary wound care is significantly predictive
for death in tetanus patients. This warrants the need
for education of the population regarding primary wound
care as well as regular tetanus immunization at primary
care center.

The present study also demonstrates that tetanus
has a prolonged course; the average hospitalization is
about a month for each patient. Clearly, the cost of
hospitalization and the lost of life from the high mortality
of this disease outweighed the cost of systematic
immunization campaigns against tetanus.

The limitations of the present study include the
retrospective nature, small sample size, and unavailable
anaerobic culture. None of our patients had positive
cultures for \textit{C. tetani} from routine aerobic wound
cultures. However, a diagnosis of tetanus can be made
on a clinical basis. A previous study shows that
wound cultures are positive for \textit{C. tetani} in only 30
percent of documented cases.

In conclusion, in countries where primary and
follow-up immunization programs are not effective,
tetanus remains a major problem. Tetanus is a disease
mainly affecting the older population in Burirum and
carries a high mortality rate. This population is likely to
have inadequate tetanus immunization, injuries with open
wounds, and lack of postexposure tetanus vaccination
and appropriate primary wound care. Since tetanus is
an entirely preventable disease by immunization, we
need to educate the general population particularly the
older generation about the disease and need for primary
wound care, as well as to improve the accessibility of
tetanus vaccination programs.

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