

# A Ten-year Retrospective Study of Tetanus at a General Hospital in Malaysia

L G Lau, K O Kong, P H Chew

## ABSTRACT

**Aims:** To study the demographic and clinical features as well as outcomes of tetanus patients at the Sarawak General Hospital, Kuching from 1990 to 1999.

**Methods:** All cases of tetanus from January 1990 to September 1999 were identified from the computer record at the hospital and these were then retrospectively reviewed.

**Results:** A total of 22 cases of tetanus was seen at the Sarawak General Hospital in the ten-year period with a mean of 2.2 cases per year. There were 15 male (68.2%) and 7 female (31.8%) patients. Most cases occurred in the age group 60 - 69. Eighteen patients (81.8%) had a reasonably identifiable injury prior to the onset; all had their wounds debrided. Body stiffness, trismus and dysphagia were the three commonest presenting complaints. Twenty-one patients (95.5%) were admitted to the intensive care unit (ICU), with an average length of ICU stay of 21.4 days. Nineteen patients (86.4%) required mechanical ventilation for a varying period of time in the ICU. All patients (100%) had tracheostomy performed and intravenous diazepam infusion as part of their management. Twenty patients (90.9%) received intravenous crystalline penicillin as the treatment antibiotics. Twenty-one patients (95.5%) received intramuscular human antitetanus immunoglobulin. There were four deaths, accounting for a mortality of 18.2%.

**Conclusion:** In general, tetanus remains in Sarawak an important disease with substantial mortality and morbidity that primarily affects unvaccinated or inadequately vaccinated individuals. It is, however, highly preventable through both routine vaccination and appropriate wound management. Our case series show comparable pattern and outcome with other case series reported in the literatures.

**Keywords:** Retrospective study, Tetanus, Demography, Clinical features, Sarawak General Hospital

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## INTRODUCTION

Tetanus is a neurological disorder, characterised by increased muscle tone and spasms. It is caused by tetanospasmin, a powerful protein toxin elaborated by *Clostridium tetani*. *C. tetani* is a ubiquitous organism, found worldwide in soil, in inanimate environment, in animal, and occasionally human faeces. The organism exists in two forms: spores and vegetative cells. Tetanospasmin is formed in the vegetative cells under plasmid control.

Tetanus occurs sporadically and almost always affects nonimmunised, partially immunised, or fully immunised persons who fail to maintain adequate immunity with booster doses of vaccine. Although tetanus is entirely preventable by immunisation, the burden of disease is large worldwide. The global incidence of tetanus is still estimated at one million cases annually, with a case fatality ratio ranging from 20 to over 50 percent<sup>(1)</sup>. The disease is common in areas where soil is cultivated, in rural areas, in warm climates, and among males. In places without a comprehensive immunisation programme, tetanus occurs predominantly in neonates and young children. In countries with successful immunisation programmes, neonatal tetanus is rare and the disease affects other age group inadequately covered by immunisation.

Most cases of tetanus follow an acute penetrating skin injury. The injury may be major but often is trivial, so that medical attention is often not sought. Tetanus is also associated with chronic skin ulcers<sup>(1,10)</sup>, abscesses, gangrene, burns, surgery, abortion<sup>(2)</sup>, childbirth<sup>(2)</sup>, and intravenous drug abuse<sup>(9)</sup>. In some patients no portal of entry for the organism can be identified<sup>(1)</sup>.

In Sarawak, like most developing countries in the world, tetanus is endemic and remains an important health problem especially among the rural farming folks. We undertook a ten-year retrospective study of all the tetanus cases managed at a 700-bedded secondary/tertiary hospital, looking into its demographic and clinical profiles.

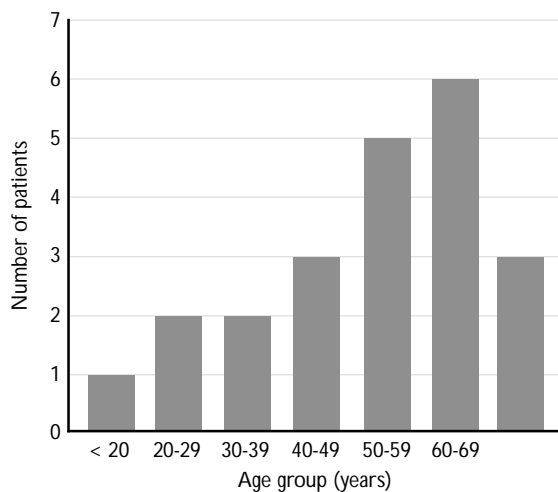
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**Fig. 1** The age distribution of the tetanus patients from 1990 - 1999.**Table I.** The racial breakdown of the tetanus patients from 1990 - 1999.

| Race    | Number of patients |
|---------|--------------------|
| Malay   | 12                 |
| Iban    | 3                  |
| Bidayuh | 3                  |
| Chinese | 3                  |
| Others  | 1                  |
| Total   | 22                 |

**Table II.** Number of patients with or without identifiable acute injury in the series of 22 tetanus patients from 1990 - 1999.

| Presence of injury        | Number of patients |
|---------------------------|--------------------|
| Identifiable acute injury | 18                 |
| No identifiable injury    | 3                  |
| Other lesion              | 1                  |
| Total                     | 22                 |

**Table III.** The presenting complaints of the 22 tetanus patients in our series.

| Presenting symptoms    | Number of patients | Percentage of patients |
|------------------------|--------------------|------------------------|
| Body stiffness / spasm | 17                 | 77.2 %                 |
| Trismus                | 16                 | 72.7 %                 |
| Dysphagia              | 10                 | 45.3 %                 |
| Body ache              | 5                  | 22.7 %                 |
| Backache               | 4                  | 18.2 %                 |
| Abdominal pain         | 3                  | 13.6 %                 |
| Neck pain              | 1                  | 4.5 %                  |
| Jaw pain               | 1                  | 4.5 %                  |
| Dyspnoea               | 1                  | 4.5 %                  |
| Urinary retention      | 1                  | 4.5 %                  |

## METHODS

All cases of tetanus from January 1990 to September 1999 were included in this 10-year retrospective descriptive study. The tetanus cases were searched for and identified from the computer record in the Record Office as well as the ICU Record of the Sarawak General Hospital. The individual case notes were then retrieved and studied. Tables and charts were then made to summarize the various data of interest.

## RESULTS

There were 22 cases of tetanus in the study period with a range of 0 to 4 cases per year and a mean of 2.2 cases per year. There were 15 male (68.2%) and seven female (31.8%) patients. The racial breakdown of the 22 tetanus patients is shown in Table I. Twelve patients (54.5%) were Malays and there were three patients (13.6%) each from Iban, Bidayuh and Chinese ethnic background. The remaining patient was an Indonesian.

The age distribution of these 22 tetanus patients is shown in Fig. 1. Most cases occurred in the age groups 60 - 69 and 50 - 59, with 6 and 5 cases respectively. Seventeen cases (77%) occurred in people more than 40 years of age. Only one patient was less than 20 years of age. The mean age in our series was 51.7 years.

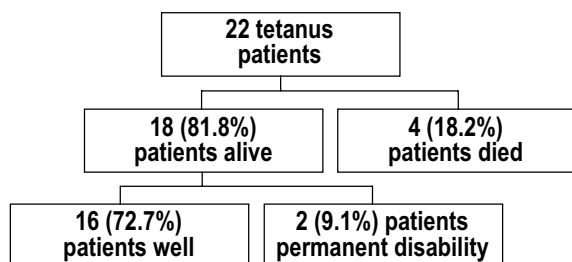
Eighteen of the 22 patients (81.8%) had a reasonably identifiable acute injury (prick, puncture wound or laceration) prior to the onset of tetanus, as shown in Table II. In 12 patients (54.5%), the injuries were on the lower limbs whereas in five patients (22.7%), the injuries were described on the upper limbs. In one patient, a fall led to a wound on the scalp at the occipital region. In another patient, there was a boil on the right leg for about a week before the first symptoms of tetanus. In three patients (13.6%), there was no clinically identifiable portal of entry.

Table III shows the presenting complaints of the 22 tetanus patients in our series. Body stiffness / spasm, trismus and dysphagia made up the 3 commonest presenting complaints. Body ache, backache and abdominal pain were also fairly common; while the other complaints (neck pain, jaw pain, dyspnoea and urinary retention) were only present in one patient each.

Of the 22 patients, 18 (81.8%) were alive, though one remained in a persistent vegetative state due to hypoxic brain damage and another required a below knee amputation of the left leg. Hence, 16 (72.7%) were discharged well and 2 (9.1%) were discharged with permanent disabilities. There were four deaths, accounting for a mortality of 18.2%. The eventual outcomes of the 22 tetanus patients in our series are depicted in Fig. 2.

For those 18 patients that were discharged alive, the length of hospital stay ranged from 16 to 150 days,

Fig. 2 Flow chart showing the outcomes of the 22 tetanus patients in our series.



with an average length of stay of 83 days. Two patients spent more than 100 days in the hospital; one spent 150 and the other, 119 days. This made the average length of stay skewed towards a longer duration. From Table IV, which shows the range of hospital stay for the 18 tetanus patients that were alive, it is clear that most patients (seven patients or 31.8%) stayed for 31 - 40 days. Twenty-one patients (95.5%) were admitted to and managed in the intensive care unit (ICU). The range of stay in the ICU for these 21 patients is shown in Table V. Most patients stayed for a range of 11 - 20 days and 21 - 30 days (with nine and eight patients respectively, representing 77.2% of the patients). The average length of ICU stay was 21.4 days.

All patients (100%) had tracheostomy performed and intravenous diazepam infusion as an integral part of their management. Nineteen of the 22 patients (86.4%) required mechanical ventilation for a varying period of time in the ICU. Twenty patients (90.9%) received intravenous crystalline penicillin as the treatment antibiotics; 11 patients (50%) received it as the only antibiotics and nine patients (40.9%) received it in combination with metronidazole. One patient (4.5%) received metronidazole as the only antibiotics and one more received a combination of ceftriaxone and metronidazole. All the 19 patients with an identifiable portal of entry (18 were acute wounds and 1 was an infective wound) underwent surgical toilet and debridement of the wounds. Twenty-one patients (95.5%) received intramuscular human antitetanus immunoglobulin. A 54-year-old Bidayuh man had such mild tetanus that he did not receive human antitetanus immunoglobulin, did not require ICU care and was not ventilated. He had tracheostomy performed, was given intravenous diazepam infusion and was nursed in a quiet side room on the general ward. He made a good recovery in 20 days.

All the four deaths in our series were attributed to nosocomial sepsis. Three deaths (75%) had positive blood cultures (growing *Burkholderia cepacia*, *Escherichia coli* and *Klebsiella pneumoniae* respectively). There was no positive culture in the fourth death. Table VI shows a summary of the treatments given to the 22 tetanus patients.

Table IV. The range of hospital stay for the 18 tetanus patients that were alive.

| Number of days of hospital stay | Number of patients |
|---------------------------------|--------------------|
| 11 - 20                         | 2                  |
| 21 - 30                         | 2                  |
| 31 - 40                         | 7                  |
| 41 - 50                         | 3                  |
| 51 - 60                         | 2                  |
| > 60                            | 2                  |
| Total                           | 18                 |

Table V. The range of ICU stay of the tetanus patients from 1990 - 1999.

| Number of days of ICU stay | Number of patients |
|----------------------------|--------------------|
| 1 - 10                     | 2                  |
| 11 - 20                    | 9                  |
| 21 - 30                    | 8                  |
| 31 - 40                    | 1                  |
| > 40                       | 1                  |
| Total                      | 21                 |

Table VI. Summary of the treatments afforded to the 22 tetanus patients.

| Treatments given                    | Number of patients |
|-------------------------------------|--------------------|
| Tracheostomy                        | 22                 |
| Intravenous diazepam infusion       | 22                 |
| IM human antitetanus immunoglobulin | 21                 |
| ICU management                      | 21                 |
| Intravenous crystalline penicillin  | 20                 |
| Mechanical ventilation              | 19                 |
| Wound toilet and debridement        | 19                 |
| Intravenous metronidazole           | 11                 |

## DISCUSSION

In this retrospective descriptive study, we identified a total of 22 cases of tetanus in the ten-year period from 1990 to 1999, giving a mean of 2.2 cases per annum. The case records of these 22 tetanus cases were thoroughly studied to gather various demographic and clinical data of interest. We found regrettably that in most cases the occupational data of the tetanus patients was incompletely entered and hence, we were not able to analyse these tetanus cases in relation to the occupations of the patients. We were also unable to collect sufficient information on immunisation history and whether the patients were from a rural or urban environment. More detailed history taking and recording should therefore be mandatory in the future so that important and complete data would be available for analysis to provide invaluable information<sup>(3)</sup>. The sex distribution analysis revealed that almost two-thirds of the cases (68.2%) occurred in men while a third occurred (31.8%) in

women. This finding is consistent with that of other studies<sup>(4,5,6,15)</sup>. This could be explained by the fact that men tend to spend more time outdoor, in farming activities and other types of field work. Hence, they are more likely to be exposed to both the causal organism, *C. tetani*, which is ubiquitous in soil in a tropical country like Sarawak, and the penetrating injury necessary for the organism to enter the body.

The mean age of the tetanus patients in our series was 51.7 years. 77% of the tetanus cases occurred in individuals more than 40 years of age. The possible explanation for this observation is that tetanus immunisation programme was only commenced in this country in the mid-1960's. Hence, people more than 40 years of age have low immunity against tetanus, because they had never received tetanus immunisation<sup>(3,7)</sup>. This observation is also consistent with a population-based serologic survey of immunity to tetanus in the United States which showed that the prevalence of Americans with protective levels of tetanus antibody declined rapidly starting at the age of 40 years and that most cases of tetanus occurred in persons of older age group<sup>(8)</sup>.

81.1% of the tetanus patients were indigenous races, 54.5% being the Malays. Only 13.6% (or three patients) were Chinese. This pattern of racial breakdown is explained by the fact that more indigenous people live in the rural areas and engage themselves in the agricultural sector. Therefore, they again are more likely to be exposed to the causal organism as well as the injury necessary for the organism to enter the body. 81.8% of the tetanus patients had an identifiable acute skin injury; a prick, a puncture wound or a laceration wound, a figure fairly consistent with that of other studies<sup>(9)</sup>. 54.5% of these injuries occurred in the lower limb, while only 22.7% were on the upper limbs. Other studies also reported that the majority of tetanus wounds were located on the lower limbs<sup>(10)</sup>. *C. tetani* exists in soil; hence, any lower limb injury would be open to contamination and infection by this organism, bearing in mind too that most tetanus patients were rural farming folks. In 13.6% of the patients, no probable portal of entry was identified; the injuries were likely too trivial to be recalled<sup>(1,3,9)</sup>.

Body stiffness/spasm, trismus and dysphagia, in that order, were the commonest presenting complaints of the tetanus patients in our series. Other investigators had also found trismus and rigidity to be the commonest presenting symptoms<sup>(4,11,15)</sup>. Hence, a high index of suspicion for tetanus should be exercised whenever patients present with any of these symptoms as tetanus is essentially a clinical diagnosis and laboratory results as well as cultures

are of little diagnostic value<sup>(1,4)</sup>. If a patient presents with all the three complaints, the probability of tetanus would be extremely high. Tetanus patients also complained of pains and aches involving other parts of the body, either generalised or localised such as back, neck and jaw pain. If these were the only complaint, the correct diagnosis as well as the appropriate management might be delayed<sup>(12)</sup>. The mortality rate of tetanus in our series was 18.2%. This finding is fairly consistent with that of other studies<sup>(5,6,9,10,11,13,15,18)</sup>. All deaths in our series were attributed to nosocomial infections, though the blood cultures were positive only in 75%. This is in contrast with other studies which showed that the most frequent cause of death was cardiac arrhythmias and infections was the second commonest cause of mortality<sup>(14)</sup>. A Jamaican study, however, also showed that infective respiratory complications occurred most commonly in their series of 108 tetanus patients, but sudden cardiac arrest was the most common cause of death<sup>(4)</sup>.

81.8% of our series of patients survived. Two of them, however, suffered permanent disability. One, a diabetic patient, required a below knee amputation for left foot sepsis (following an injury which was the portal of entry for *C. tetani*) that was unresponsive to conservative management. The other patient, presented with back pain, was wrongly thought to have a non-medical problem and was admitted to the orthopaedic ward. There was a delay in the diagnosis of tetanus and the institution of appropriate management<sup>(12)</sup>. He developed hypoxic brain damage and remained in a persistent vegetative state upon discharge.

The average length of hospital stay was 83 days. Two patients stayed for more than 100 days; one stayed 150 days and the other, 119 days. 21 (95.5%) patients were admitted to and managed in the intensive care unit, with an average length of ICU stay of 21.4 days, a figure comparable with that of other studies<sup>(5,11,18)</sup>.

In terms of management, all patients had tracheostomy performed to circumvent the problem of laryngeal spasm (which could lead to asphyxiation and hypoxia) and to enable tracheal suction and toilet to be carried out efficiently (airway protection)<sup>(6,16)</sup>. 86.4% of the patients required mechanical ventilation for a varying period of time in the ICU<sup>(5,11)</sup>. All patients were also given intravenous diazepam infusion to control the spasm and relieve the body rigidity<sup>(1,6,11,15)</sup>.

Twenty-one patients were given intramuscular human antitetanus immunoglobulin to neutralise the free unbound tetanospasmin<sup>(1,6,11,15-17)</sup>. All patients with identifiable portal of entry for the causal organism underwent surgical wound

debridement to prevent further elaboration and absorption of the toxin tetanospasmin<sup>(10,11,15,17)</sup>. 90.9% of the patients received intravenous crystalline penicillin as the treatment antibiotics; 50% received it as the sole antibiotics and 40.9% received it in combination with metronidazole. Metronidazole was only used in the management of tetanus after the mid-1996, before which time penicillin was the sole antibiotics employed<sup>(1,15)</sup>.

In conclusion, tetanus remains in Sarawak an important disease with substantial mortality and morbidity that primarily affects unvaccinated or inadequately vaccinated individuals<sup>(4,7,11,12,18)</sup>. As Sarawak, like most Third World countries, has very limited resources, the continued occurrence of this preventable disease represents a drain on existing intensive care funds<sup>(5)</sup>. This must be brought to the attention of institutions responsible for planning health care programmes. Tetanus is, however, highly preventable through both routine vaccination and appropriate wound management<sup>(3,9,10,17)</sup>. The method of good management emphasises: 1) wound care, 2) neutralisation of the toxin, 3) antibiotic therapy, 4) supportive measures including good nursing care with control of convulsions and, 5) completion of active immunisation<sup>(3,17)</sup>. Every contact with the health-care system, particularly among older adults and intravenous drug abusers, should be used to review and update vaccination status as needed<sup>(1)</sup>. A case of tetanus reflects the failure of our health care delivery system to provide adequate and appropriate immunisation<sup>(1)</sup>. The solution to the problem of tetanus remains prophylaxis<sup>(10,17,18)</sup>.

## REFERENCES

1. Sanford JP. Tetanus - Forgotten but not gone. *N Engl J Med* 1995; 332:812-3.
2. Brabin L, Kemp J, Maxwell SM, Ikimalo J, Obunge OK, Briggs ND. Protecting adolescent girls against tetanus. *BMJ* 1995; 311:73-4.
3. Bowen V, Johnson J, Boyle J, Snelling CF. Tetanus - A continuing problem in minor injuries. *Can J Surg* 1988; 31:7-9.
4. Henderson SO, Mody T, Groth DE, Moore JJ, Newton E. The presentation of tetanus in an emergency department. *J Emerg Med* 1998; 16:705-8.
5. Harding-Goldson HE, Hanna WJ. Tetanus: a recurring intensive care problem. *J Trop Med Hyg* 1995; 98:179-84.
6. Garnier MJ. Tetanus in patients three years of age and up. A personal series of 230 consecutive patients. *Am J Surg* 1975; 129:459-63.
7. Zuber PL, Schierz A, Arestegui G, Steffen R. Tetanus in Switzerland 1980-1989. *Eur J Epidemiol* 1993; 9:617-24.
8. Gergen PJ, McQuillan G, Kiely M, Ezzati-Rice TM, Sutter RW, Virella G. A population-based serologic survey of immunity to tetanus in the United States. *N Engl J Med* 1995; 332:761-6.
9. Bardenheier B, Prevots DR, Khetsuriani N, Wharton M. Tetanus surveillance - United States, 1995-1997. *Mor Mortal Wkly Rep CDC Surveill Summ* 1998; 47:1-13.
10. Percy AS, Kukora JS. The continuing problem of tetanus. *Surg Gynecol Obstet* 1985; 160:307-12.
11. Peetermans WE, Schepens D. Tetanus - still a topic of present interest: a report of 27 cases from a Belgian referral hospital. *J Intern Med* 1996; 239:249-52.
12. Sharma N, Trubuhovich R, Thomas MG. Tetanus in Auckland: a preventable disease. *N Z Med J* 1994; 107:82-4.
13. Prospero E, Appignanesi R, D'Errico MM, Carle F. Epidemiology of tetanus in the Marches Region of Italy, 1992-95. *Bull World Health Organ* 1998; 76:47-54.
14. Pappagallo S, Romagnoli P, Giannoni S, Tinagli F, Feri M, Tulli G. Tetanus disease. Experience with 2 intensive treatments during 13 years. *Minerva Anesthesiol* 1992; 58:165-72.
15. Lima VM, Garcia MT, Resende MR, Nouer SR, Campos EO, Papiordanou PM, da Silva LJ. Accidental tetanus: clinical and epidemiological profile of inpatients at a university hospital. *Rev Saude Publica* 1998; 32:66-71.
16. Haid B. 111 cases of tetanus in 18 years. Report of experiences and general conclusions. *MMW Munch Med Wochenschr* 1975; 117:1149-58.
17. Faust RA, Vickers OR, Cohn I Jr. Tetanus: 2,449 cases in 68 years at Charity Hospital. *J Trauma* 1976; 16:704-12.
18. Camacho JA, Jimenez JM, Diaz A, Montijano A, Quesada JL, Montiel D. Severe-grade tetanus in a multipurpose ICU: review of 13 cases. *Enferm Infecc Microbiol Clin* 1997; 15:243-5.