

# Adult tetanus in Accra, why the high mortality? An audit of clinical management of tetanus.

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## Summary

**Background:** Tetanus is a life threatening infection relatively uncommon in the developed countries but occurs frequently in developing countries with case fatality rates of 40-60%. Recent review of adult tetanus at the Korle-bu Teaching Hospital showed a high case fatality of 50%. In order to determine the factors underlying this high case fatality we conducted a retrospective clinical audit of the clinical management of adult tetanus admitted in 1994 to 2001 to the Korle-bu Teaching Hospital.

**Methods:** Data extracted from the admission and discharge books of the Fevers' Unit of Korle-bu Teaching Hospital, Accra and patient case notes were examined and analysed.

**Results:** Case fatality rate (CFR) varied from 25% in 1999 to 72.7% in 2001. There was no gender difference in the case fatality. There was no significant difference in the mean age of those who died and those who survived, however, the CFR rose with age. The presence of neck and a dirty wound were associated with increased CFR. The CFR correlated with the severity of tetanus and increased when an expected treatment action, wound debridement, administration of antibiotics and/or immunoglobulin, was not performed. The administration of anti-tetanus toxin was associated with an increased CFR.

**Conclusion:** The high case fatality rate in Accra was due to inappropriate management with most of the patients not treated with immunoglobulin and antibiotics and had inadequate wound care.

**Key- words:** Adult Tetanus, Mortality, Clinical Audit.

## Résumé

**Introduction:** Tétanos est une infection qui menace la vie. Il est relativement peu commun dans les pays développés mais arrive fréquemment dans les pays en voie de développement avec le taux de cas de fatalité de 40-60%. Bilan le plus récent de cas de tétanos chez les adultes au centre hospitalier universitaire à Korle-Bu avait démontré un cas de fatalité élevé de 50%. Afin de déterminer les facteurs sous-jacent ce cas de fatalité

élevées, nous avons effectué une vérification clinique rétrospective de la prise en charge clinique de tétanos d'adultes admis du 1994 au l'an 2001 au centre hospitalier universitaire de Korle-Bu.

**Méthodes:** Extraire des données des cahiers d'admission et du renvoi du service de la fièvre du centre hospitalier universitaire de Korle-Bu, Accra et dossiers des patients ont été étudiés et analysés.

**Résultats:** Taux de cas de Fatalité (TCF) varie de 25% en 1999 au 72,7% en l'an 2001. Il n'y avait aucune différence sensible dans l'âge moyen de ceux qui ont mort et ceux qui ont survie, toutefois, le TCF avait augmenté avec âge. La présence du cou et une blessure sale ont été liés avec l'augmentation de TCF. Le TCF était en corrélation avec la gravité de tétanos et a augmenté quand une action de traitement attendu débridement de blessure, administration d'antibiotiques et/ou d'immunoglobuline, n'était pas opéré. L'administration de la toxine d'anti-tétanos était liée avec une augmentation de TCF.

**Conclusion:** Le taux élevé de cas de fatalité à Accra était attribuable à la prise en charge peu appropriée avec le grand nombre de patient pas soigné avec immunoglobuline et antibiotiques et n'avaient pas eu des soins de blessure adéquat.

## Introduction

Tetanus is a life threatening infection that is uncommon in developed countries but relatively common in developing countries. In the USA, between 40 and 70 cases were reported each year during 1994-1998<sup>1,2</sup>, approximately 12-15 cases were reported each year in Britain<sup>3</sup> and in South Africa approximately 300 cases<sup>4</sup>. The overall annual incidence worldwide is estimated to be 0.5-1 million cases<sup>5</sup>. The prevalence of tetanus in Ghana is not known. The only available data is the number of cases reported to the WHO, which may reflect the "iceberg phenomena" because reporting is incomplete. The total number of tetanus cases (neonatal and others) reported from Ghana was 1,232 in 1974 and gradually decreased to 219 in 2000<sup>6</sup>. The annual admission rate of adult tetanus at the Korle-Bu Teaching Hospital (KBTH) between 1994 and 2001 was relatively constant at 20 cases and this was taken to indicate that the extended immunization programme (EPI) had not affected the annual prevalence

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of tetanus in adults in Accra<sup>7</sup>.

Tetanus carries a high mortality of 40%-60%<sup>8,9</sup>. Intensive care management can reduce the mortality to less than 20%.<sup>10</sup>. In developing countries, with minimal facilities for management, death from tetanus is high. In areas in Africa, where there was no intensive care, reported mortality from neonatal tetanus was very high (60% – 90%)<sup>11,12,13,14</sup>. Tetanus can therefore be described as a disease of developing countries needing developed countries' facilities for treatment<sup>15</sup>. The mortality of tetanus also depends on other factors such as the age of the patient, the severity of the illness, the presence of complications and the clinical management of the patient<sup>8-14,16,17</sup>. We have found a high case mortality of 50% of adult tetanus in Accra. In order to determine the factors underlying this high case mortality we conducted a retrospective clinical audit of the management of adult patients with tetanus admitted in 1994 to 2001 to the Korle-bu Teaching Hospital in order to formulate guidelines for improved management.

**Methods**

**Study site and population**

The study was conducted in the Fevers Unit of the Korle-Bu Teaching Hospital, Accra, Ghana. KBTH is the largest hospital in Ghana (1,500 beds and cots) and serves the city of Accra (population of 2 million), the surrounding urban population and the southern part of Ghana. The Fevers Unit admits most of the cases of tetanus in the southern half of Ghana. It is an isolation ward, where seriously ill patients with infectious diseases such as HIV/AIDS, chicken pox, measles, etc. are admitted. It is located some distance from the main KBTH complex and although it was built to be self sufficient in facilities such as its own laboratory, x-ray, and theatre etc, most of these are not functioning nor are there any personnel to run them. This isolation ward is therefore very physically isolated from most of the facilities in the main hospital. Only simple wound dressing could be done at the unit, there are no facilities for anaesthetic and intensive care and monitoring. Since there is no pharmacy, drugs were supplied as and when needed, with the attendant delay,

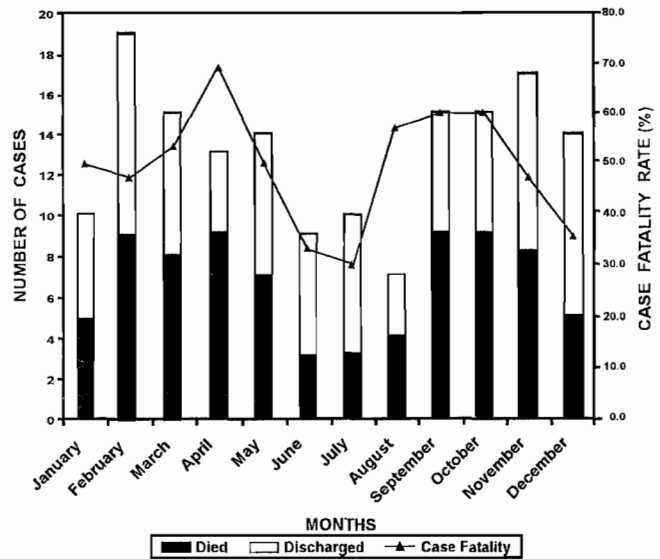


Fig. 2 The monthly variation in case fatality in adult patients with Tetanus in Korle-bu Teaching Hospital

especially during out-of-hours periods, from the central pharmacy located in the main KBTH complex. For the most part of the period of this review, the national policy of drug supply and dispensing was on a “cash and carry” basis, i.e. patients’ prescriptions were honoured only if they paid for them up-front. However, drugs were supplied on credit for the first 24-48 hours of admission. There were therefore many instances when access to drugs was poor because patients could not afford the payment.

**Materials and statistical analyses**

In this retrospective study, the admission and discharges books of the Fevers’ Unit of the KBTH for the years 1994-2001 were examined and information on all patients with tetanus were extracted. Available case notes of patients admitted with the diagnosis of tetanus over the period were retrieved and examined. The patient characteristics, clinical features, management and outcome were obtained and analysed. The severity of tetanus was graded as mild, moderate, severe and very severe according to the system reported by Ablett<sup>18</sup>. Single and multiple stratified analyses and the odds ratio

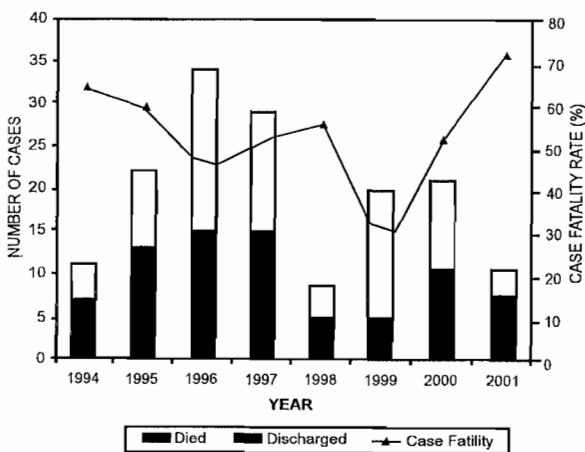


Fig. 1 The yearly variation in case fatality from 1994 to 2001 in adult patients with Tetanus in Korle-bu Teaching Hospital

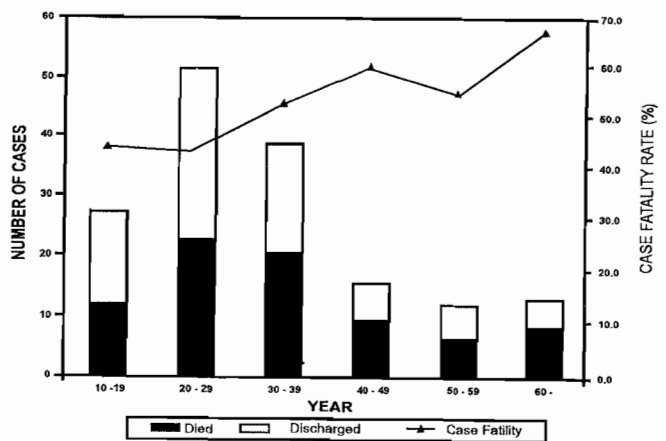


Fig. 3 The age distribution of case fatality in adult patients with Tetanus in Korle-bu Teaching Hospital

(OR) comparisons of the influence of patient characteristics and case management on case mortality were calculated using EPI6 info software<sup>19</sup>. In all statistics  $p < 0.05$  was taken as significant.

## Results

### Patient characteristics

The demographic and clinical characteristics of the patients were described in an earlier paper<sup>7</sup>. There were 158 patients diagnosed and managed as tetanus. Males (121) constituted 76.6% of cases and the mean age with no significant gender difference was  $32.7 \pm 15.0$  (range

12-78) years. The case notes of 74 out of the 158 (46.8%) patients could be retrieved and analysed. Tetanus was commonly acquired through a deep prick (18, 24.3%) or cut (12, 16.2%) on the lower limbs (33, 44.6%), usually due to nail or other metal and most commonly occurred outdoors (41, 56.9%). Patients presented for admission  $8.3 \pm 22.4$  weeks (range = 1-156 weeks) after the injury and after a mean duration of symptoms of  $2.9 \pm 2.7$  days (range = 1.0-21.0 days). Most of the patients had severe form of tetanus: 51 (68.9%) were very severe, 14 (18.9%) severe, 8 (11.4%) moderate and 1 (1.4%) mild tetanus.

**Table 1** The association between presenting clinical features and case fatality Rate (CFR) in patients with tetanus (n= 74).

Features	Frequency	CFR (%)	Odds Ratio	95% CL	P
Locked Jaw	61	50.8	1.21	0.3 – 4.7	0.7
Neck stiffness	37	62.2	2.70	0.95 – 7.81	0.038
Local Spasm:					
Lower Limb	5	20	0.23	0.01 – 2.42	0.16
Upper limb	2	0	0.0	0.0 – 4.2	0.15
Trunk	13	30.8	0.38	0.08 – 1.57	0.13
General Spasm	46	52.2	1.26	0.44 – 3.63	0.63
Opisthotonus	11	63.6	1.87	0.42 – 8.68	0.35
Fever	21	61.9	1.96	0.62 – 6.34	0.20
Respiratory Distress	7	57.1	1.37	0.23 – 8.64	0.69
Complications					
Aspiration	10	50	1.00	0.22-4-57	1.0
Infection	12	50	1.00	0.25 – 4.07	1.0
Wound present:	36	58.3	1.70	0.57 – 5.09	0.29
Dirty wound	22	75.0	9.00	1.45 – 64.29	0.005

CL = Cornfield 95% confidence limits for Odds Ratio.

**Table 2** The effect of different management actions on tetanus case fatality rates (CRF).

Management action	CFR (%)		Odds Ratio	CL	P
	Done	Not Done			
1. Wound debridement	33.3	76.2	6.4	1.18 – 38.28	0.013
2. Penicillin injections					
• All patients	40.7	55.3	1.80	0.62-5.32	0.16
• Wound present	33.3	76.2	6.4	1.18 – 38.28	0.012
3. Antibiotic					
• All patients	37.9	57.8	2.24	0.77-6.59	0.076
• Wound present	33.3	76.2	6.4	1.18 – 38.28	0.012
4. Immunization with TIG					
• All patients	25.0	61.5	4.8	1.33 – 18.28	0.006
• Wound present	20.0	73.1	10.86	1.48 – 100.67	0.006
5. Antibiotics plus TIG					
• All patients (n = 74)	14.3	69.2	0.07	0.01-0.65	0.005
• Wound present (n = 36)	12.5	78.9	–	–	0.3
• No wound present (n = 38)	12.5	70.0	–	–	0.4
6. Antitetanus Serum					
• All patients	58.3	34.8	2.64	0.88 – 8.04	0.04
• Wound present	69.6	38.5 <sup>a</sup>	3.66	0.71 – 20.16	0.07

TIG = Tetanus Immunoglobulin. CL = Confidence Limits

### Management

Wound debridement was performed in 15 out of the 36 (41.7%) patients with an open wound on admission. All but one patient had diazepam injections (10 mg i.v. loading dose followed by infusion of 40 mg in 500 ml 5% Dextrose at a variable rate of infusion) to control the spasms over a mean of  $7 \pm 5.8$  (range = 0-20) days. Two patients received phenobarbitone (200 mg slow intravenously [i.v.] repeated every 6 hours) for two days. Magnesium sulphate (5g i.v. as a loading dose followed by 2-3 g every hour to control spasms while maintaining the patella tendon reflex) was given for 4 days to the one patient who did not have diazepam. Chlorpromazine (25-50 mg 8 hourly, deep intramuscular injection) was given to 72.6% of patients over a mean of  $4.9 \pm 6.9$  (range = 0-40) days. One dose (0.5 ml once a month) of tetanus toxoid (TT) was given to 61 (83.6%) patients, 2 doses to 3 (4.1%) patients and 3 doses to 4 (5.5%) patients. Passive immunization was given to 68 (91.9%) patients. This consisted of: horse anti-tetanus serum (ATS) to 48 (64.9%) and human tetanus immunoglobulin (TIG) to 20 (27.0%) patients. All the TIG was administered in 1999-2000 when it was available. Antibiotics were administered to 29 (39.2%) patients: 18 received penicillin G (4 MU 6 hourly) alone, 9 received penicillin with other antibiotics, while 2 received other antibiotics alone; the other antibiotics were flucloxacillin (i.v. 500mg 6 hourly), metronidazole (i.v. 500 mg 8 hourly) and Gentamicin (i.v. 60-80mg 8 hourly). No patient had endotracheal intubation or tracheostomy, muscle relaxation and assisted ventilation. Patients were kept in single or double-bedded dark wards with minimal external stimulation.

### Outcome

There was an overall case fatality rate (CFR) of 50.0% (79 out of 158 cases). The CFR for each year is shown in Figure 1. The CFR decreased from 63.6% in 1994 to its lowest (25.0%) in 1999 after which there was a sharp rise to reach the highest rate (72.7%) in 2001. Seasonally, the average CFR was lowest during the months of June, July and December (see Figure 2). The CFR in males (51.2%) was not significantly different from those in females (47.2%). There was no significant difference in the mean age of those who died ( $34.42 \pm 15.4$  years) and those who survived ( $30.8 \pm 13.8$  years). However, Figure 3 shows that the CFR rose with age so that the highest (66.7%) was in those above 59 years. The CFRs for the presenting clinical features are shown in Table 1. The presence of neck stiffness and a dirty wound were the only clinical features that were significantly associated with increased CFR. The CFR varied with the severity of tetanus: it was 54.9% in very severe, 42.9% in severe and 37.5% in moderate tetanus; the only mild case survived. The effect of management options on the CFR is shown in Table 2. This shows that with the exception of ATS, the CFR was generally increased when an expected treatment action was not taken. The CFR was highest in patients with wounds

who did not have wound debridement (76.2%), antibiotics (76.2%) or TIG (73.1%). It was lowest in all patients given TIG plus antibiotics (14.3%), given TIG (25%), and those with a wound given TIG (20%) and TIG plus antibiotics (12.5%). The administration of ATS was associated with increased CFR in all patients and marginally in those with wounds.

### Discussion

The observed CFR of 50% was very high in this series. Worryingly, was the impression of increase in the latter 2 years of the study. Admittedly, most of the cases were seriously ill with generalised tetanus and therefore had a high CFR. However, the results indicated that the most important underlying factor of this high CFR was poor medical management. Management of tetanus at KBTH followed traditional lines with wound debridement, antibiotics, passive and active immunization and drugs to control the muscle spasms. However, only 42% of patients with open wound had wound debridement. This was very low because of the lack of a functioning theatre in the isolation ward and the physical isolation of this ward from the other facilities of the hospital. This made it difficult to provide adequate anaesthesia and wound debridement with removal of all foreign bodies and devitalised tissue. Thus, there was poor eradication of the source of toxin production in most cases with wounds. It was therefore not surprising that the CFR of those patients whose wounds were not debrided was more than 2 times those who had wound debridement. The choice of antibiotics in the treatment of tetanus is unclear. Penicillin G has traditionally been considered the initial drug of choice; however, because of its potential to act as a GABA antagonist, its use has fallen into disfavour in some centres. Metronidazole, 500 mg IV every 6 hours, has been recommended as the first-line antibiotic.<sup>20</sup> This study cannot contribute to this debate on the choice of antibiotics as it was not designed to do so and the number of patients on the different antibiotics was too small for analysis. In this series, only 39% patients were given any antibiotics, the most popular (93%) of which was penicillin. It is significant to note the practice here of combining metronidazole with penicillin or flucloxacillin. The low rate of antibiotic use in this study may be related to the implementation of the "cash and carry" policy of drug access at the Fevers Unit, in that those patients who could not afford the antibiotics were not given any. Not giving any antibiotics, particularly to those with a wound, resulted in a high mortality of 76.2%. However, antibiotics given to those with a wound reduced this to 33.3%. Clearly, antibiotics are important, particularly to those with a wound, to reduce the high mortality of tetanus.

Further analysis of the results showed that the combination of TIG and antibiotics was most rewarding as it reduced the mortality rate to 12.5% in those who had wounds. It also showed that wound debridement, although highly recommended, did not influence this

mortality further. Thus, antibiotics (penicillin) with TIG would seem the minimum treatment of patients with established tetanus.

One surprising finding was the greater CFR in those given ATS. No record of an allergic reaction was noted, thus it is difficult to explain this finding. This ought to be studied further to be certain whether ATS increases the CFR.

In summary, the high CFR for tetanus in Accra was found to be due to inappropriate management with most of the patients not treated with TIG and antibiotics. Most of the patients with wounds also did not have adequate wound care.

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