# Morbidity and mortality of tetanus at Kenyatta National Hospital: a ten-year case audit

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## ABSTRACT

**Introduction:** Tetanus is a major health problem in developing countries, and is associated with high a morbidity and mortality. There are no recent local data in Kenya on the impact of the disease in terms of morbidity and mortality. The objective of this study was to describe the type, severity, risk factors, immunization history and outcome of tetanus patients at Kenyatta National Hospital (KNH).

**Method:** This was a retrospective descriptive study of patients with a clinical diagnosis of tetanus admitted to KNH over ten years, who were aged 13 years and above. All available files with tetanus diagnosis were selected, and the patients' data were retrieved and analysed using SPSS Software version 21.0.

**Results:** Out of 53 patients with tetanus, 50 (94.3%) were males and 3 (5.7%) were females. The mean age at presentation was 33.2 years (SD= 15.6). Only 4 (7.5%) patients had prior tetanus immunization. The commonest risk factor was acute injury - seen in 37 (69.8%) patients. The common site of injury was the lower limb - seen in 26 (49.1%) patients. The incubation period ranged from 3 to 90 days (IQR 7-17). Generalized tetanus was the commonest form found in 50 (94.3%) patients. Only 16 (30.2%) patients were managed in the Intensive Care Unit (ICU). The overall mortality was 49.1%.

**Conclusion:** Tetanus mortality is still high as reported in many other studies. Most patients were males without prior immunization history. Only few patients were managed in Intensive Care Unit. We recommend advocacy on tetanus immunization and booster dosing.

**Keywords:** Tetanus, Kenyatta National Hospital, morbidity, mortality, audit

## INTRODUCTION

Tetanus is a disease characterized by muscle rigidity and spasm. Despite the World Health Organization's (WHO) efforts to eradicate the disease by 1995, tetanus remains one of the world's major preventable causes of death, with an estimated incidence of 700,000 to 1 million cases each year, causing an estimated 213,000 deaths.[1]

In developed countries tetanus is mainly a disease of elderly due to reduced immunity, while in the developing world it is common in the young due to low immunization rates and lack of appropriate wound management.[2, 3]

Studies in East Africa, and most developing countries, show a case fatality between 40% to 60%, depending on the management applied and availability of ventilatory support.[4,5,6,7]

The etiological organism is *Clostridium tetani*, which is sensitive to heat and cannot survive in the presence of oxygen. In contrast, the spores are resistant to

heat and most antiseptics.[8]

Tetanus commonly affects more males than females. In developing countries, it usually occurs in those aged less than 40 years.[5,6,7,9]

The incubation period of tetanus ranges from 3 to 14 days.[8] Four types of tetanus occur: generalized, cephalic, localized and neonatal tetanus.[3,8] The diagnosis is mostly clinically based as there is little role for laboratory diagnosis.[3]

Management of tetanus is essentially supportive. Despite good management, tetanus is associated with a very high mortality at high cost to the health care system. Therefore, focusing on its prevention through vaccination has been proven most effective.[1,10]

## METHOD

This was a retrospective study over a ten-year period (January 2006 to December 2015). Kenyatta National Hospital (KNH) is a tertiary referral hospital in Nairobi, Kenya. There are 1,800 beds, and an Intensive Care Unit (ICU) with 20 beds.

Medical records of tetanus cases were retrieved. The selection criteria were: 1. Physician made diagnosis of tetanus. 2. Age 13 years and above of both sexes. Those with doubtful diagnosis and incomplete information were excluded. The following details were retrieved from the individual case notes for analysis: demographics, immunization history, site of entry of organism, incubation period, clinical presentation, management, length of hospital stay, admission pattern, severity of tetanus and outcome.

Data analysis was done using SPSS software version 21.0 for windows. Patients' characteristics were summarized into means or medians for continuous data and categorical variables as percentages. Mortality was analysed and presented as percentages with 95% confidence interval. Chi-square ($x^2$) test was used to test for significance of association between the dependent variables with the categorical exposure variables such as clinical presentation, incubation period, treatment given, duration of hospital stay and previous immunization status. The level of significance was considered as $p \leq 0.05$.

Ethical approval was obtained from the Department of Clinical Medicine and Therapeutics, University of Nairobi and the KNH/UoN Scientific and Ethical Review Committee.

## RESULTS

Sixty-nine patients with tetanus were admitted during the study period. Of these 63 files were retrieved, 53 met the inclusion criteria. Thirty (56.6%) patients were referral

**Table 1. Socio-demographic data (N=53)**

| Variable | n (%) |
| --- | --- |
| **Sex** | |
| Male | 50 (94.3) |
| Female | 3 (5.7) |
| **Occupation** | |
| Farmer | 5 (9.4) |
| Student | 14 (26.4) |
| Casual labourer | 14 (26.4) |
| Industrial worker | 2 (3.8) |
| Businessman | 11 (20.8) |
| Unemployed | 2 (3.8) |
| Occupation not indicated | 5 (9.4) |

**Table 2. Risk factors and site of entry (N=53)**

| Variable | n (%) |
| --- | --- |
| **Risk factors** | |
| Acute injury | 37 (69.8) |
| Assault | 6 (11.3) |
| Road traffic accident (RTA) | 4 (7.5) |
| No port of entry | 3 (5.7) |
| Others | 3 (5.7) |
| **Anatomical site of entry** | |
| Legs | 26 (49.1) |
| Upper limb | 16 (30.2) |
| Trunk | 2 (3.8) |
| Head and neck | 12 (22.6) |

from other hospitals, and 23 (43.4%) patients were direct admissions.

There were 50 (94.3%) males and 3 (5.7%) females (male to female ratio of 16.7:1). Ages ranged from 13 to 69 years (mean of 33.2 years and standard deviation of 15.6). Thirty-one (58.5%) patients were aged below 40 years, while 22 (41.5%) patients were aged 40 years and above. The occupation groups of patients are shown in Table 1.

Table 2 shows that the most common site of entry was an acute injury such as a prick, puncture wounds, laceration and burns.

Figure 1 shows the prior immunization history. Out of 53 patients, only 4 (7.5%) patients had known prior immunization but there was no written proof.

The incubation period was documented in 49 (92.5%) patients and ranged from 3 to 90 days (median of 14 days and interquartile ratio of 7 – 17)). Forty-two (79.2%) patients had an incubation period of more than 7 days.
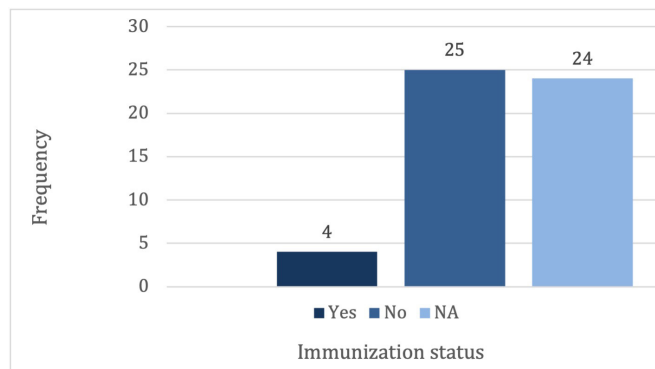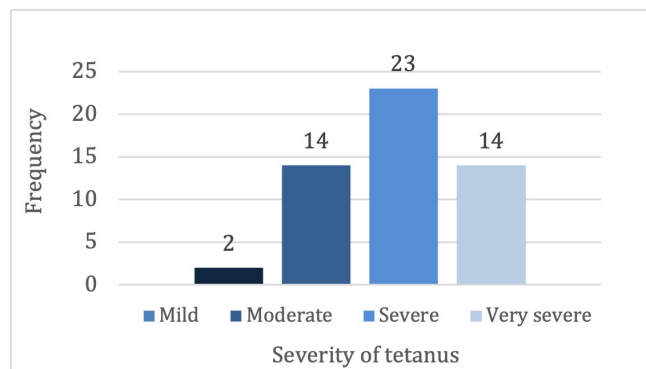
Figure 1. Prior immunization status (N=53)



Figure 2. Severity of tetanus

Fifty (94.3%) patients had generalized tetanus, 2 (3.8%) cephalic tetanus and 1 (1.9%) localized tetanus. Two (3.8%) patients had mild tetanus, 14 (26.4%) moderate, 23 (43.4%) severe, and 14 (26.4%) had very severe tetanus. Thus, the majority (96.2%) had moderate to very severe tetanus. Figure 2.

The common presenting complaints were body stiffness/spasm in 49 (92.5%) patients, trismus in 48 (90.6%), dysphagia in 30 (56.6%) and back pain and body aches in 15 (28.3%) patients.

Thirty-seven (69.8%) patients were admitted to an isolation room in a general ward. Although 21 (56.8%) patients needed ICU care, there was no space available in the ICU. Twelve (22.6%) patients were admitted to ICU and 4 (7.6%) were transferred from the general ward to ICU.

### Treatment and outcome

All patients were managed with tetanus toxoid and immunoglobulin, muscle relaxants, wound care, deep vein thrombosis (DVT) prophylaxis with low molecular weight heparin and antibiotics i.e., metronidazole and benzyl penicillin. Beta blockers were given to only 4 (7.5%) patients and respiratory support to 16 (30.2%) patients. Table 3.

There were pulmonary complications in 42 (79.2%) patients, central nervous system complications in 17 (32.1%) patients, cardiovascular system complications reported in 24 (45.3%) patients, gastrointestinal system complications in 24 (45.3%) patients, and renal complications in 9 (17%) patients.

Twenty-seven (50.9%) of the 53 patients survived. There were 26 (49.1%) deaths of which 20 (76.9%) occurred in the first 10 days. The mortality was highest among those with severe and very severe tetanus at 66.7% and 76.9% respectively compared to 0% in mild and moderate tetanus. Mortality was higher in those admitted to ICU at 62.5% than those were in general ward at 43.2% p= 0.202.

**Table 1. Socio-demographic data (N=53)**

| Management | n (%) |
|---|---|
| Wound toilet and debridement | 38 (71.7) |
| Control of spasms | 53 (100) |
| IV antibiotics | 53 (100) |
| Tetanus toxoid and tetanus immunoglobulin | 51 (96.2) |
| Ventilatory support | 16 (30.2) |

Both direct admission and short duration of hospital stay showed a statistically significant association with tetanus mortality. Most tetanus deaths occurred within the first 5 days of admission (p < 0.001). Deaths were also three times more likely to occur among direct admissions (65.2%) compared to referrals (36.7%) OR = 3.24(95% CI 1.04-10.07). Mortality among patients admitted with tetanus after logistic regression analysis, did not show significant associations with the remaining factors including age (p = 0.501), sex (p = 0.305), incubation period (p = 0.481), type of tetanus (p = 0.237) and severity of tetanus which was numerically higher but was not statistically significant (p = 0.517.)

The average ICU stay was 23.2 days (SD of 20.9). The median hospital stay was 15 days (IQR 5 - 23). The mean duration of hospitalization for the mortalities was 7.8 days (SD 8.9). The average hospital stay for survivors was 24.4 days, (SD 14.7).

### DISCUSSION

Tetanus is prevalent in developing countries, and associated with a high morbidity and mortality despite the availability of an effective vaccine.

Out of 53 patients in this study 50 (94.3%) patients were males and 3 (5.7%) females. The male preponderance is similar to that reported by other investigations in developing countries.[5, 6, 7, 11] This is a reflection of the

fact that males are at a higher risk of sustaining wounds prone to tetanus infection by the nature of their work and spending more times outdoors. Females are protected by the TT immunization during the antenatal period and through the regular immunization campaign for school girls at reproductive age.

In this study 58.5% were aged below aged 40 years. This is similar to other studies in the region: Chalya et al in Tanzania and Amare et al in Ethiopia found that 74.5% and 63.7% respectively were below aged 40 years. [5,6] This observation may be explained by an inadequate immunization programme and inappropriate wound management. Only 7.5% of our study population reported (unrecorded) primary immunization.

About a half of our patients were students (14 (26.4%)) or casual labourers (14 (26.4%)). This is in contrast to many studies in developing countries, which reported farmers and daily wage workers as the most affected occupational groups.[5, 6, 7, 9] Our results can be explained by the fact that the age group in our study is relatively young. KNH is a tertiary referral hospital in the urban city, access from rural villages could be a factor.

The common risk factor for tetanus in this study was acute injury, seen in 37 (69.8%) patients. Six (11.3%) patients had a history of assault: the site of entry could not be identified in 3 (5.7%) patients. Most injuries were in the lower limbs as in 26 (49.1%) patients, which is in accordance with the findings of other studies.[6,7,13] The lower limbs are more prone to injury and contamination by the *C. tetani* which is a ubiquitous in the soil.

The incubation period was documented in 49 (92.5%) patients. The majority, 42 (79.2%), had an incubation period of over 7 days. This is in agreement with the literature that says that the greater the distance of the injury site from the central nervous system the longer the incubation period.[8] In our study 79.3% had an injury in the lower and upper limbs.

Most of our patients (94.3%) had generalized tetanus consistent with other studies.[5,11] Only 7.5% had a probable history of vaccination. Amare et al in Ethiopia found that none of their cases had prior immunization[6] and Feroz et al in a similar study at a teaching hospital in Bangladesh reported that only 18.8% had prior tetanus immunization.[11]

Over two-thirds (69.8%) of patients had severe or very severe tetanus agreeing with Chalya et al who reported 68.7% had moderate to severe disease.[5] This may be explained by the fact that KNH is a referral hospital, so the sickest patients are more likely to be referred.

The overall median hospital stay was 15 days (IQR 5-23); the average ICU stay was 23.2 days (SD 20.9). A report[4] from the Democratic Republic of the Congo (DRC) states the average length of hospital stay of 11.3 ± 11.4 days. However, Chalya et al has reported a longer average length of hospital stay at 34.12 ± 38.44 days[5] but in this study only 16 (30.2%) patients were managed in ICU, which is low in comparison to other studies in developing countries.[5,6,7,9] Chalya et al in Tanzania[5] reported an ICU admission rate of 82.4%.

In terms of management, although there was no uniform protocol for tetanus management, all patients received tetanus toxoid and immunoglobulin, muscle relaxants and antibiotics. Only 4 (7.5%) patients received beta blockers, because of lack of protocol for tetanus management and drugs availability. Only five patients completed the three doses of TT because of the low coverage of immunization in the country.

The mortality rate in our study was 49.1%, similar to the observation by Zziwa et al in Uganda[13] who reported a mortality of 47%, and Muteya et al in DRC[4] who reported a mortality of 52%. The higher mortality in our study could be explained by the fact that most of our patients, 69.8%, were managed outside the ICU where ventilatory support and tracheostomy were not readily available.

## CONCLUSION

Most of our patients were young males, who had no prior immunization or did not know their immunization status. Only a minority of cases were managed in the ICU where ventilatory support was available and most deaths occurred in the first five days of admission which can point to a possible lack of respiratory support as a cause of death. It is clear that a vigorous campaign to widen immunization coverage is required and agreed guidelines are needed for management of a tetanus patient.

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