

PREVALENCE AND CLINICAL OUTCOMES OF TETANUS IN A TERTIARY HOSPITAL IN FREETOWN, SIERRA LEONE-2018-2019

Joshua Coker¹ MBChB, MSc,FWACP,FCPS; Michael Lahai² Bpharm(Hons),MSc,MPH; Janet Turay¹MBChB; Abdul Sesay¹, MD; Sulaiman Lakoh¹ MBChB,MPH,FWACP,FCPS; Tom Sesay³ MBChB, MPH; Durodami Lisk¹ MBChB, FWACP,FRCP,FCPS

1. *Connaught Hospital, University of Sierra Leone Teaching Hospital Complex*

2. *Pharmacy Board, Sierra Leone*

3. *Expanded Programme of Immunization, Ministry of Health and Sanitation*

ABSTRACT

Introduction

The global incidence of tetanus is approximately one million cases annually. Mortality rates attributable may reach 100% in the absence of appropriate medical treatment. The study intends to outline the treatment outcome of tetanus patients in our environment.

Methods

The study was conducted at the Intensive Care Unit (ICU) of the Connaught Hospital, University of Sierra Leone Teaching Hospital Complex. The study was designed as a retrospective study of patients who presented with tetanus between 1st January 2018 and 31st December 2019. All the case notes/files of tetanus cases were retrieved from the hospital medical records unit. A research proforma was designed and used to extract information regarding the Socio-demographic characteristics of the patients, type of tetanus, mechanism of injury, the portal of entry, type of wounds, symptoms at presentation (prodromal and classic symptoms), duration of hospital stay, outcomes and complications.

Results

The findings from this study revealed a hospital prevalence of tetanus of 0.67%, male preponderance (84.6%); mean age of patients was 24 years; 61.5% of patients had generalized tetanus. The mean incubation period was 7 days; the mean period of onset was 5.5 days; 76.37% of patients were unimmunized. The mortality rate was 23.1% and 46.2% had dysautonomia.

Conclusion

This study shows that tetanus is still prevalent in Sierra Leone and affects mainly young males. Despite the satisfactory patient outcomes in terms of mortality, there is still a need for improved support by the government to enhance hospital or clinical services nationwide.

Correspondence: Dr Joshua Coker, Consultant Physician and Nephrologist, Connaught Hospital.

Email: Joshuacoker001@yahoo.com Tel:+2329961321

INTRODUCTION

Tetanus is an acute infectious disease caused by spores of *Clostridium tetani* (a bacterium). The spores are found mainly in soil, ash, intestinal tracts/faeces of animals and humans, and on the surfaces of skin and rusty tools like nails, needles, barbed wire, etc. The spores are resistant to heat and many antiseptics and so can survive for years [1]. The incidence of tetanus is low in developed countries with markedly reduced mortality due to improved public sensitization in terms of vaccination as well as the presence of expertise and equipment required to manage the disease [2]. The global incidence of tetanus is approximately one million cases annually [3]. Mortality rates attributable to tetanus vary greatly across the world, depending on access to healthcare, and may reach 100% in the absence of appropriate medical treatment [4]. In 2017, WHO reported that tetanus deaths in Sierra Leone reached 164 or 0.20% of total deaths [5].

The only hospital-based study on tetanus patients in Sierra Leone was published over forty years ago [6]. In that study, the authors showed that tetanus can be well managed in a special care unit that is fairly well equipped, in a low-income country with acceptable outcomes especially in terms of mortality [6].

This study was conducted to describe what has changed in the management of tetanus at Connaught Hospital, Freetown, Sierra Leone. The paucity of literature on tetanus in adults from Sierra Leone also prompted this review. The study intends to outline the socio-demographic characteristics and treatment outcomes of tetanus patients in our environment. The findings from this study may be used to advocate for improvement in tetanus immunization and management.

METHODS

The study was conducted at the Intensive Care Unit (ICU) of the Connaught Hospital, University of

Sierra Leone Teaching Hospital Complex. The study was designed as a retrospective study of patients who presented with tetanus between 1st January 2018 and 31st December 2019. The ICU is headed by a Consultant anesthesiologist supported by trained nurses.

The study included all patients who presented with a diagnosis of tetanus. The diagnosis of tetanus was entirely clinical and based on the presence of one or more of the following: - Trismus, the rigidity of the neck and or abdomen, reflex spasms and risus sardonicus.

Tetanus was classified into generalized, cephalic and localized. Patients with rigidity and/or spasm limited to the wound bearing area of the body were classified as having localized tetanus, whereas those with trismus and generalized rigidity with or without generalized spasms were classified as having generalized tetanus. A form of localized tetanus restricted to the head and neck was classified as cephalic tetanus. The severity of tetanus was classified into mild, moderate-severe and very severe according to the system reported by Ablett [7]. A total of 23 patients were admitted with tetanus over a 2 year period. All the case notes/files of tetanus cases were retrieved from the hospital medical records unit. A research proforma was designed and used to extract information regarding the Socio-demographic characteristics of the patients, type of tetanus, mechanism of injury, the portal of entry, type of wounds, symptoms at presentation (prodromal and classic symptoms), duration of hospital stay, outcomes and complications.

Statistical analysis

The data obtained were cross-checked for errors after collection and entered into data analysis software on a computer. Data analysis was done using Statistical Package for Social Sciences Software (SPSS), version 20. Data were presented using tables, a 95% confidence interval was used and a P-value < 0.05 was regarded as statistically significant.

RESULTS

There were 3418 admissions to Connaught Hospital during the study period of which 23 were tetanus cases giving a prevalence of 0.67%. The clinical notes of 8 of these patients could not be retrieved for detailed analysis.

Socio-demographic characteristics of patients (Table 1): The mean age of patients was 24 years, (IQR13.5-33.5); there was a male preponderance, majority of patients (61.5%) were < 18 years; 61.5% were workers and 53.8% were educated above the primary level.

Table 1: Sociodemographic characteristics of tetanus patients

Item	(%)
Sex	
Female	15.4
Male	84.6
Age Category	
</=18years	61.5
>18years	38.5
Worker Category	
Worker	61.5
Non-worker	38.5
Educational level	
junior	7.7
secondary	30.8
tertiary	23.0

undocumented	38.5
--------------	------

Clinical profile of patients (Table 2): The majority had generalized tetanus (61.5%); 61.6% were due to trauma; a portal of entry was mainly lower limb (61.5%), wound type was mainly laceration or abrasion(69.2%). Fever was the commonest prodromal symptom (61.5%). The mean incubation period (time interval from injury to the appearance of the first symptom) was 7 days (IQR 4-12.3) days; mean period of onset (defined as the interval between the first symptoms and the first spasm), 5.5 days (IQR 2.7-5.0) days. The immunization status of patients revealed that 76.37% of patients were not immunized prior to the injury.

Table 2: Clinical profile of tetanus patients

Item	N(%)
Predominant Symptom	
fever	76.9
none	23.1
Tetanus type	
generalized	8(61.5)
undocumented	5(38.5)
Mechanism of injury	
instrumental	1(7.7)
post-surgical wound	1(7.7)
trauma	8(61.6)
undocumented	3(23.1)
Portal of entry	
abdomen	1(7.7)
head	1(7.7)
lower limb	8(61.5)
upper limb	1(7.7)
undocumented	2(15.4)
Type of wound	
abrasion	3(23.0)
laceration	6(46.2)
puncture	2(15.4)
undocumented	2(15.4)
Incubation Period	
1d	1(7.7)
14d	2(15.3)
3d	1(7.7)

7d	4(30.8)
Missing data	5(38.5)
Onset of symptoms	
<3	2(15.4)
3-14	6(46.2)
>14	2(15.4)

Outcome and severity of patients (Table 3): The mortality rate was 23.1%; 38.5% of patients presented each with grade 1 or grade IV tetanus (Ablett Classification). The mean duration of hospital stay was 20 days. The occurrence of dysautonomia was seen in 46.2% of patients who had one of or a combination of tachycardia, cardiac arrhythmias, hypotension, profuse sweating, fever and retention of urine

Table 3 shows the outcome and severity of patients with tetanus

Outcome	(%)
Death	23.1
Discharge	76.9
Severity of Tetanus	
Grade II	38.5
Grade III	23.0
Grade IV	38.5

DISCUSSION

Tetanus still occurs in low and middle-income countries and contributes to morbidity and mortality despite the proven efficacy of tetanus vaccines [8-10]. This may be due to reduced public sensitization regarding tetanus vaccination as well as inadequate human and financial resources to prevent and manage the disease[2,11].

The male preponderance seen in this study may be explained by low vaccination rates among males as females and children are usually vaccinated during pregnancy or infant immunization schedule. An earlier study on tetanus in Sierra Leone also demonstrated a male preponderance [6]. Also, males tend to do a lot of fieldwork including agricultural as well other

outdoor activities. These activities increase their exposure to *C. tetani*, which is ubiquitous in soil[12,13]. Patients were also young and may engage in injury-prone activities like running, soccer (sometimes bare-footed) and even fighting[12,13].

The commonest portal of entry among patients was the limbs are thereby easily contaminated. This is also supported by lower limb. As the organism resides in soil, wounds of the lower studies done in other developing countries [14,15]. The most commonly documented form of tetanus was generalized tetanus. In others, the type of tetanus was not documented and this may be generalized or cephalic as patients with localized tetanus are unlikely to visit the hospital while those with neonatal tetanus will visit the Children’s hospital. The commonest wound type was lacerations and abrasions which are open wounds that can easily become contaminated with *C.tetani*.

In this study, patients were managed in an intensive care unit (ICU) with 12 beds, equipped with piped oxygen, a defibrillator and suction machines. However, in an earlier study done in this same hospital, the tetanus patients were managed in a special care unit (SCU) with similar facilities but with 4 beds and equipped with 2 ventilators [6]. The nurse to patient ratio as well as nutritional support to patients was similar in both studies. All patients in this current study were managed in a dark room reserved for them at the ICU. In the previous study, it was not clearly stated whether there was any darkroom at the unit at that time [6]. All patients were managed with high doses of diazepam given as a bolus or as an infusion for control of spasms. In the earlier study, a combination of drugs was used for spasm control including parenteral chlorpromazine, phenobarbitone, diazepam and paraldehyde [6]. None of the patients in this study received tracheostomy or intermittent positive pressure ventilation (IPPV) while 17 patients received a

tracheostomy and one patient received IPPV out of a total of 24 cases in the earlier study [6]. It should be noted that the earlier study included only patients with severe tetanus suggesting the need for respiratory support while this current study included patients with moderate or severe tetanus.

Despite these differences, the patient outcomes in both studies in terms of mortality rates, duration of stay in the units and average incubation periods were similar in both studies – present vs earlier [(23.1% vs 24%); 20 days; 7 vs 9.3 days] respectively. Patients in the earlier study were managed by the same team and so it is probable that there is little variation in management plan and records were well kept reducing the number of missing data [6]. The facilities in the special care unit were better than in the ICU presently reflecting a general decline of hospital health facilities countrywide in the recent past. There might have been a slight decline in services provided by the hospital which may be attributable to the civil war or government neglect of clinical services delivered by this hospital.

A mortality rate of 23.1% was seen in this study, this may be explained by the early presentation of the patients as the majority of patients presented in Ablett stage II or III despite being managed in an intensive care unit devoid of ventilator support. Other studies in Tanzania and Uganda reported high mortality rates [2,16]. In the Tanzanian study, the reported mortality was 72.7% and the patients were managed in an ICU [2]. The Ugandan study reported a 47% mortality in a rural hospital without an ICU facility and so all patients were managed on the general wards [16]. In a systematic review and meta-analysis of African studies on tetanus, the pooled crude tetanus case- fatality rate was found to be 43.2% (95% CI 36.9%–49.5%) [17]. The clinical course of some patients was complicated by dysautonomia presenting as tachycardia, profuse sweating, hypotension and fever. This is a well-documented feature of severe tetanus and underlines the

severity of the disease [18,19]. In this study, this complication was seen in 46.2% of patients while it was seen in 72% of patients in an earlier study on tetanus in Sierra Leone [6].

In Africa, death from tetanus is still high; this may be due to inefficient care facilities and restricted access to mechanical ventilation and potent drugs. The presence of co morbidities, restricted access to hospitals, higher disease burden from rural locations and lower disease awareness exacerbates this scenario [20]. In addition, the economic burden of tetanus care due to the cost of highly specialized drugs, prolonged ward or ICU admissions pose a great challenge to our already impoverished populations [21]. The majorities of our patients were not immunized or were unaware of their immunization status prior to admission and treatment for tetanus. This calls for effective sensitization on tetanus immunization to all citizens with specific emphasis on males. There is also a need for proper wound management in our primary and secondary health facilities. The health education arm of the Expanded Programme of Immunization programme may expand their activities to overcome this challenge and also educate the populace on the need for booster vaccination when one is injured and that pharmacies and hospitals should ensure the cold chain is maintained for vaccine efficacy.

Study limitations- The limitations of this study are the small sample size which reduces the power of the study and the retrospective study design which results in incomplete patient information.

CONCLUSION

This study shows that tetanus is still prevalent in Sierra Leone and affects mainly young males. There is a need for enhanced health education on tetanus immunization to this group of individuals, the need for people to take booster doses of tetanus vaccines following injury and improved access to efficacious vaccines. Despite the satisfactory patient outcomes in terms of mortality, there is still a need for improved

support by the government to enhance hospital or clinical services nationwide.

REFERENCES

1. World Health Organization, fact sheet, May 2018.
2. Mchembe MD, Mwafongo V: Tetanus and its treatment outcome in Dar es Salaam: need for male vaccination. *East African Journal of Public Health* 2005, 2: 22-23.
3. Thwaites CL, Farrar JJ. Preventing and treating tetanus. *BMJ* 2003, 326, 117-118.
4. Blencowe H, Lawn J, Vandelaer J, Roper M, Cousens S. Tetanus toxoid immunization to reduce mortality from neonatal tetanus. *Int. J. Epidemiol.* 2010, 39, i102-i109.
5. World Health Organization ranking 2017
6. Lisk DR, Coker REO. The management of severe tetanus in a special care unit. *Ghana Medical Journal*, June 1979
7. Ablett JLL: Analysis and main experience in 82 patients treated in Leeds tetanus unit. Edited by: Ellis M. Symposium on tetanus in Great Britain. Leeds; 1967:1.
8. Galazka A, Gasse F. The present status of tetanus and tetanus vaccination. *Curr Top Microbiol Immunol* 1995, 195:31-53
9. Anuradha S. Tetanus in adults-A continuing problem: An analysis of 217 patients over 3 years from Delhi, India, with special emphasis on predictors of mortality. *Med J Malaysia* 2006, 61(1):7-14.
10. Oladiran I, Meier DE, Ojelade AA, Olaolorun DA, Adeniran A, Tarpley JL. Tetanus continuing problem in the developing world. *World J Surg* 2002, 26(10):1282-85.
11. Dietz V, Milstien JB, van Loon F, Cochi S, Bennett J: Performance and potency of tetanus toxoid: implications for eliminating neonatal tetanus. *Bull WHO* 1996, 74:619-28.
12. Adekanle O, Ayodeji OO, Olasunde LO. Tetanus in a rural setting of South Western Nigeria: A ten year retrospective study. *Libyan J Med* 2009;4:100-4.
13. Chukwubike OA, Godspower AE. A 10 year review of outcome of management of tetanus in adults at a Nigerian teaching hospital. *Ann Afr Med* 2009;8:68-72.
14. Feroz AHM, Rahman MH: A Ten-year Retrospective Study of Tetanus at a Teaching hospital in Bangladesh. *J Bangladesh Coll Phys Surg* 2007, 25:62-69.
15. Lau LG, Kong KO, Chew PH: A ten-year retrospective study of tetanus at a general hospital in Malaysia. *Singapore Med J* 2001, 42(8):346-50.
16. Zziwa GB: Review of tetanus admissions to a rural Ugandan Hospital. *UMU press*;2009:7(3):199-202.
17. Woldeamanuel YW, Andemeskel AT, Kyei K, Woldeamanuel MW, Woldeamanuel W. Case fatality of adult tetanus in Africa: systematic review and meta analysis. *Journal of the Neurological sciences.* 368(2016) 292-299
18. Clifton B. Hypotension associated with Tetanus. *Lancet* i.785(1964)
19. Kerr JH et al. Involvement of the sympathetic nervous system in Tetanus (Studies on 82 cases). *Lancet* 2: 236,1968
20. Woldeamanuel YW. Tetanus in Ethiopia: unveiling the blight of an entirely vaccine-preventable disease, *Curr. Neurol. Neurosci. Rep.* 12 (6) (2012) 655-665
21. Miranda-Filho DB, Ximenes RA, Siqueira-Filha NT, Santos AC. Incremental costs of treating tetanus with intrathecal antitetanus immunoglobulin, *Tropical Med. Int. Health* 18 (5) (2013) 555-563.