INNSPUB

International Journal of Microbiology and Mycology | IJMM |
pISSN: 2309-4796
http://www.innspub.net
Vol. 20, No. 3, p. 12-21, 2025

Open Access RESEARCH PAPER

Post-surgical tetanus, an infectious pathology still relevant in Guinea

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Keywords: Tetanus, Surgery, Death, Donka, Guinea

Publication date: March 15, 2025

Abstract

The aim of this study was to describe post-surgical tetanus in the infectious and tropical diseases department of Donka National Hospital. This was a retrospective descriptive study from June 1, 2013 to May 31, 2023 and concerned all the files of patients received for tetanus with surgical entry. We carried out an exhaustive recruitment of all the files of patients meeting the selection criteria and the parameters studied were the sociodemographic characteristics, the clinical picture and the outcome of the hospitalized patients. The frequency of tetanus with surgical entry point was 5.60%. The mean age of patients was 27.0 years, with a sex ratio of 1.29. Regional hospitals 43/147 and private clinics 37/147 were the largest providers of these cases of tetanus. Among the surgical specialties, gynecology-obstetrics 63/147 was the type of surgery most frequently encountered as responsible for tetanus entry point. Trismus 147/147 and generalized contracture 124/147 were the most frequently found signs. Acute generalized tetanus was found in all patients, i.e. in 100% of cases, and we recorded a lethality of 36.73%. Surgical tetanus remains a public health problem in developing countries. Continuing education on tetanus should be provided to surgeons in general.

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Introduction

Post-surgical tetanus is a serious non-immunizing acute bacterial toxi-infection caused by tetanospasmin, a toxin produced by *Clostridium tetani* that occurs after surgery. The defined surgical entry points are surgical wounds and surgical wounds or procedures (Aba *et al.*, 2012). Contamination occurs by penetration of *Clostridium tetani* into the body via a portal of entry (Nicolai *et al.*, 2015).

The hospital stay should, for example, be used to update the patients' tetanus vaccination schedule, but instead they are sometimes exposed to tetanus. Injections with poorly mastered techniques, surgical procedures performed under insufficient aseptic conditions while tetanus vaccination is either old or non-existent, are the risk factors for this condition in the hospital environment (Aba *et al.*, 2011).

The diagnosis of tetanus can be made on the basis of a set of anamnestic and clinical arguments such as the absence of up-to-date tetanus vaccination, the demonstration of an entry point, the presence of trismus with Armengaud's captive tongue depressor sign, generalized contracture with opisthotonos attitude and spontaneous paroxysms. No biological argument is necessary for the diagnosis. Any trismus must be considered as tetanus until proven otherwise (Mallick *et al.*, 2004, Thwaites *et al.*, 2015). It is a severe, acute wound infection caused by the bacterium *Clostrisdium tetani* which is a Gram-positive anaerobic bacillus (Srigley *et al.*, 2011).

It is also a completely preventable disease and has been virtually eliminated from developed countries thanks to widespread vaccination and rigorous post-exposure prophylaxis, both of which are perfectly codified. Its treatment consists of neutralizing the circulating toxin, combating the effects of the toxin already fixed, eradicating germs at the entry point, maintaining vital functions and ensuring lasting immunity through anatoxin therapy (An *et al.*, 2015).

In developed countries, it is a rare condition but is nevertheless associated with relatively high mortality (10–20%) (Vázquez *et al.*, 2015). In France, it affects elderly people who have not had their booster vaccinations (Garé *et al.*, 2017).

On the other hand, in developing countries, particularly in Africa, due to incomplete immunization and poor hygiene conditions, tetanus remains a public health problem due to its frequency and severity (Minta *et al.*, 2012), with an annual incidence rate of 10 to 50 per 100,000 in habitants (OMS *et al.*, 2021). In Ivory Coast in 2012, Aba *et al.* reported in their studies that the prevalence of post-surgical tetanus was 11% (Aba *et al.*, 2012). In Mali in 2015, Gapingsi observed in its study a frequency of 3.6% of cases of tetanus (Gapingsi *et al.*, 2015). In Guinea, Traoré *et al.* in 2013 reported that the prevalence of nosocomial tetanus was 2.7% from 2001 to 2011 (Traoré *et al.*, 2013). Thus, the high lethality rate and the scarcity of previous studies are among the reasons for choosing this present theme.

To describe post-surgical tetanus in the infectious and tropical diseases department of Donka National Hospital.

Materials and methods

This was a retrospective descriptive study lasting 10 years from June 1, 2013 to May 31, 2023 in the infectious and tropical diseases department of the Donka National Hospital. This is the only department for the management of adult tetanus in Guinea, but it does not have a resuscitation unit for possible respiratory assistance.

Included in this study were the files of patients of all genders, ages and origins received for tetanus with surgical entry at the Infectious and Tropical Diseases Department of Donka National Hospital.

We excluded incomplete patient records (lack of precision of the surgical intervention site and the progressive outcome).

For data collection, we conducted an exhaustive recruitment of all patient records meeting the selection criteria during the period considered. The parameters studied were the sociodemographic characteristics, the clinical picture and the outcome of patients hospitalized for tetanus.

Recruitment method

For data collection, we collected, from a standardized survey form, epidemiological parameters (age, sex, occupation, origin and level of education), clinical (vaccination status, type and location of surgical entry point, physical signs, Dakar score), therapeutic (sensory isolation, tetanus serovaccination, antibiotic therapy based on metronidazole or penicillin G for 7-10 days, sedatives including benzodiazepines, disinfection of the entry point with hydrogen peroxide, etc.) and evolutionary (cured, deceased, escaped).

Study variables

The variables were quantitative and qualitative.

Age: Number of years lived by the person until the day of hospitalization. Patients were grouped by 10-year age group.

Sex: Permanent physical characteristic of a person allowing to distinguish between male and female individuals but also to determine the sex ratio.

Marital status

Married: Two people united by a marriage bond.

Bachelor: A person who is not married.

Divorce: A person whose marriage has been legally dissolved.

Widower: Person whose spouse has died.

Socio-professional layer: This is the patient's professional activity and is classified into:

Formal sector: Set of official activities, recognized by the state with monthly remuneration.

Informal sector: Set of activities producing goods and services which escape the gaze or regulation of the state (driver, worker, merchant/trader, hairdresser, seamstress, farmer).

Housewife: Woman who keeps a house, takes care of the housework.

Student: People who receive education in a pre-university school, university or vocational establishment.

Unemployed: Group of people who do not have a job.

School level: It designates the highest level of education attained by the patient: Low: person whose level of education is limited to primary school.

Secondary: A person whose level of education is between the end of primary school and the beginning of university.

Superior: A person whose level of education is university.

Vaccination status: Degree of tetanus immunity and is classified into:

Incomplete vaccination status: Patient in whom a tetanus vaccination was found but not up to date.

Complete vaccination status: Patient with up-to-date vaccination status, well documented in a medical file or vaccination record.

Vaccination status unknown: Absence of documented proof of vaccination.

Signs

Lockjaw: Involuntary contraction of the jaw muscles.

Dysphagia: Difficulty swallowing.

Contracture: Widespread or localized muscle stiffness.

Stiffness: Feeling of muscular or joint rigidity accompanied by a limitation of voluntary movement.

Paroxysms: Tonic or tonic-clonic spasms against a background of muscle contracture.

Fever: Temperature rises above normal.

Front door: It is the cutaneous continuity solution through which *Clostridium tetani* enters the body; it has been distributed as follows:

Intramuscular injection (IM): Technique of drug administration by a needle topped with a syringe into deep muscle tissue, below the subcutaneous tissue.

Obstetrics: Entry point occurring after any obstetric maneuver.

Surgical: Entry point following surgery.

Type of surgery: This is the type of intervention that led to tetanus, it was: vascular, digestive, infantile, plastic/aesthetic, maxillofacial, ophthalmological, ENT, urological, gynecological, obstetric.

Place of intervention: Place where the intervention took place, it was: CHU, CMC, Regional hospital, Prefectural hospital, Private clinics, Medical NGO

Dakar prediction score

Score 0-1: Tetanus frustrates

Score 2-3: Moderate tetanus

Score 4-6: Severe

Molllaret stadiums

Stage I (trismus and/or generalized contracture): Mild forms

Stage II (Stage I + Dysphagia and/or Tonic Spasms): Acute generalized forms

Stage III:

Stage IIIa (Stage II+ Tonic-clonic paroxysms after 72 hours): Severe forms

Stage IIIb (Stage II+ Tonic-clonic paroxysms before 72 hours): Severe forms

Etiological treatment: Consisted of administration of antitetanus serum subcutaneously or intrathecally, antibiotic therapy with tetanus vaccine and treatment of the entry point.

Serotherapy: Aims to neutralize the circulating toxin. It was done using two methods:

Subcutaneous: consists of administering the SAT subcutaneously at a dosage of 3000-10000 IU

Intrathecal: consists of administering SAT into the subarachnoid space at a dosage of 15,000 IU (adult) and 750 IU (child).

Antibiotic therapy

Metronidazole: 30-40mg/kg for 7-10 days

Penicillin G: 100,000-200,000 IU/kg for 10 days

Vaccination therapy: tetanus is a non-immunizing disease.

Front door care: essential and consists of cleaning, disinfecting and trimming the front door.

Sensory processing: Use of sedatives and muscle relaxants.

Length of hospitalization

This is the time between the patient's admission and discharge, it was expressed in days divided into:

1. ≤ 7 days
2. 8-14 days
3. 15-21 days
4. 29-35 days
5. 36 and over

Process

1. Development of a research protocol which has been validated;
2. Approval by the head of department; The survey was on two categories of patients:
   1. Those who benefited from subcutaneous SAT;
   2. Those who benefited from intrathecal SAT.

Data collection and analysis

Data collection was done using standard data grouped into sociodemographic, clinical, therapeutic and evolutionary data. The data were then transported into the SPSS software in its version 21 and entered by the Pack office 2016 software. The qualitative variables were presented in the form of numbers and proportions and the quantitative variables expressed as mean, standard deviation or median, maximum and minimum values and frequency distribution.

Collection technique

Data were extracted from hospital records, patient consultation and hospitalization register.

Data analysis and presentation

Data entry and analysis were carried out using Epi info software in its version 7.4.0, the results were presented in the form of tables and figures using Microsoft World, Excel and Power Point software from the Office 2016 Pack.

Ethical and professional conduct considerations

After validation of the protocol by the thesis board; the data was collected anonymously from the patients, the confidentiality of the information collected was respected.

Results

Out of a total of 2637 hospitalized patients, 386 cases of tetanus were collected, including 147 with surgical entry, i.e. a frequency of 5.60%.

Table 1. Distribution of 147 patients hospitalized for tetanus with surgical entry at the SMIT of the Donka national hospital from June 1, 2013 to May 31, 2023 according to sociodemographic characteristics

Variables	Workforce (N=147)	Percentage (%)
Age		34.01
05-15 years	50	27.31
16-35 years old	40	9.52
36-45 years old	14	28.25
Others	43	
Sex		56.46
Male	83	
Marital status		
Bachelor	84	57.14
Others	63	42.86
Level of education		
Weak	71	48.30
Others	76	51.70
Occupation		
Students	78	53.06
Others	69	46.93
Residence		
Conakry	93	63.26
Others	54	36.74
Monthly income		
Weak	116	78.91
Others	31	21.09

The mean age of our patients was 27.0 (± 20.20) years with extremes of 05 and 90 years and the age group of 5-15 years was the most affected in 34.01% of cases. The sex ratio was 1.29 (83/64) in favor of men. Nearly 2/3 (84/147) of the patients were single and almost half (71/147) had a low level of education. More than 3/4 (116/147) of the patients had a low income and pupils/students were the most affected (78/147) or 53.06% (Table 1).

Regional hospitals 43/147 (29.25%), private clinics 37/147 (25.17%) and the two university hospitals 35/147 (23.81%) were the largest providers of these tetanus cases (Table 2).

Table 2. Distribution of the 147 patients received for post-surgical tetanus at the SMIT of the Donka national hospital from June 1, 2013 to May 31, 2023 according to the location of the intervention

Place of intervention	Workforce (N=147)	Proportion (%)
Regional hospital	43	29.25
Private clinics	37	25.17
CHU	35	23.81
CMC	24	16.33
Medical NGO	4	2.72
Prefectural hospital	4	2.72
Total	147	100.0

Regional hospitals 43/147 (29.25%), private clinics 37/147 (25.17%) and the two university hospitals 35/147 (23.81%) were the largest providers of these tetanus cases (Table 2).

Table 3. Distribution according to the clinical picture of the 147 patients hospitalized for tetanus at the SMIT of the Donka National Hospital from June 1, 2013 to May 31, 2023

Variables	Effect (n=147)	Percentage (%)
Signs		
Lockjaw	147	100
Generalized contracture	124	84.35
Dysphagia	124	84.35
Tonic paroxysm	52	35.37
Cervicalgia	52	35.37
Fever	29	19.73
Tonic-clonic paroxysm	10	6.8
Clinical forms		
Acute generalized tetanus	147	100
Localized tetanus	0	00
Dakar Score		
0-1	31	21.09
2-3	89	60.54
4-6	27	18.37
Mollaret stadiums		
Stage 1	24	16.33
Stage 2	88	59.86
Stage 3A	24	16.33
Stage 3B	11	7.48
Complications		
Infectious	29	19.73
Others	6	4.08

Trismus 147/147 (100%), generalized contracture 124/147 (84.35%) and dysphagia 124/147 (84.35%) were the most frequently found signs. Fever was also found in 29/147 (19.73%) of patients. Acute generalized tetanus was found in all patients, i.e. in 100% of cases. Mollaret stage II 88/147 (59.86%) and III 35/147 (23.81%) and Dakar score 2-3 69/147 (60.54%) were the most frequently found forms. Among the complications, infectious ones 29/147 (19.73%) were the most found and presented in the form of sepsis (5/29), pneumonia (8/29), severe sepsis (12/29) and septic shock (4/29) (Table 3).

Among the surgical specialties, gynecology-obstetrics 63/147 (49.9%), digestive surgery 40/147 (27.2%) and plastic surgery 25/147 (17%) were the types of surgeries most frequently encountered as responsible for tetanus entry points in this study (Fig. 1).

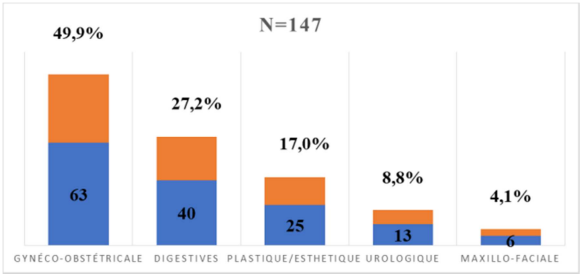

Fig. 1. Distribution of the 147 patients received for post-surgical tetanus at the SMIT of the Donka national hospital from June 1, 2013 to May 31, 2023 according to the entry point

The most frequently mentioned diagnoses were maternal-fetal dystocia 63/147 (42.86%), appendicitis 24/147 (16.33%) and open fracture 25/147 (17.01%)(Table 4).

Table 4. Distribution of the 147 patients received for post-surgical tetanus at the SMIT of the Donka national hospital from June 1, 2013 to May 31, 2023 according to the presumptive diagnosis

Presumptive diagnosis	Effective	Proportion (%)
Dystocic delivery	63	42.86
Appendicitis	24	16.33
Open fracture	25	17.01
Peritonitis	10	6.80
Malignantprostatic hypertrophy	10	6.80
Hernia	6	4.08
Maxillofacial trauma	6	4.08
Prostate cancer	3	1.36
Total	147	100.0

Sensory isolation 147/147, front door trimming 147/147 were performed. Serotherapy 147/147, 1st dose of tetanus vaccine 147/147, metronidazole 147/147, diazepam 147/147 were administered systematically in all patients. Other antibiotics (ceftriaxone 1g, amoxicillin-clavulanic acid, gentamicin, etc.) were prescribed only in patients with infectious complications (Table 5).

Table 5. Distribution according to the treatment of the 147 patients hospitalized for tetanus with surgical entry at the SMIT of the Donka National Hospital from June 1, 2013 to May 31, 202

Treatment	Effective (n=147)	Percentage (%)
Sensory isolation	147	100
Front door trimming	147	100
Serotherapy	147	100
Metronidazole	147	100
Injectable diazepan	147	100
Ceftriaxone injection	17	11.56
Amoxi-Clavulanic Acid	12	8.16
Injectable phenobarbital	9	6.12
Gentamycin	5	3.40

Table 6. Distribution of the 147 patients hospitalized for tetanus at the SMIT of the Donka National Hospital from June 1, 2013 to May 31, 2023 according to the duration of hospitalization and the progressive outcome depending on the routes of administration of the SAT

Length of hospitalization/ Evolutionary issue	Effective (N=147)	Percentage (%)
Hospitalisation		
≤ 7 days	21	14.29
8-14 days	2	1.36
15-21 days	66	44.90
22-28 days	21	14.29
29 days and more	37	25.17
Evolutionary issue		
Improved output	93	63.27
Deaths	54	36.73

The length of hospitalization of15-21 days was observed in almost half of the patients 66/147 (44.90%). We recorded 54/147 cases of death, or 36.73% of the patients (Table 6). Trismus 147/147 (100%), generalized contracture 124/147 (84.35%) and dysphagia 124/147 (84.35%) were the most frequently found signs. Fever was also found in 29/147 (19.73%) of patients. Acute generalized tetanus was found in all patients, i.e. in 100% of cases. Mollaret stage II 88/147 (59.86%) and III 35/147 (23.81%) and Dakar score 2-3 69/147 (60.54%) were the most frequently found forms. Among the complications, infectious ones 29/147 (19.73%) were the most found and presented in the form of sepsis (5/29), pneumonia (8/29), severe sepsis (12/29) and septic shock (4/29) (Table 3).

Discussion

It was abouta retrospective descriptive study over a period of 10 years from June 1, 2013 to May 31, 2023 on patients hospitalized for tetanus with surgical entry with the general objective of taking stock of the Infectious and Tropical Diseases department of the Donka National Hospital.

Despite the average sample sizeand the retrospective nature, this study allowed us to determine the proportion of patients hospitalized for tetanus with surgical entry point and to specify the type of surgeries responsible for it in the Infectious and Tropical Diseases department of the Donka National Hospital.

The frequency of tetanus found in this study (5.6%) was lower than that of Aba *et al.*, 2012 in Ivory Coast which had reported 11% and close to that of Diallo *et al.*, 2019 in Guinea with a frequency of 5%.

This high frequency in this study could be explained by poor hygiene, by non-compliance with the rules of asepsis and antisepsis during surgical procedures, the lack of awareness of surgeons of the risk of tetanus incurred by these patients in the absence of effective anti-tetanus immunization, also by the absence of rigorous monitoring of prenatal consultations during pregnancy for these patients who have benefited from a cesarean section.and finally by the absence of awareness campaigns and vaccination against tetanus in the general population.

Tetanus appears to be a childhood and young adult disease 104/147 (70.75%) in this study. This corroborates with the results of Traoré *et al.*, 2013; However it is different from those of Antona *et al.*, 2018 and Zieliński *et al.*, 2013, which found a clear predominance among people aged over 60.

This result could be explained by the fact that this young population constitutes the most active and most vulnerable group to tetanus due to the absence of a policy of catch-up vaccination boosters.

The sex ratio was in favor of men. This same finding was reported by Hounpké *et al.*, 2014, by Miloševic *et al.*, 2014. This finding could be explained by the absence of a vaccination follow-up program for adult males. Furthermore, there are no programs aimed at implementing a vaccination booster schedule for adolescent males, more specifically after early childhood (after 0-59 months). The systematic extension of vaccination to adult men and access to post-exposure serovaccination at all levels of health centers should reduce the burden of tetanus in Guinea and achieve the goal of universal health coverage.

In our study, the majority of patients came from regional hospitals, university hospitals and private clinics. Traoré *et al.*, 2013 had also noted in their study that the two national hospitals of the Conakry University Hospital and private clinics were the largest providers of these nosocomial tetanus cases.

This observation could be explained by the fact that these health structures constitute the reference hospitals in the management of the most serious pathologies, but which unfortunately do not always meet the conditions of asepsis and antisepsis on the one hand and on the other hand do not take into account the antitetanus immune status of these patients before surgical procedures.

Trismus, generalized contracture and dysphagia were the most frequently encountered clinical signs. Baye *et al.*, 2020 reported in his study that trismus (82.5%), contractures (77.8%) and tonic-clonic paroxysms (60.3%) dominated the clinical picture.

This symptomatology constitutes that of acute generalized tetanus. Moreover, this generalized form of tetanus was observed in all patients.

Many African authors, notably Baye *et al.*, 2020 and Fofana *et al.*, 2013, confirm this trend.

In our sample, the majority of our patients presented Mollaret stage 2 and Dakar score 2. Traoré *et al.*, 2013 had also reported that most of the patients surveyed had stage II tetanus in the Mollaret classification and the Dakar score II. Contrary to the work of Benjira *et al.*, 2016 and Wateba *et al.*, 2008 who reported respectively the predominance of mild forms and stage III tetanus.

In this study, the obstetric entry point and the diagnosis of cesarean section were the most frequently found. In the study of Diallo *et al.*, 2019, 15% of patients had a surgical entry point during an appendectomy or IM injection. Gapingsi *et al.*, 2015 reported that 100% of patients had an integumentary entry point.

This result could be explained by the fact that these gynecologists at level 3 of the health pyramid ignored the anti-tetanus immune status of these parturients combined with a failure of hygiene rules before, during and/or after surgery.

The combination of metronidazole + diazepam + SAT was the most commonly used treatment regimen. In the Benjira (2016) study in Morocco, 75% of patients had received antibiotic therapy based on metronidazole alone. Balla Kegam, 2017 had also observed a frequency of 72%.

Metronidazole is preferred by some authors because of its excellent activity, longer half-life than penicillin, and lack of GABA antagonist activity at Unlike penicillin and diazepam, it is a molecule of the basic treatment of tetanus. Their purpose is to stop the effects of tetanospasmin on the motor nerves and of tetanolysin on the autonomic nervous system (Pilly, 2018).

In our series, almost all patients benefited from tetanus vaccination. Benjira, 2016, had also reported that 100% of patients received tetanus serum therapy in his study at a dose of 500 IU.

Tetanus is not an immunizing disease, so to prevent a new infection a dose of VAT was systematically administered.

The length of hospitalization was more than two weeks. Gapingsi (2015), it was noted that the majority of patients had a hospital stay of 7 to 14 days.

This result in this study could be explained by the severity of the clinical picture on admission.

We have recorded a high mortality rate. Benjira, 2016, 55% deaths and Antona *et al.*, 2018 had found a lethality of 23%.

The absence of a resuscitation unit which would have made it possible to improve care efficiently and effectively and at a cost would have a positive impact on the mortality rate of these patients.

Recommendations

Promote awareness campaigns and tetanus vaccination in the general population. Promote tetanus vaccination and/or serotherapy in all patients before, during or after surgery if the tetanus immune status is defective. Strengthen awareness campaigns on tetanus vaccination during antenatal consultations.

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