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Orapuh Journal

ORIGINAL ARTICLE

Journal of Oral & Public Health

Prevalence, clinical profile, and outcomes of patients with tetanus admitted to the N'Djili General Referral Hospital, Kinshasa, Democratic Republic of the Congo

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ARTICLE INFO

Received: *18 March 2025*
Accepted: *24 October 2025*
Published: *13 January 2026*

Keywords:
Prevalence, clinical profile, outcomes, tetanus, N'Djili General Referral Hospital

Peer-Review: *Externally peer-reviewed*

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To cite:
Kanyere, S. C.1, Kadiata, B. A., Masengu, B. R., Mufaume, S. S., Sebo, M. C., Kiala, D. H., & Kulembidila, N. É. (2026). Prevalence, clinical profile, and outcomes of patients with tetanus admitted to the N'Djili General Referral Hospital, Kinshasa, Democratic Republic of the Congo. *Orapuh Journal, 7*(1), e1401
https://dx.doi.org/10.4314/orapj.v7i1.1

ISSN: *2644-3740*

Published by Orapuh, Inc. (info@orapuh.org)

Editor-in-Chief: Prof. V. E. Adamu
Orapuh, UMTG PMB 405, Serrekunda, The Gambia, editor@orapuh.org.

ABSTRACT

Introduction
Tetanus remains a potentially fatal bacterial infection that affects the nervous system. Although there is no cure, the disease can be effectively prevented through vaccination.

Purpose
This study aimed to determine the prevalence, clinical profile, and outcomes of tetanus cases admitted to the intensive care unit.

Methods
This was a descriptive, retrospective study conducted at the N'Djili General Referral Hospital, located in the Tshiangu Health District of Kinshasa, Democratic Republic of the Congo. All patients admitted with tetanus to the intensive care unit between 2018 and 2021 constituted the study population. Data were collected from archived medical records, with a total of 51 patient files available for analysis.

Results
The prevalence of tetanus between 2018 and 2021 was 5.3 per 100 intensive care unit admissions, corresponding to approximately six cases. The cutaneous route, mainly through traumatic skin wounds, was the principal portal of entry for *Clostridium tetani* (70.58%). Injuries occurred predominantly in the community (80%), and post-traumatic care was provided by trained personnel in 72.54% of cases. In most patients, initial symptoms appeared 2 to 9 days after injury (47.05%). A total of 82.35% of patients were referred from peripheral health centres after observation and first aid. Recent wounds (less than 15 days old) accounted for 96.07% of cases, and no patient had received a booster dose of the tetanus vaccine. The length of hospital stay ranged from 1 to 10 days in 70.58% of patients. Mortality was 45%, while 55% of patients were discharged with recovery.

Conclusion
Tetanus remains a significant public health concern in the Democratic Republic of the Congo. Community education on injury management, strengthening healthcare workers' capacity in tetanus prophylaxis, and implementing booster vaccination programmes are essential strategies to reduce the burden of tetanus.

INTRODUCTION

Tetanus is a vaccine-preventable infectious disease caused by a Gram-positive bacillus, *Clostridium tetani*, also known as the Nicolaier bacillus. It remains a major public health problem in developing countries, where it is responsible for high mortality, particularly among women and newborns. *Clostridium tetani* spores are ubiquitous in the environment, irrespective of geographical location. While tetanus has almost disappeared from high-income countries due to widespread vaccination, with current cases mainly resulting from injuries in children and under-vaccinated or unvaccinated adults, it continues to pose a significant public health challenge in developing countries where vaccination programmes are inadequate (Aubry & Gaüzère, 2023).

The global incidence of tetanus has declined markedly since the mid-20th century, largely due to the development and implementation of tetanus vaccination programmes. Nevertheless, tetanus remains a significant cause of mortality in low- and middle-income countries, accounting for approximately 56,000 deaths worldwide in 2015, including an estimated 20,000 neonatal deaths (Rhinesmith & Fu, 2018). In developing countries, particularly in Southeast Asia, the Western Pacific, and Africa, tetanus cases include maternal tetanus, which occurs during or shortly after pregnancy, and neonatal tetanus, which develops within the first 28 days of life. Maternal and neonatal tetanus (MNT) remains a major cause of neonatal mortality in low-income settings, with case fatality rates ranging from 80% to 100% among newborns of inadequately vaccinated mothers following deliveries conducted under poor hygienic conditions (Aubry & Gaüzère, 2023).

In many tropical and subtropical countries where vaccination coverage and access to quality medical care remain limited, tetanus is still widespread, particularly neonatal tetanus. Approximately 50,000 newborns and infants die each year from complications of this severe disease. Management of tetanus includes neutralisation of circulating toxin, appropriate antibacterial and symptomatic treatment, and intensive supportive care. For prevention, active immunisation with tetanus toxoid remains the most effective strategy (Stock, 2015).

The Democratic Republic of the Congo (DRC) was among the 13 countries where elimination of maternal and neonatal tetanus had not yet been validated as of March 2019. Following intensified efforts after 2008, the DRC implemented supplementary immunisation activities targeting women of reproductive age in high-risk districts using tetanus toxoid vaccination. Between 2008 and 2017, approximately 10 million women of reproductive age received at least two doses of tetanus toxoid vaccine in these districts (World Health Organization [WHO], 2019). According to WHO data published in 2020, tetanus-related deaths in the DRC reached 1,166, representing approximately 0.18% of total deaths nationwide.

Although tetanus elimination is included among the Sustainable Development Goals (SDGs) to be achieved by 2030, as endorsed by the World Health Assembly, the disease has not yet been eliminated in many countries, particularly in Africa. A country is considered to have eliminated maternal and neonatal tetanus when there is fewer than one case per 1,000 live births in every district. Elimination strategies include administration of tetanus toxoid vaccine to pregnant women during antenatal care and to women of childbearing age through outreach strategies, achieving national coverage of at least 80% for two or more doses of tetanus toxoid (TTV2+), promoting hygienic childbirth practices, and ensuring effective epidemiological surveillance (Aba et al., 2016; WHO, 2018; WHO, UNICEF, & UNFPA, 2015).

Furthermore, one of the most effective means of reducing mortality lies in prompt diagnosis and optimal management of tetanus cases. This remains challenging, particularly because many physicians may not encounter tetanus during their clinical training. Diagnosis is entirely clinical, as laboratory investigations play little or no role. In addition, tetanus management is complex even for experienced clinicians. Both inexperienced and seasoned practitioners benefit from access to up-to-date clinical guidelines and evidence-based treatment protocols (Govindaraj & Riyaz, 2014).

In the N'Djili Health Zone of Kinshasa, cases of tetanus continue to be reported, particularly at the N'Djili General Referral Hospital. This study therefore aims to determine

the frequency, clinical profile, and outcomes of tetanus cases admitted to the intensive care unit of this hospital.

METHODS

Study Setting

This study was conducted at the N'Djili General Referral Hospital, located in the Tshiangu Health District of Kinshasa, Democratic Republic of the Congo.

Target Population, Sampling, and Sample

All patients admitted with tetanus to the intensive care unit between 2018 and 2021 constituted the study population. Data were collected using an exhaustive non-probability sampling technique based on the total number of available medical records, comprising 51 patient files from the period 2018–2021.

Technical Methods and Data Collection Instruments

Data collection was carried out using a survey method supported by documentary analysis. A structured data collection sheet was used as the measurement instrument. This tool comprised three sections: patients' sociodemographic characteristics, clinical profiles, and outcomes (death, recovery, or complications).

Ethical Considerations

Prior to data collection, authorisation was obtained from the Medical Director of the N'Djili General Referral Hospital. A confidentiality agreement was signed, committing the researchers to maintain anonymity and confidentiality of all patient information accessed in the hospital archives.

Data Processing and Analysis

An initial verification was performed during data collection to ensure completeness, accuracy, and correct recording of data. A second verification was conducted prior to data processing and analysis to assess internal consistency. Data entry was performed using Microsoft Excel 2010, and statistical analysis was carried out using Epi Info version 7.1.1.1. Descriptive statistical measures, including frequencies, percentages, means, and standard deviations, were used for data analysis.

RESULTS

General Overview

At the N'Djili General Referral Hospital, the intensive care unit admitted a total of 955 patients between 2018 and 2021, including 51 cases of tetanus among patients aged 5 to over 65 years. This represents 51 cases out of 955 admissions, with an average of 12.5 tetanus cases per year.

Prevalence of Tetanus (2018–2021)

$$\text{Prevalence} = \frac{51}{955} \times 100 = 5.3\%$$

These findings indicate that, between 2018 and 2021, approximately 5.3 out of every 100 patients admitted to the intensive care unit were treated for tetanus.

Sociodemographic Characteristics of Patients (n = 51)

Table 1:
Sociodemographic characteristics of tetanus patients

Characteristic	Category	n	%
Age group	0–5 years	1	1.96
	5–16 years	16	31.37
	17–25 years	15	29.41
	27–45 years	10	19.61
	≥45 years	9	17.65
Sex	Male	32	62.74
	Female	19	37.25
Educational level	Primary	10	19.61
	Secondary	5	9.80
	Not specified	36	70.59
Patient's occupation	Risky professions (frequent soil contact)	0	0.00
	Less risky professions	33	64.71
	Schoolchildren/pupils	18	35.29
Municipality of origin	Masina	14	27.45
	Kimbaseke	24	47.05
	Nsele	3	5.88
	Matete	2	3.92
	N'Djili	7	13.72
	Outside Tshiangu	1	1.96
Caregiver relationship	Parents	10	19.61
	Grandparents	25	49.01
	Uncle/Aunt	10	19.61
	Cousins	3	5.88
	Others	3	5.88
Caregiver occupation	Housewife	15	29.41
	Unemployed	15	29.41
	Civil servant	5	9.80
	Private sector	6	11.77

Characteristic	Category	n	%
	Informal activities	10	19.61

Tetanus was most frequent among patients aged 5–16 years (31.37%) and 17–25 years (29.41%). Males were more affected than females (62.74%). Educational level was undocumented in 70.59% of cases; among those documented, primary education predominated. Most patients (64.71%) were engaged in occupations with limited soil contact. The majority originated from the municipalities of Kimbaseke (47.05%) and Masina (27.45%). Nearly half of the patients were accompanied by grandparents (49.01%), most of whom were either unemployed or engaged in household activities.

Clinical Profile of Patients

Table 2:
Mode of contamination and clinical characteristics

Variable	Category	n	%
Portal of entry	Cutaneous	36	70.58
	Gynaecological	7	13.72
	Surgical	5	9.80
	Other	3	5.88
Cause of trauma	Hospital-related	10	19.60
	Community-related	41	80.39
Post-traumatic care by trained personnel	Yes	14	27.45
	No	37	72.54
Onset of symptoms after injury	<2 days	6	11.76
	2–9 days	24	47.05
	10–14 days	15	29.41
	Undetermined	6	11.76
Referral from peripheral facilities	Yes	42	82.35
	No	9	17.65
Wound type	Acute (<15 days)	49	96.07
	Chronic (≥15 days)	2	3.93
Booster vaccination received	Yes	0	0.00
Length of hospital stay	1–10 days	36	70.58
	11–20 days	6	11.76
	21–30 days	9	17.65

The cutaneous route, mainly through traumatic skin wounds, was the most common portal of entry for *Clostridium tetani* (70.58%). Injuries occurred predominantly in the community (80.39%). In most cases (72.54%), post-traumatic care was not provided by trained personnel. Symptoms most frequently appeared within 2–9 days after injury (47.05%). The majority of patients (82.35%) were referred from peripheral health centres. Nearly all wounds were acute, and none of the patients had received a booster dose of the tetanus vaccine. Most patients (70.58%) had a hospital stay of 1–10 days.

Management of Tetanus Patients

Table 3:
Treatment modalities and outcomes

Treatment received	Cured n (%)	Not cured n (%)	Death n (%)	Survived n (%)
Metronidazole + quinolones	28 (54.90)	0 (0.00)	18 (35.29)	5 (9.80)
Sedatives (diazepam, phenobarbital)	28 (54.90)	0 (0.00)	18 (35.29)	5 (9.80)
Magnesium sulfate	5 (9.80)	23 (45.09)	5 (9.80)	18 (35.29)
Casual treatment	20 (39.21)	8 (15.68)	0 (0.00)	0 (0.00)

Most patients (54.90%) received a combination of nitro-imidazoles (metronidazole) and quinolones, along with sedatives (diazepam and phenobarbital) to control clonic spasms.

Outcomes

Overall, 55% of patients recovered and were discharged, while 45% died during hospitalisation.

The majority of deaths occurred 72 hours or more after admission.

Prognostic Factors

Table 4:
Fever at admission and patient outcomes

Fever status	Healed (n = 28)	%	Deaths (n = 23)	%	Total n (%)
Present	6	21.43	15	65.22	21 (41.17)
Absent	22	78.57	8	34.78	30 (58.82)

More than half of the patients (58.82%) did not present with fever at admission. However, fever was present in 65.22% of patients who died.

Severity Assessment Using the Dakar Scale

Table 5:
Dakar Scale assessment and outcomes

Dakar Scale score	Cured n (%)	Death n (%)	Total n	%
0–2 per criterion (mild to moderate severity)	18 (64.28)	0 (0.00)	18	35.29
>2 per criterion (severe symptoms)	10 (35.71)	23 (100.00)	33	64.70

https://dx.doi.org/10.4314/orapj.v7i1.1

Overall, the majority of patients had a Dakar Scale score greater than 2 per criterion, indicating severe disease.

DISCUSSION

The findings of this study indicate that tetanus was most frequent among patients aged 5–16 years (31.37%) and 17–25 years (29.41%). These results differ from those reported by Tekpa Gaspard et al. (2018), whose study focused exclusively on neonates and included 332 newborns, comprising 166 cases of neonatal tetanus and 166 controls, with a mean age of 7.8 ± 3.6 days. In the present study, children under five years of age were less affected, a finding that may be explained by routine immunisation through the Expanded Programme on Immunisation (EPI) and parental support in early childhood. Routine vaccination provides near-complete protection during early childhood; however, this immunity is not lifelong. In the absence of booster doses after early childhood, immunity wanes, rendering older children and young adults vulnerable to infection. This observation is supported by patient reports indicating that no booster vaccination had been received within the ten years following routine immunisation, as recommended by the World Health Organization (WHO). These findings are further compounded by precarious hygienic and environmental conditions, limited access to vaccination services for all age groups, overcrowded living conditions, and inadequate adherence to aseptic principles in some healthcare facilities.

Male patients were more affected than females, accounting for 62.74% of cases. This disparity may be attributed to the fact that women receive tetanus toxoid vaccination during pregnancy, which also serves as a booster dose, whereas men are not systematically targeted by immunisation programmes following routine childhood vaccination. This selective vaccination strategy excludes a substantial proportion of the population and may contribute to increased vulnerability among males.

Regarding educational status, 70.59% of patients did not provide information on their level of education. Among those who did, primary education predominated. Educational level is widely recognised as a determinant of health knowledge, decision-making, and behaviour. Individuals with higher educational attainment are more likely to adhere to vaccination recommendations, maintain hygienic practices, and seek timely medical care following injury. In the context of the Democratic Republic of the Congo, vaccination is often perceived as a preventive measure limited to children and pregnant women. The absence of structured booster vaccination programmes may further contribute to low awareness and uptake among adolescents and adults.

Contrary to findings from settings where tetanus predominantly affects farmers due to direct contact with contaminated soil, the majority of patients in this study (64.71%) reported limited contact with soil. This suggests that, in the study setting, unsanitary living conditions, inadequate hygiene, and weak aseptic practices play a more significant role in transmission. Practices such as the extraction of chiggers using non-sterile instruments, children playing barefoot in dusty environments, and injuries caused by contaminated sharp objects are common risk factors. Additionally, the presence of unattended domestic animals and overcrowded housing conditions facilitates continuous environmental contamination with *Clostridium tetani* spores, irrespective of season.

The municipalities of Kimbaseke (47.05%) and Masina (27.45%) contributed the highest number of cases. These areas are characterised by high population density, poor housing conditions, and inadequate sanitation. Such environments are typical of under-resourced urban settings and are associated with increased risk of infectious diseases. Low educational attainment, poverty, violence, and poor hygiene further exacerbate these risks.

Nearly half of the patients (49.01%) were accompanied by grandparents, many of whom were unemployed or engaged solely in household activities. These caregivers may lack the capacity or awareness to prioritise vaccination schedules and preventive healthcare. The absence of adequate supervision and healthcare follow-up for children under such circumstances increases vulnerability to preventable diseases. Socioeconomic status remains a critical determinant of health, influencing hygiene practices, healthcare access, and disease outcomes.

With respect to the mode of contamination, the cutaneous route through traumatic skin wounds was the predominant portal of entry for *Clostridium tetani* (70.58%). Injuries frequently involved breaches in skin integrity and were

often managed using contaminated or poorly maintained instruments, including during minor procedures such as chigger extraction. The majority of injuries (80.39%) occurred in the community, where aseptic practices are rarely observed. Examples include the use of rusty needles or unclean razor blades. These findings underscore the importance of booster vaccination programmes to protect populations at risk.

Evidence from high-income countries supports the effectiveness of comprehensive vaccination strategies. For example, in the Netherlands, inclusion of tetanus vaccination in the national immunisation programme has resulted in protection of approximately 94% of the population, although gaps persist in certain subgroups. Post-exposure prophylaxis may involve administration of tetanus toxoid vaccines and/or tetanus immunoglobulin, depending on immunisation history and wound characteristics (te Wierik et al., 2013).

Post-traumatic care by trained personnel was absent in 72.54% of cases, highlighting gaps in community-level knowledge and practice. Many individuals who provided first aid lacked adequate understanding of preventive measures against tetanus. Public education on appropriate responses to injuries is therefore essential, both for community members and healthcare providers. Similar concerns have been reported in the United Kingdom, where primary care physicians require improved knowledge of injury risk stratification and post-exposure prophylaxis to ensure timely and appropriate management, particularly among older adults who may not have been vaccinated during childhood (Bandapaati et al., 2024).

Most wounds were recent (96.07%), and none of the patients had received a booster vaccination, in contrast to reports from other countries where tetanus is frequently associated with chronic wounds. The majority of patients developed symptoms within 2–9 days following injury (47.05%), consistent with the known incubation period of tetanus. Most patients (82.35%) were referred from peripheral health facilities, underscoring the referral role of the N'Djili General Referral Hospital. However, this also highlights the need for sustained institutional support, including adequate equipment, trained personnel, and updated clinical knowledge to ensure effective care for severely ill patients.

The prevalence of tetanus at the N'Djili General Referral Hospital between 2018 and 2021 was 5.34%, equivalent to 53.4 cases per 1,000 patients. This is higher than the incidence reported by Tekpa Gaspard et al. (2018), who documented 2.7 to 5.2 cases per 1,000 live births for neonatal tetanus. Their study also reported a hospital frequency of 7.5%, a high proportion of severe cases based on the Dakar score (62.4%), and a case fatality rate of 54%. Identified risk factors included male sex, low maternal education, distance from health facilities, inadequate antenatal care, insufficient vaccination, home delivery, and unhygienic cord care practices.

Seasonal analysis revealed three peaks in hospitalisation: February–March, June–August, and November, corresponding broadly to the dry seasons in the region. Although tetanus spores persist in soil throughout the year, environmental exposure may increase during dry periods due to dust and barefoot activities. Limited access to healthcare services, poor hygiene, and low vaccination coverage further contribute to sustained transmission.

Hospitalisation data showed that 70.58% of patients were admitted for 1–10 days. Deaths were more frequent within the first ten days, whereas survivors tended to remain hospitalised longer. Unlike many other conditions, prolonged hospitalisation in tetanus patients appears to be associated with improved outcomes, reflecting the importance of sustained supportive care.

Most patients (54.90%) received a combination of metronidazole and quinolones, along with sedatives such as diazepam and phenobarbital to control muscle spasms. This approach aligns with case reports describing successful management of severe tetanus using multimodal pharmacological strategies, including benzodiazepines and barbiturates, alongside immunoglobulin therapy and supportive intensive care (Ahmadi et al., 2023). These practices are consistent with established principles of tetanus management, which include toxin neutralisation, wound care, antimicrobial therapy, and control of muscle spasms and autonomic instability (Rodrigo et al., 2014).

Despite advances in treatment, declining incidence in high-income countries has limited large-scale clinical trials, resulting in continued reliance on observational evidence. While therapies such as benzodiazepines, magnesium sulfate, and baclofen have demonstrated benefits, each carries limitations related to side effects, availability, and required expertise, particularly in resource-limited settings (Boer et al., 2024). In this study, magnesium sulfate was infrequently used due to limited availability and lack of familiarity among clinicians.

Overall, 45% of patients died, while 55% recovered. Most deaths occurred 72 hours or more after admission, often attributable to delayed healthcare seeking, late referral, insufficient resuscitation equipment, and suboptimal hospital conditions. The most critical determinants of outcome remain the quality of supportive care and the timeliness of intervention. Evidence-based guidelines and updated clinical resources are therefore essential to improve survival (Govindaraj & Riyaz, 2014).

Fever was absent in 58.82% of patients at admission but present in 65.22% of those who died, indicating its role as a marker of severity. Fever may exacerbate seizures by disrupting thermoregulation due to central nervous system involvement. Most patients had Dakar Scale scores greater than 2, reflecting severe disease, and nearly all deaths occurred in this group. These findings confirm the prognostic value of the Dakar Scale and underscore the need for early identification and aggressive management of severe tetanus cases.

CONCLUSION

The findings of this study indicate that, in the Democratic Republic of Congo—specifically in the city-province of Kinshasa, within the Tshiangu health district, and more particularly at the N'Djili General Reference Hospital—the prevalence of tetanus between 2018 and 2021 was 5.3 per 100 patients admitted to intensive care, corresponding to approximately six tetanus cases. The cutaneous portal of entry, mainly through traumatic skin wounds, remained the predominant route of infection (70.58%). Injuries occurred predominantly in community settings (80%), with post-traumatic interventions performed by trained personnel in 72.54% of cases. For most patients, initial symptoms appeared within 2 to 9 days following trauma (47.05%). A large proportion of patients (82.35%) were referred from peripheral health centres after initial observation and first aid.

Ethical Approval: Prior to data collection, authorisation was obtained from the Medical Director of the N'Djili General Referral Hospital. A confidentiality agreement was signed, committing the researchers to maintain anonymity and confidentiality of all patient information accessed in the hospital archives.

Conflicts of Interest: None declared.

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