

## Current Aspects of Non-Neonatal Tetanus at the University Hospital of Brazzaville

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### ABSTRACT

**Objective:** Tetanus is present in Congo, the objective of this work is to study the epidemiological, clinical and evolutionary aspects of non-neonatal tetanus cases and to formulate recommendations.

**Methods:** This was a retrospective study conducted among patients admitted to the infectious diseases department of the University Hospital Center of Brazzaville, from January 1st 2018 to December 31st 2020. The data collected were : age, sex, portal of entry, clinical signs, duration of hospitalization, stage of tetanus as well as evolution.

**Results:** A total of 44 cases of non-neonatal tetanus was found among the 2440 patients admitted during the study period, with a frequency of 1.8%. A male predominance was observed, the sex ratio M/F was 4.5. The average age was  $31.6 \pm 2.9$  years with extremes of 6 and 78 years. The age group 15-24 years (31.8%) was the most represented. More than half of the patients were single (81.8%) with a secondary level of education level (54.5%), most were students (38.6%). The main portal of entry for tetanus was integumentary in 77.3% of patients. About 70.5% of patients were not vaccinated. Most of them (59.1%) had a moderate form of tetanus, the Dakar score was between 2-3. The mortality rate was 36.4% and was associated with patient age and duration of hospitalization.

**Conclusion:** It is important to promote vaccination against tetanus from adolescence. Systematic verification of their vaccination status and updating them by the administration of the tetanus vaccine and booster doses is necessary. The continuous training of health professionals on the effective management of risky situations or cases of tetanus must be integrated into the strategy for the fight against tetanus.

### Keywords

Non-neonatal tetanus, Epidemiological aspects, Clinical signs, Prevention, Brazzaville.

### Introduction

Tetanus is a serious acute infectious bacterial disease that can be fatal ; caused by Nicolaier's bacillus or *Clostridium tetani*. This infectious disease is non-contagious and non-immunizing. This Gram-positive anaerobic bacillus is ubiquitous and enters the body through a

wound or portal of entry [1]. After infection by the bacillus, there is an incubation phase which lasts 4 to 21 days then appears a rigidity of the body accompanied by convulsive spasms of skeletal muscles. Muscle stiffness usually affects the jaw and neck and then becomes generalized. The diagnosis is essentially clinical, it is made in a patient with a defective tetanus vaccination status, in the presence of a portal of entry. The disease comes in three forms : generalized the most frequent and the most serious about 80% of cases, localized (anatomical region close to the wound) or cephalic (involvement of the brain and/or

cranial nerves) [2]. However, the localized clinical form is often the cause of misdiagnosis, even among the most experienced practitioners. The chances of recovery largely depend on early treatment [2,3].

Globally, approximately 13,500 tetanus cases were reported in 2016, with 85% of cases occurring after the neonatal period; however, the true incidence of non-neonatal tetanus is poorly known [4]. Mortality in industrialized countries would be around 10 to 20%, against 45 to 55% generally reported [5]. In industrialized countries like France, cases of tetanus have become rare [2]. The implementation of an anti-tetanus vaccination policy integrating the administration of booster vaccinations as well as the improvement of aseptic conditions have made it possible to considerably reduce the incidence of tetanus [6].

In Africa, and in several developing countries, tetanus is omnipresent, it remains a priority health problem, its hospital prevalence of tetanus remains high at around 3.6% with a lethality which oscillates between 10 and 60% [7].

In 2013, in the Republic of Congo, the frequency of non-neonatal tetanus recorded at the University Hospital of Brazzaville was (5.27%), with a lethality of 45.7% [8].

As part of the fight against tetanus, the Extended Vaccination Program (EPI) recommends preventive vaccination against tetanus for pregnant women or women of childbearing age and children under one year with booster doses given at age 5 and every 10 years [9].

Also, it seems important to us to keep a health watch on non-neonatal tetanus, a preventable disease by vaccination but still fatal in Congo. Our study was conducted with the aim of updating the data on the epidemiological profile, the clinical aspects as well as the factors associated with death in patients with tetanus, admitted at the University Hospital Center of Brazzaville in the Republic of Congo and to propose some recommendations.

## Methodology

This was a retrospective descriptive epidemiological study of patients with tetanus during the period from January 1st, 2018 to December 31st, 2020. The population source consisted of patients admitted to the Infectious Diseases Department of the University Hospital of Brazzaville. Were included in this study, people of both sexes and aged over 28 days, and admitted in the said department and in whom the diagnosis of tetanus was established.

The data collected was extracted from the patients medical records, using a questionnaire. These data were then processed with Excel 2016 software. The variables were divided as follows:

- The socio-demographic, individual and evolutionary data taken into account in this study were: age; gender; level of education, profession, marital status, individual history, vaccination status.
- The clinical variables considered were: the portal of entry, the clinical manifestations, the time to consultation (time between the

first clinical signs and admission); the duration of hospitalization, the evolution of the disease as well as the severity of disease were established respectively according to the score of Dakar and classification of Mollaret. For the score of Dakar, the classification was as follows: Class I: Score from 0 to 1; Class II: score of 2 to 3; Class III: score of 4 to 6).

- The evolution of the patient under treatment deemed favorable in the event of recovery or unfavorable when death occurs. Statistical analysis were performed with the R software and the differences were significant when  $p\text{-value} \leq 0.05$ .

## Ethical considerations

The files of the patients included in the study were anonymous. The data collection sheets were made anonymous through coding. Codes were used to protect the scanned data. Only the principal investigator and other people involved in carrying out this study had access to it.

## Results

During the period from January 1st, 2018 to December 31st, 2020, 44 cases of non-neonatal tetanus were found among the 2440 patients hospitalized in the infectious diseases department of University Hospital Center of Brazzaville with a hospital frequency of 1.8%.

## Socio-demographic and vaccination characteristics of patients

A male predominance was observed, i.e. 81.2% of the study population, the sex ratio M/F = 4.5; a mean age of  $31.6 \pm 2.9$  years (6-78 years). The 15-24 age group (31.8%) was the most represented. More than half of the patients were single (81.8%) with secondary level of education (54.5%), most were students (38.6%) (Table 1). The vaccination status was absent for 70.5%.

## Types of portal of entry

The different portal of entry identified in our series are presented in Figure 1. The main portal of entry was integumentary (77.3%) following a wound in the lower limb. The portal of entry was iatrogenic after intramuscular injection (9.1%); other portals of entry related to trauma have also been identified.

The patients presented a moderate form of tetanus 59.1% was at stage II according to the Dakar classification and 47.7% according to the Mollaret classification (Table 2). The course of the disease was unfavorable with death occurring in 36.4% of patients.

## Factors associated with death in patients hospitalized for tetanus

Death from tetanus is associated with patient age with a statistically significant difference  $p=0.005$ . They were more observed in the 25-34 age group (83.33%) and in people over 55 (80%) (Table 3).

Duration of hospitalization was also associated with death. Most of the deaths (81.82%) occurred during the 4 days of hospitalization ( $p<0.001$ ). The Dakar prognostic score is not associated with death ( $p>0.8$ ).

**Table 1:** Socio-demographic characteristics and vaccination status of patients.

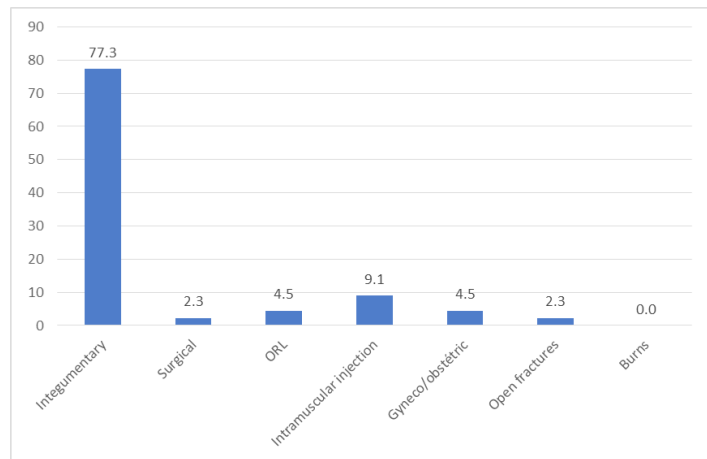
Variables	Number (N=44)	%
<b>Sex</b>		
Men	36	81.8
Women	8	18.2
<b>Age groups (years)</b>		
5 - 14	7	15.9
15 - 2	14	31.8
25 - 34	6	13.6
35 - 44	5	11.4
45 - 54	7	15.9
>55	5	11.4
<b>Marital status</b>		
In union	8	18.2
Alone	36	81.8
<b>Level of education</b>		
Primary	10	22.7
Secondary	24	54.5
Tertiary	2	4.5
None	8	18.2
<b>Profession</b>		
Informal	16	36.4
Civil servant	3	6.8
Students	17	38.6
None	8	18.2
<b>Vaccination status</b>		
Present	1	2.3
Doubtful	12	27.3
Absent	31	70.5

**Table 2:** Distribution of patients according to clinical manifestations and evolution.

	Number (N= 44)	%
<b>Signs</b>		
Fever	23	52.3
Lockjaw	35	79.5
Contractions	44	100
Dysphagia	18	40.9
Opisthotonos	12	27.3
Paroxysms	29	65.9
<b>Time of consultation</b>		
> 7 days	12	27.3
≤ 7 days	32	72.7
<b>Duration of admission (days)</b>		
< 1	1	2.3
1 to 4	18	40.9
5 to 9	14	31.8
10 to 14	8	18.2
15 to 19	3	6.8
<b>Disease stage</b>		
<b>Score of Dakar</b>		
0 à 1	12	27.3
2 à 3	26	59.1
4 à 6	6	13.6
<b>Classification of Mollaret</b>		
Stade I	13	29.5
Stade II	21	47.7
Stade III.a	8	18.2
Stade III.b	2	4.5
<b>Evolution</b>		
Favorable (cured)	28	63.6
Unfavorable (death)	16	36.4

**Table 3:** Socio-demographic and clinical factors associated with death.

	Cured N (%)	Death N (%)	p -value
<b>Age groups (years)</b>			
5 - 14	7 (100)	0 (0)	0.005
15 - 24	10 (71.43)	4 (28.57)	
25 - 34	1(16.67)	5(83.33)	
35 - 44	3 (60)	2(40)	
45 - 54	6 (85.71)	1(14.29)	
> 55	1(20)	4(80)	
<b>Sex</b>			
Men	25 (69.44)	11(30.56)	0.12
Women	3 (37.5)	5 (62.5)	
<b>Portal of entry</b>			
Integumentary	23 (67.65)	11 (32.35)	0.5
Others	5 (50)	5(50)	
<b>Time of consultation (days)</b>			
> 7	6 (50)	6 (50)	0.3
≤ 7	22 (68.75)	10 (31.25)	
<b>Duration of admission (days)</b>			
<4	2 (18.18)	9 (81.82)	<0.001
5 to 9	6 (54.55)	5 (45.45)	
10 to 14	5 (71.43)	2 (28.57)	
>15	15 (100)	0 (0)	
<b>Score of Dakar</b>			
Score 0 - 1	8 (66.67)	4 (33.33)	0,8
Score 2 -3	17 (65.38)	9 (34.61)	
Score 4-6	3 (50)	3 (50)	

**Figure 1:** Prevalence of patients by portal of entry.

## Discussion

### Epidemiological and clinical characteristics

Tetanus remains a health problem in Congo, its hospital frequency (1.8%) in the infectious diseases department of University Hospital Center of Brazzaville, corroborates with that noted at the CHR of Maradi in Niger 1.67% and at the Sominé Dolo hospital Mopti (1.03%) in Mali [10,11]. It is however less than 6.5% observed in Bamako [7]. In a similar study conducted in the same department in Brazzaville, Ossibi *et al.* [8] had reported higher hospital frequencies of tetanus at 2.8% in 2008 and 5.27% in 2013 respectively. Although there is a decrease in the frequency of

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tetanus at the University Hospital Center of Brazzaville B shows that this fatal disease is still present in Congo Republic.

The male predominance observed in our series (81.8%) is similar to that noted by other authors respectively in Vietnam [12] and Mali where Minta *et al.* found in their study a sex ratio M/F of 5.26 [13]. In France Antona D.[2] reports a female predominance of tetanus between 2008 -2011. In the Congolese context, the male predominance could be explained by the fact, on one hand, that male subjects are more exposed than women to activities at risk of trauma and that they are unaware of the importance of vaccine boosters. As for women, they would have better protection against tetanus because of the systematic vaccination of pregnant women recommended by the expanded program of vaccination [9].

The average age of our patients was 31.6 years  $\pm$  19.06 with extremes of 6 and 78 years. It is similar to that found in other Minta *et al.* studies. 32.9  $\pm$  15.9 years and Ossibi and col 29.03  $\pm$  3.3 years with extremes of 6-70 years [8,13]. The predominance of cases in the 15-24 age group differs from that observed in Mali where it was found that 40% of affected subjects were found in the 35-44 age group [7]. These cases of tetanus observed in adolescents and young adults in our series, testify to a weak immunity against tetanus in this population group, probably linked to lack of vaccination. In their study Plichon *et al* [14] propose that between the ages of 18 and 25, young adults must take the decision for the first time to receive a booster shot of tetanus vaccine.

Pupils (38.6%) as well as people working in the informal sector (36.4%) are more represented, which corroborates with the results of other authors [2,7,8] who found that cases of tetanus were recorded among farmers, workers.

In our context, this could be explained by a greater exposure to activities at high risk of injury.

Most of the patients (70.5%) in our study were not vaccinated or had a doubtful vaccination status. This finding has also been reported by other authors. Minta notes in his series that none of the cases had been properly vaccinated ; Ossibi *et al.* indicates that 94.3% of patients had doubtful or incomplete vaccination status [8,13]. This lack of immunization in these patients can be explained in particular by the lack of knowledge of effective prevention of tetanus through tetanus vaccination. This suggests the need to improve the knowledge of men, particularly adolescents, about tetanus prevention. Sending telephone messages on the interest of booster vaccinations, with a view of encouraging the prevention of tetanus in this category of the population, could strengthen the strategy for fighting this disease.

The most frequent integumentary portal of entry (77.3%) or the other portals of entry observed (obstetrical, surgical) found in our series agree with the observation made by other authors [7,10,15,16]. This could be the result of an insufficiency in the prevention or in the management of patients and also raises the problem of tetanus which can be a healthcare-associated infection.

Aloumba *et al.* [17] noted that only about 13% of hospital staff had an appropriate tetanus prevention practice. The fight against this form of tetanus necessarily involves improving working conditions, strict application of asepsis rules and continuous training of medical and paramedical staff [16].

### Factors associated with patient death

In our series, the unfavorable evolution with occurrence of death in 16 patients, is associated with the age of patients with tetanus: in particular those in the age group 25-34 years and in those aged over 55 years (80%) with a statistically significant difference  $p < 0.05$ . This result corroborates with the finding of Garé *et al.* which notes in France that tetanus affects elderly people who have not carried out their booster vaccinations [3]. In their study, Autran *et al.* evoke the complex issue of immunosenescence, which increases after the age of 50. This also compromises the capacity of the immune system to develop effective and protective vaccine responses, thus limiting the scope of the vaccine recommendations made for this field [18]. This justifies the interest of more effective management of situations at risk of tetanus in the elderly.

The length of hospitalization is associated with death with a statistically significant difference ( $p = 0.001$ ). A high proportion of deaths (81.82%) was observed in the first four days of hospitalization. This finding is similar to that made by Samake *et al* [11] in Mali who noted in their series that 83.33% of deaths occurred within four days of hospitalization. It corroborates with that of Minta in Niger which indicates a high lethality within 48 hours of hospitalization [13] ; Fofana *et al* note that 70% of deaths occur in the first week of hospitalization [7]. This implies that the longer the hospital stay, the better the survival.

No statistically significant association was noted between death and the time to treatment, whatever the duration  $p > 0.3$ . In addition, mortality was not associated with the level of the Dakar score  $p > 0.8$ . Cissoko *et al.* noted, however, that the most vulnerable people had a Dakar score greater than 3 [15].

### Conclusion

This study revealed that tetanus remains a major health problem in Brazzaville. Male subjects in the 15-24 age group are more affected. The entrance door is essentially integumentary following wounds of the lower limbs. Lethality of 36.4%. Tetanus mortality is related to age and length of hospitalization. But retrospective data collection limited the analysis of some data. More studies are needed.

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