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Tetanus in the Elderly in Dakar: Epidemiological, Clinical, Evolutionary Aspects and Associated Factors of Death

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Abstract: Senegal is one of the African countries where tetanus in children and adults remains a concern. Until now, there have been few studies on tetanus in elderly people. The objective of this study was to describe the epidemiological, clinical and evolutionary aspects of tetanus in elderly people. This was a descriptive and analytical retrospective study of the records of patients hospitalized at the Infectious Diseases Department of Fann National University Hospital in Dakar for tetanus in person aged 60 years and older, from January 1, 2009, to December 31, 2019. Data were collected from medical records. Multivariable logistic regression was used to evaluate potential risk factors of death. We included 962 cases of tetanus of all ages. Among the cases, 98 were elderly persons, representing a proportional morbidity of 10.10%. A male predominance was noted with a sex ratio (M/F) of 1.45. Fifty-seven patients (58.17%) had at least one comorbidity and they were dominated by hypertension (32 cases) and diabetes (13 cases). More than half of the patients (63.3%) were unaware of their vaccination status and only 03 patients were up to date. The portal of entry was mainly integumentary (72.45%). The incubation period was ≥ 7 Days in 88.78% of cases, and the invasion period ≥ 48 hours in 60.20% of patients. The generalized clinical form represented 95% of cases. The evolution was marked by complications in 78.60% of cases. Complications were dominated by bacterial infections (45.90%). The average length of hospitalization was 13.5 ± 2.9 days [1 - 49 days]. Forty-eight (48) patients died during hospitalization, representing a hospital case fatality of 48.97%. In multivariate analysis, only a duration of invasion < 48 hours (p=0.032) and the occurrence of complications were significantly associated with death (p=0.004). Our study reveals once again the seriousness of tetanus in elderly. Moreover, our data confirms the need to update prognostic classifications by introducing certain factors that have been identified in numerous studies as being associated with patient death, such as advanced age, presence of comorbidities and occurrence of a complication.

Keywords: Elderly, Tetanus, Senegal

1. Introduction

Tetanus is a severe acute infection, caused by a bacterium called *Clostridium tetani*. According to the World Health Organization (WHO), tetanus remains an important public health problem in many parts of the world, mainly in low-income countries or districts where immunization coverage is low. Senegal is one of the African countries where tetanus in children and adults remains a concern, despite the efforts taken by the Expanded Program of Vaccination (EPV). Even with the strong experience acquired on hospital medical care of tetanus in Dakar, the case fatality rate remains high in all age group (20 to 30%) [1-3], due to several unknown factors that would influence the prognosis of the disease [4].

In developing countries, we are witnessing a rise of the elderly population because of medical progress. The absence of prophylactic measures and vaccination programs targeting the elderly exposes this age group to this disease. In addition, the frequency of co-morbidities and fragility of the elderly could make the management of tetanus more difficult and contribute to a worse prognosis.

Until now, no studies of tetanus in the elderly have been carried out in Senegal. In this context, we undertook this study to describe the epidemiological, clinical and evolutionary aspects of tetanus in the elderly in Dakar, at the referral center for management of tetanus.

2. Methods

It was a retrospective, descriptive and analytical study of the records of patients hospitalized for tetanus, at the Infectious Diseases Department of Fann National University Hospital in Dakar (referral service for management of tetanus), from January 1, 2009, to December 31, 2019.

We considered as tetanus in the elderly any case of tetanus that occurred in person aged over 60 years, regardless of their sex and the circumstances of the disease.

The diagnosis of tetanus was clinical and was based on the epidemiological factors (presence of an entry point, absence of vaccination or notion of incomplete vaccination), clinical signs (presence of a trismus associated or not with dysphagia, contracture and/or paroxysms). No paraclinical arguments were necessary for confirmation. The tetanus was considered as frust for stage I, or score 0 - 1; moderate (stage II, score 2 - 3); severe (stage III, score 4 - 6).

Data were collected from patient charts and hospitalization records. A standardized form was used for data collection and included sociodemographic data (age, sex, geographical origin, profession, vaccination status, medical specifies), clinical data (clinical form, incubation and invasion duration, trismus, dysphagia, tonic paroxysms, tonic-clonic paroxysms), prognostic data (classification by Mollaret stage and Dakar score) and evolutionary data (cure, death, complication).

The data were entered using Microsoft Excel and processed by using SPSS. Quantitative variables were described through their mean, standard deviation, median and extremes. However, the qualitative variables were described by their relative frequencies. For the analysis, the Pearson Chi-square test or the Fischer test was used to search for factors associated with the occurrence of patient death. A value of $p < 0.05$ was used as the threshold for significance.

3. Results

During the study, we recorded 962 cases of tetanus of all ages. Among these cases, 98 were elderly persons, representing a proportional morbidity of 10.10%. There was a male predominance with a sex ratio (M/F) of 1.45. Most of patients were from urban and suburban areas, respectively 43% and 42%. More than half of the patients (63.3%) were unaware of their vaccination status and only 03 patients were up to date (table 1). The median age was 73 years [60-94 years]. Fifty-seven patients (58.17%) had at least one comorbidity and they were dominated by hypertension (32 cases) and diabetes (13 cases).

The portal of entry was mainly integumentary (72.45%), followed by post-surgical (8.16%). It was also dental (6.12%), otogenic (4.08%) and in 5.10% of cases, not found. The incubation period was ≥ 7 Days in 88.78% of cases, and the invasion period ≥ 48 hours in 60.20% of patients. The generalized clinical form represented 95% of cases. The main signs of tetanus were found, including trismus (96.9%), paroxysms (51.00%) and dysphagia (45.90%).

According to the Dakar prognostic score, tetanus was classified as frust in 61.22% of cases, and moderate in 38.78%, (Table 1).

Table 1. *Epidemiological, clinical and evolutionary aspects of tetanus cases in the elderly in the infectious and tropical diseases department of the CHNU Fann, from 2009 to 2019.*

Characteristics		Number (n)	Percentage (%)
Sex	Male	58	59.18
	Female	40	40.82
Origin	Urban/ suburban	83	84.70
Vaccinal status	Completed	0	0.00
	Incompleted	3	3.06
	Not specified	95	96.94
Comorbidity	Yes	57	58.17
	No	41	41.83
Portal of entry	integumentary	71	72.45
	Post-surgery	8	8.16
	Dental	6	6.12
	Otogenic	4	4.08
	Others	4	4.08
	Not found	5	5.10
Incubation	≥ 7 days	87	88.78
	< 7 days	11	11.22
Invasion	≥ 48 hours	59	60.20
	< 48 hours	39	39.80
Dakar score	0 - 1	60	61.22
	2 - 3	38	38.78
	4 – 6	0	0.00
Mollaret stage	I	5	5.10
	II	86	87.76
	III	7	7.14
Evolution	Cure	50	51.03
	Death	48	48.97

The evolution was marked by complications in 78.60% of cases. Complications were dominated by bacterial infections (45.90%), cardio-circulatory accidents (39.80%) and metabolic disorders (29.60%). Infectious complications were mainly represented by pneumonia (57.8%), bacteremia (46.6%) and urinary tract infections (22.2%). The average length of hospitalization was 13.5 ± 2.9 days [1 - 49 days].

Forty-eight (48) patients died during hospitalization, representing a hospital case lethality of 48.97% (Table 1). Cardiac arrest, septic shock, respiratory distress and sedative-related coma were the main circumstances of death.

All patients with localized forms healed (100%). In multivariate analysis, only a duration of invasion < 48 hours and the occurrence of complications were significantly associated with death. Case lethality was 66.67% when invasion was less than 48 hours versus 33.33% for invasion greater than or equal to 48 hours (p=0.032; OR 3.16; CI [1.14 - 9.44]). When complications occurred, lethality was 59.74% versus 9.52% in their absence with a statistically significant difference (p=0.004; OR 11.9; CI [2.74 - 88.4]) (Table 2).

Table 2. *Lethality and factors associated with death during tetanus in the elderly in Dakar.*

Characteristics		death		0R [IC 95%]	P value
		No (n=50)	yes (n=48)		
Sex	Male	32 (55.17%)	26 (44.83%)	0.61 [0.21 – 1.73]	0.4
	Female	18 (45.00%)	22 (55.00%)		
Invasion	< 48 hours	13 (33.33%)	26 (66.67%)	3.16 [1.14 – 9.44]	0.032
	≥ 48 hours	37 (62.72%)	22 (37.28%)		
Complication	Yes	31 (40.26%)	46 (59.74%)	11.9 [2.74 – 88.4]	0.004
	No	19 (90.48%)	2 (9.52%)		
Tare	Yes	18 (38.30%)	29 (61.70%)	2.13 [0.76 – 6.13]	0.2
	No	32 (62.74%)	19 (37.26%)		
Dakar score 3	Yes	1 (16.67%)	5 (83.33%)	2.32 [0.29 – 49.7]	0.5
	No	49 (53.26%)	43 (46.73%)		

4. Discussion

During our study, 962 cases of tetanus were recorded for all ages, 98 were elderly person (10.1%). These results were lower than those reported in France by Antona and al. who found a prevalence of 77.1% of tetanus in elderly persons and a median age of 83 years old [5]. This difference in prevalence can be explained by the fact that tetanus is the prerogative of elderly in developed countries, in contrast to developing countries where tetanus is still a young person disease.

Predominance of males was found in developing countries regardless of the age group [6, 7]. This situation seems related to the fact that in our context male persons are more likely to be exposed to professional trauma, even at an advanced age, in addition to the absence of any specific immunization program for the elderly.

Our results agree with those found in Dakar by Anttinsounon C. A. and al., [8], and in Mali by Minta and al., [6] when it comes to the patient's origin. Inadequate vaccination coverage was common in our study. Neglect of tetanus prevention was observed in most of the series [9]. However, this observation is not exclusive to developing countries. Indeed, the data of Antona and al., [5] in the French adult population were declarative and more than half of the people surveyed did not have a document attesting their vaccinations, and according to Guthmann J. P., [10], vaccination coverage for French people aged 65 and over is very low compared to other age groups [10]. Whatever the country, there is no specific tetanus vaccination program for this age group.

Most of our patients (58%) had at least one comorbidity, dominated by hypertension and diabetes. This is explained by the increase in cardiovascular risk factors in this population. The study by Tetchi et al., on the profile of diseases of the African elderly supported this observation and reported a predominance of hypertension and diabetes in cardiovascular and metabolic diseases [11].

The portal of entry was mostly integumentary (76.34%), unlike Antona and al., [6] who reported an identification of all portals of entry in his cohort. This could be related to the fact that portal of entry was not properly searched, or probably to the fact that elderly do not remember and do not often complain about microtrauma, especially in diabetic settings. A non-negligible proportion of dental entry points (6.4%) was found. The poor oral hygiene in these patients would explain this result. [12].

A long incubation period was also found by Antona and al., [6]. The distant distance between the point of entry and the central nervous system would explain this finding; we found a localization of the portal entry in lower limbs in 63% of cases.

The evolution was marked by complications in 78.5% of cases. Ndour C. T., [7] noted that complications occurred three times more frequently in elderly (61.8%). In our study, complications were dominated by bacterial infections (45.9%), cardiovascular complications, and metabolic disorders. Infectious complications were mainly represented by pneumonia bacteremia (46.6%) and urinary tract infections (22.2%).

These results are like those of Attinssounon and al., [8] in Dakar and Derbie and al., in Ethiopia [13]. In the Ethiopian study, pulmonary infection was the most common infectious complication (34.5%), Cardiovascular complications were dominated by hypertension (46.1%), rhythm disorders (48.7%) and cardiac arrest (33%).

We reported a case fatality of 48.97%. This rate was lower

than what was found by Ndour, C. T., (73.5%) at the same department in 1990 [7]. This difference can be explained by the improvement of health systems and the efforts made during the last decade to ensure better management of tetanus in elderly in our department. However, it should be noted that the case-fatality rate remains high among elderly people throughout the world, both in highly industrialized countries and in countries with limited resources. This lethality was three times higher in persons over 60 years old in both India [14] and the United States [15]. Thus, age would constitute a poor prognostic factor across several series.

The presence of a comorbidity in elderly was associated with high lethality according to literature [6, 14]. We noticed this in our patients, but the difference was not significant.

The case fatality was 66.67% when the invasion was less than 48 hours versus 33.33% for invasion ≥ 48 hours (p=0.032; OR 3.16; CI [1.14 - 9.44]). When complications occurred, the lethality was 59.74% versus 9.52% in their absence with a statistically significant difference (p=0.004; OR 11.9; CI [2.74 - 88.4]). This finding was made by Saltoglu and al., [16] who reported that when complications occurred, mortality increased up to 64.3% against 48.7% when they did not exist. This leads us to conclude that the presence of complications would be synonymous with excess mortality, and therefore a poor prognostic factor.

5. Conclusion

Tetanus is still a real health problem in developing countries, despite the existence of an effective and perfectly safe vaccine. This disease does not spare any age group. In fact, the less effective post-vaccination response in elderly person, linked to decrease in immunity, make this age group at high risk of tetanus. Our study reveals once again the seriousness of tetanus in elderly. Moreover, our results confirm the need to update prognostic classifications by introducing certain factors that have been identified as being associated with death, such as: advanced age, presence of comorbidities and occurrence of complications. For this we need other studies with much more representative populations.

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