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Trend and Epidemiology of Tetanus in Nasarawa State, Nigeria: A Five Years Review

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ABSTRACT

Background: Tetanus is a vaccine preventable, non-communicable disease known as lockjaw and characterized by muscle spasm. It is a forgotten disease in the developed world but remained an infection of public health importance in the developing countries. This study aimed to determine the trend in its epidemiology and outcome in Nasarawa state.
Subjects and Method: A retrospective study using secondary data from the medical records of three selected health facilities, one each across the three senatorial zones of the state. All those who had tetanus were included while those with incomplete records, 5 were excluded. Data analysis was done using a statistical package for social sciences version 23. The dependent variable was the outcome of tetanus while the independent variables were incubation period, onset period, type of tetanus, risk factors, vaccination history, and manifestations of tetanus.
Results: The subject consists of 53.8% males and single with age (Mean=15; SD=6.90). Four and 17 days were the shortest and longest incubation periods while one and six days were the shortest and longest onset periods respectively. A total of 24 (93.3%) patients had generalized tetanus. Nail puncture, road traffic accidents, and umbilical infection were the commonest sources of post-neonatal and neonatal tetanus in this study. Spasm is the commonest manifestation, present in 19 (73.1%) of the study population. This is closely followed by trismus in 57.7% of the cases. About half have a positive vaccination history. This study found case fatality of 7.7%.
Conclusion: Generalized tetanus was the commonest type seen in this study, while nail puncture, road traffic accident and umbilical infection were the most common sources of infection. Although, more than half of the study subjects received immunization to prevent tetanus, the case fatality in this study was in one in twelve sufferers.

Keywords: Epidemiology, review, tetanus, trend.

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BACKGROUND

Tetanus is a non-communicable disease acquired through exposure to the spores of the bacterium Clostridium tetani toxin that exists globally in soil and in animal intestinal tracts (WHO, 2019). Tetanus also known as lockjaw is a bacterial infection characterized by muscle spasm. The spasm commences in the jaw and then progresses to the rest of the body, each lasting a few minutes and occurring recurrently for three to four weeks (Atkinson, 2012). Spasms may be severe enough to cause bone fractures; other symptoms of tetanus may include fever, sweating, headache, trouble swallowing, high blood pressure, and a fast heart rate (CDC, 2015). The commencement of symptoms is typically three to twenty-one days resulting from infection and recovery may take months. About 10% of cases result in death (Atkinson, 2012).

There are four forms of tetanus based on clinical findings: generalized, neonatal, local, and cephalic tetanus. Generalized tetanus is the most common form of tetanus, occurring in approximately 80% of cases. Tetanus occurring in the post-neonatal age group is also referred to as post-neonatal tetanus. Patients present with a descending pattern of muscle spasms, first presenting with lockjaw, abdominal rigidity and risus sardonicus (Bae and Bourget, 2019). This can progress to a stiff neck, difficulty swallowing, and rigid pectoral and calf muscles. These spasms can occur for up to four weeks, with a full recovery taking months. Autonomic instability can also occur in these patients with fever, dysrhythmia, labile blood pressure and heart rate, respiratory difficulties, catecholamine excretion, and even early death (Bae and Bourget, 2019).

Anyone can be infected by tetanus but the disease is predominantly common and severe in newborn babies and pregnant women who have not been adequately immunized with tetanus-toxoid-containing vaccines (Janice et al., 2003). Tetanus during pregnancy or within the last six weeks of pregnancy is called “maternal tetanus”, and tetanus within the first 28 days of life is called “neonatal tetanus” (WHO, 2018). Precisely it prevents the release of the signaling substance Gamma Amino Butryic Acid (GABA) from nerve cells, Tetanus is lethal in 13.2% of cases overall (including cases with and without treatment) (Behrens et al., 2019).

Neonatal tetanus (NT) remains a public health problem in many developing countries (Lambo et al., 2011). It is a highly devastating disease, found frequently in cuts with small external openings such as needle pricks, nails, or fork piercings (Janice et al., 2003). The high mortality rate of neonatal tetanus remains a therapeutic challenge to health workers and requires continuous evaluation. The determinants of mortality in neonatal tetanus are not well understood (Lambo et al., 2011). The most common port of entry for tetanus spores is the unhealed umbilical cord and 90% of cases of neonatal tetanus develop symptoms during the first 3–14 days of life with the majority presenting at 6–8 days and the mortality rate tends to be very high. In the absence of medical treatment, case fatality approaches 100%, with hospital care, 10–60% of neonatal tetanus cases die, depending on the availability of intensive care facilities (Blencowe et al., 2010). It is more effective in preventing tetanus than case management even where intensive care is available (Rodrigo et al., 2014). In severe cases, the spine will arch backward as the back muscles become affected. This is more common when children experience a tetanus infection (Felman, 2019).

Despite World Health Organization's intention to eradicate tetanus by the year

1995, it remains endemic in the developing world and WHO estimated approximately 1, 000, 000 deaths from tetanus worldwide in 1992. This included 580,000 deaths from neonatal tetanus, with 210,000 in Southeast Asia and 152,000 in Africa (Galazka and Gasse, 1995). The disease is uncommon in developed countries. In South Africa, approximately 300 cases occur each year (Wilkins, 1988).

The vaccine for tetanus brought about massive progress in controlling the disease, leading to an 89.0% reduction in tetanus cases and deaths between 1990 and 2016 which accounted for 333,000 to 37,000 in 2016. 38,000 people died from tetanus in 2017. Around half (49%) were younger than five years old (Behrens et al., 2019). In 1990 there was a high risk of contracting tetanus in tropical Africa, in South and Southeast Asia, and in Haiti but today most tetanus cases occur in Sub-Saharan Africa where progress has been slower, resulting in a 75.0% decline in cases of tetanus between 1990 and 2016. By 2016 there were only five countries in the world where tetanus still manifests at a rate of more than 10 per 100,000 people: Somalia, South Sudan, Kenya, Chad, and Central African Republic (Behrens et al., 2019). The number of neonatal tetanus cases reduced from 787,000 in 1988 to 34,019 in 2015 – a 96% reduction (WHO, 2018).

Tetanus accounts for 7% of neonatal deaths world-over, and up to 20% in Nigeria (Oruamabo, 2007). Although only 5% of neonatal tetanus cases are actually reported to health services (Oruamabo, 2007). The incidence of neonatal tetanus in Nigeria ranges between 14.6 and 20 per 1,000 live births (FMOH,1992). Recent data shows that Nigeria contributes 16% of global neonatal tetanus deaths, second only to India (UNICEF et al., 2010). Universally, 7% of neonatal deaths were due to tetanus but the incidence is up to 20% in Nigeria (Orimadegun et al., 2014). About five million babies are born yearly in Nigeria, an average of 240,000 (4.8%) die within the first four weeks of life (FMOH, 2005). The incidence of neonatal deaths in Lagos state of Nigeria from 1982 to 1987 ranged from 4% and 8% of all births (Oruamabo, 2007). Other earlier studies predominantly in the Southern part of Nigeria reported rates ranging from 2.3% to 6.9% (Grange, 1999; Oyedeji et al., 2012).

Contributing factors to the tetanus infection is the cultural diversity of hygienic childbirth practices and cord care, lack of skilled attendance with delivery, parent illiteracy, lack of antenatal care, including low level of immunization against tetanus, seasonality, geographical location and climate, the prevalence of spores of C. tetani and rural agricultural settled populations (Janice et al., 2003). These socioeconomic and cultural factors are major reasons for the transmission of tetanus in African society especially Nigeria, and specifically the north central zone which is dominantly an agrarian society.

Tetanus is one of the public health problems in Nigeria and it is commonly associated with a high mortality rate. Knowing the prevalence of tetanus, associated risk factors and the clinical outcome in Nasarawa State will provide information on the burden of the condition, and how best to address it. This study aimed to determine the commonest type of tetanus in the Nasarawa state: (1) To evaluate the manifestations of tetanus in the Nasarawa state; (2) To determine the risk factors/causes of tetanus in the Nasarawa state; (3) To assess the outcome of tetanus in Nasarawa state.

SUBJECTS AND METHOD

1. Study Design

This was a hospital-based descriptive cross-sectional study using secondary data.

2. Population and Sample

The study included all patients diagnosed and treated for Tetanus from January 1st, 2013 to December 31st 2018 in DASH Lafia, Medical Center Mararaba, and General Hospital Akwanga. Case folders and admission information of all patients diagnosed, admitted, and treated for Tetanus from January 2015 to December 2019 in DASH Lafia, Medical Center Mararaba, and Akwanga General Hospital whose records are complete were included in this study. Those with incomplete or missing medical records were excluded from the study.

Nasarawa State in North Central Nigeria is one of the thirty-six States in Nigeria with an estimated population of about 2.6 million. The State has over 760 Primary Health Centres (PHCs), 17 General Hospitals and 2 tertiary Hospitals (DASH Lafia and FMC, Keffi) both serving as referral centers in the State. These health facilities are distributed across 13 Local Government Areas spread across 3 Senatorial zones. DASH is located in the state's capital, Lafia senatorial zone with an average of 131,923 outpatients seen annually and with about 304 bed capacity. General Hospital Akwanga is located in Akwanga senatorial zone with an available bed space of 80 capacity and has a clinical staff strength of 3 Doctors, 3 Pharmacist, 3 Medical laboratory scientists, and 33 nurses while Medical Center Mararaba is located in Keffi senatorial zone with 57 available bed spaces and having a clinical staff strength of 3 Doctors, 4 Pharmacist, 3 Medical laboratory scientists, and 44 nurses.

All patients admitted and treated for tetanus under the period of review were recruited using a medical record register. One hospital in each of the three senatorial zones was chosen by simple random sampling.

3. Study Variables

The Dependent variable was the outcome of tetanus. The independent variable: Clinical Presentation, Risk factors for tetanus, Incubation period, onset period, etc.

4. Conceptual Definition

The outcome of treatment: refers to the end result of care which could be discharge, referral, abscission, signing against medical advice, or death.

Clinical presentation: referring to the clinical features/manifestations.

Incubation period: this is the time for wound infection by the causative organism (clostridium tetani) to first symptom/ sign.

Period of onset: this is the time interval from the first manifestation to the onset of spasms.

5. Study Instruments

Case folders of all patients who satisfied the inclusion criteria were retrieved from the Record Unit of DASH Lafia, Medical Center Mararaba, and General Hospital Akwanga. Data was extracted from the patient's folders using a questionnaire. Variables assessed included: age, sex, place of residence, occupation, nail injury, trauma, fall, circumcision, clinical presentations, duration of symptoms before presentation, treatment given, duration of hospital stay, and clinical outcome of the patient.

6. Data Analysis

Data was analyzed using SPSS (Statistical Package for the Social Science) version 23.0. Frequencies and percentages were computed for categorical variables while means and standard deviation were obtained for continuous variables. Results obtained after analysis were presented in tables and charts.

7. Research Ethics

Ethical clearance was obtained from the Nasarawa State Ministry of Health Ethical Review Board. Information was treated with utmost confidentiality.

RESULTS

1. Socio-demographic distribution of the study population

In Table 1 there were twenty-six patients with tetanus across the study centers in Nasarawa state from 2015 to 2019. Fifty percent of these were from the Western senatorial zone. There are more males (53.8%) than females. Most were singles (53.8%). The mean age of the study was 15 and the standard deviation was 6.9 years (Table 1).

Table 1. Socio-demographic distribution of study population in Nasarawa State Nigeria.

Characteristics	Category	Frequency (n)	Percentages (%)
Centres	DASH	4	15.4
	GHA	9	34.6
	MCMG	13	50.0
Sex	Male	14	53.8
	Female	12	46.2
Marital status of patients	Single	14	53.8

2. Social status of patient distribution

Table 2 shows, that most of the cases are either in primary school or are holders of such certificates. The majority reside in the urban area, are students, and are not gainfully employed.

Table 2. Social status of patient distribution in Nasarawa State Nigeria

Characteristics	Category	Frequency (n)	Percentages %
Educational level	Primary	14	53.9
	Secondary	9	34.6
	Tertiary	3	11.5
Place of residence	Rural	6	23.1
	Urban	20	76.9
Occupation	Unemployed	10	38.5
	Business	3	11.5
	Farmer	3	11.5
	Students	8	30.8
	Housewife	2	7.7

3. Severity Index of Tetanus

Table 3 shows, that four and seventeen days were the shortest and longest incubation periods respectively. Also, one and six days were the shortest and longest onset periods respectively. The duration of spam and duration of hospital stay were analyzed too.

Table 3. Severity index of Tetanus in Nasarawa State Nigeria

Characteristics	Category	Mean	SD	Min	Max
Incubation period	Range (days)	7.34	2.86	4	17
Period of onset	Range (days)	3.41	1.12	1	6
Duration of spasm	Mean, SD	5.60	3.20	3	9
Duration of Hospital stay	Mean, SD	5.50	4.70	3	8

4. Types of tetanus and modes of injury

In Table 4, almost all the patients (93.3%) had generalized tetanus. Nail puncture, road traffic accidents and umbilical infection were the most common sources of post-neonatal and neonatal tetanus in this study.

Table 4. Types of Tetanus and modes of injury in Nasarawa State Nigeria

Characteristics	Category	Frequency (n)	Percentages (%)
Types of Tetanus	Generalized (Neonatal)	6	23.1
	Generalized (post-neonatal)	18	69.2
	Local	2	7.7
Mode of injury	Road traffic accident	5	19.2
	Burn	3	11.5
	Fall from a height	2	7.7
	Nail puncture	9	34.6
	Cut from glass	1	3.9
	Post circumcision	1	3.9
	Umbilical	5	19.2

5. Clinical manifestations and outcome of treatment

In Table 5, Spasm is the commonest manifestation, present in almost three-quarters of the study population. This is closely followed by trismus in 57.7% of the cases. About half have a positive vaccination history. The case fatality from this study is 7.7%.

Table 5. Clinical manifestations and outcome of treatment in Nasarawa State Nigeria

Variables	Frequency	Percentages (%)
Presence of spasm	19	73.1
Trismus	15	57.7
Inability to walk	6	23.1
Vaccination history	14	53.8
Antenatal care attendance	2	7.7
Recovery/discharge	24	92.7
Died	2	7.7

DISCUSSION

Due to poor record keeping and incompleteness of documentation, a total of twenty-six patients with complete data were recruited across the state over the study period. The mean age of the study population is (Mean= 15.00; SD= 6.91) years, this is comparable to the (Mean= 14.30; SD= 1.93) years reported in Ibadan by Orimadegun et al. (2014). This study's results is higher than the (Mean= 10.82; SD= 3.40) years reported by Alex–Hart and LongJohn in Port Harcourt Alex-Hart (2020). The difference was because the present study was among children, adolescents, and adults alike. More males than females were found in this study, similar to other earlier studies (Ogunkeyede et al., 2017; Animasahun et al., 2015). More than half of the subjects in the present study were in primary school, comparable to the findings from Port Harcourt (Alex-Hart and Long-John, 2020). Incubation study in this study ranges from 4 to 17 days comparable to (Mean= 7.34; SD= 4.20) days reported in another recent study (Alex-Hart and Long John, 2020).

Most of the subjects in the current study had generalized tetanus, similar to the report from Lagos Animasahun et al. (2015). Nail puncture is the most common injury preceding the development of tetanus in this study. Earlier studies mostly from Nigeria, and others from China and the United States have reported acute injury to the lower limb from either stepping on a nail, a wood with a cutting/sharp edge, or a cutlass (Animasahun et al., 2015; Ogunrin, 2009).

The case fatality of 7.72% in the present study is higher than the 4.10% reported by Animasahun et al. (2015) in Lagos. The difference may be explained by the fact that this study was among all age groups compared with the Lagos study which excluded the neonatal age group where mortality is known to be highest (Lambo and Anokye, 2013). This is lower than the 12.03% reported by Fatunde and Familusi in Ibadan (2001). The disparity may be attributed to variation in timing as the current study is more recent and could have benefitted from newer treatment protocols and newer inventions compared with the Ibadan study published two decades ago.

Spasms are the most common presentation in this study. Similar findings have been reported by several earlier authors (Ogunkeyede et al., 2017; Animasahun et al., 2016). The burden of tetanus (neonatal and post-neonatal) is still high in our environment. One out of twelve of these children loss their lives (higher among the neonatal age group).

This study being a retrospective study that relied on secondary data from the record system, is limited with cases of incompletely filled/documentation thereby reducing the numbers recruited. In conclusion, generalized tetanus was the commonest type in this study. Spasms were the commonest manifestation of tetanus. The common risk factors include nail puncture, road traffic accidents, and umbilical infections were the commonest risk factors leading to tetanus while the case fatality rate of tetanus was 7.72% in the current study. The findings in this study brought to the fore the need for more awareness creation and legislation by policymakers on halting the trend of this fatal disease through patronage of immunization by all.

AUTHOR CONTRIBUTION

HII: Conceptualisation, literature review, data analysis, manuscript writing, review of final manuscript, agreement to its submission and publication. AMC: Literature review, data collection, manuscript writing, review of the final manuscript, agreement to its submission and publication. LAA: Literature review, data collection, data analysis, manuscript writing, review of final manuscript, agreement to its submission and publication. AO: Literature review, data collection, manuscript writing, review of the final manuscript, agreement to its submission and publication. GT: Literature review, data collection, manuscript writing, review of the final manuscript, agreement to its submission and publication. BSO: Conceptualisation, literature review, data collection, data analysis, manuscript writing, review of final manuscript, agreement to its submission and publication.

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CONFLICT OF INTEREST

Nill.

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