

Descriptive Analysis of Snakebite Surveillance Data in North Bank West Region, The Gambia, 2017 – 2021

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Abstract

Background: Snakebites affect about 5.4 million people worldwide resulting in over 137,880 deaths per year. In Sub-Saharan Africa, the incidence of snakebite cases is generally underestimated despite the adverse effect of snakebite when it occurs. We therefore conducted this study to describe the incidence of snakebites in the North Bank West Region of the Gambia.

Methods: We reviewed snakebite surveillance data from 1st Jan 2017 to 31st Dec 2021 as recorded in health facility registers in North Bank West Region of The Gambia. Variables extracted were age, sex, date reported, health facility name, district of residence, and case outcome. We summarized the data by person, place, and time and results were presented using frequencies and proportions in tables, charts, graphs and maps.

Results: A total of 197 cases were reported, the median age was 20 (IQR: 13 -30) years, and males were 69.0% (136/197). 35.0% (69/197) of snakebite victims were between age group 10-19 years of age. There was a 5-year incidence rate of 31 snakebite cases per 100,000 population with a case fatality ratio of 4.1%. Jokadou District recorded the highest number of incidences (14 cases per 10,000) in 2017. 72.6% (143/197) of the snakebites occurred during the rainy season (June-October). The year 2020 recorded the highest incidence of snakebite in the region, 59 snakebite cases per 100,000 population.

Conclusion: There was a high incidence of snakebite cases recorded and Jokadou District recording the highest with the peak occurring during the rainy season. We recommend that the Regional Health Directorate work with health facilities to regularly organize health education activities for the communities, especially during the start of the rainy season.

Keywords: Snakebites, Incidence, Surveillance Data, Gambia, Regional

List of Abbreviations

CDC – Centre for Disease Control
DHIS2 – District Health Information System 2
DSO – District Surveillance Officer
MoH – Ministry of Health
NBWR – North Bank West Region
NTD – Neglected Tropical Diseases
PHO – Public Health Officer
RHD – Regional Health Directorate
SSA – Sub Saharan Africa

1. Introduction

Snakebite is an important but often neglected public health problem [1]. It is an injury caused by a bite from a snake, often resulting in puncture wounds inflicted by the animal's fangs and sometimes resulting in envenomation which is a life-threatening medical emergency when it occurs [2]. Globally, there were annual estimated 5.4 million snakebite cases and about 2.7 million have envenomation [3,4]. Envenoming by snakebites imposes a high burden worldwide and results in considerable social and economic impact [5]. About 137,880 deaths have been estimated annually with increasing amputations and other permanent disabilities per annum [6]. In Sub-Saharan Africa (SSA), it has

been estimated that the incidence of snakebite is around 314,000 cases and this causes about 5,000–10,000 fatalities each year [7]. The burden of snake envenoming is particularly worrisome in SSA due to the preference for traditional remedies as first-line treatment by snake-bitten patients [8,9]. The majority of bites occur among people with low socioeconomic status and have been linked to the occupations such as farming, fishing, animal rearing, and hunting [9,10]. Thus, some cases derived from victims busy with other works either in the community or nearby bush, hence, exposes many to high risk of snakebite [13].

In The Gambia, snakebite is included in the new Neglected Tropical Diseases (NTD) masterplan for 2022-2026 as enshrined in the global NTD roadmap 2021-2030. The aim is to reduce the burden of snakebite to 50% by 2030 [14]. Also, snakebite is part of the Integrated Disease Surveillance and Response (IDSR) system of the country therefore it is reported immediately it occurs.

In the region (North Bank West), snakebite cases are routinely reported by health care providers from community clinics, health centers, and regional hospitals. The reported cases are collated and recorded into the District Health Information System (DHIS2) on a weekly and monthly basis. Even though the collation and aggregation of data at the regional level is done, the snakebite data are not adequately analyzed. This leads to inadequate information on the magnitude, and distribution of snakebite cases in the region. Hence it is crucial to analyze the

available data to inform the Regional Health Directorate (RHD) and Ministry of Health (MoH) about the patterns of snakebite in the region for appropriate control and preventive measure to be instituted. We conducted this study at North Bank West Region (NBWR) to determine the magnitude, and distribution by place, person, and time from 2017-2021.

2. Methods

2.1 Study Setting

The study was carried out in the North Bank West Region (NBWR) which is one of Gambia's seventh (7th) administrative regions. The region is geographically located in the North Bank area of the Gambia. (Fig. 1). The region has a total population of 136,520 inhabitants, of which 70,990 are females and 20% (37,304) are children less than five years [15]. The region has three (3) administrative districts; Lower Nuimi, Upper Nuimi, and Jokadou with a tropical climate throughout the year as it is located near the river Gambia. Each of the districts is blessed with an enriched vegetation and fertile soil. These districts lie in the northern part of The Gambia, with a high tropical forest, dense vegetation rich in flora and wildlife and a dispersed population in the forest via forest roads, rendering residents particularly vulnerable. The main activities in the region are agriculture, petty trading and fishing. The wet season is the busiest of the two seasons in which farmers are mostly busy on their farming activities. The rains usually start in June and end in October with a duration of 4-5 months annually.

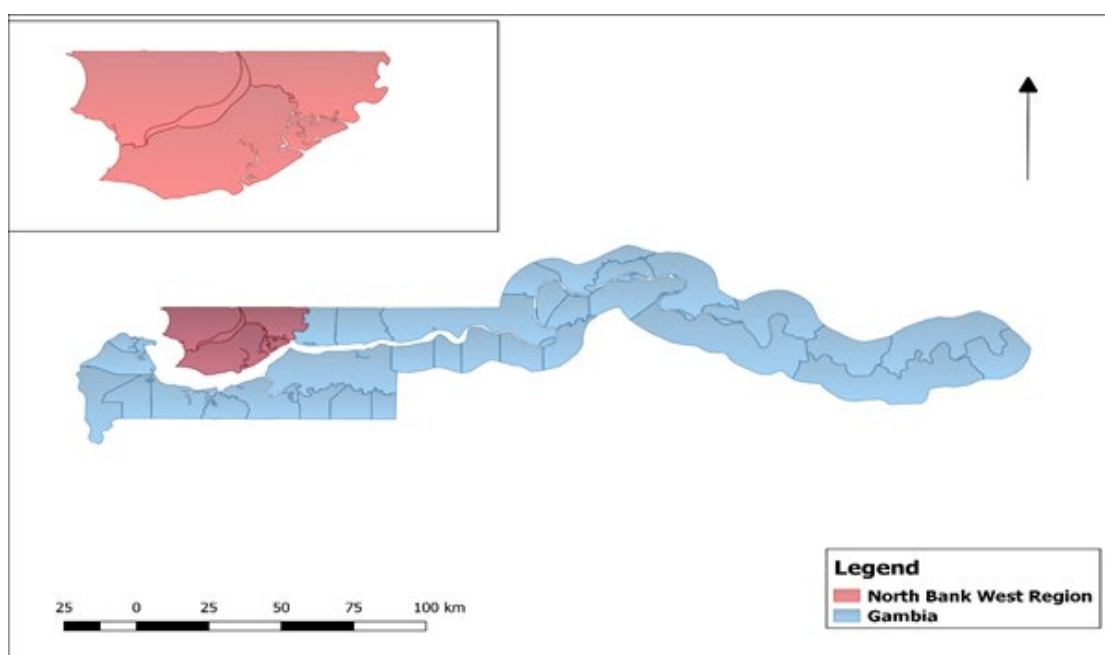


Figure 1: Map showing study area, North Bank West Region, The Gambia

There are fourteen health facilities across the region; one district hospital, four minor health centers and nine community clinics [14]. Each district has a District Surveillance Officer (DSO), who reports weekly surveillance data including snakebite. The RHD is responsible for the management of health data which are reported by health facilities on weekly and monthly basis.

2.2 Study Design

We conducted a retrospective review of snakebites in the NBWR of The Gambia, 2017 to 2021. All cases of snakebite were reported from public health facilities, though, all health facilities were included in the study. Health facilities without reported cases of snakebite within the period under review were also included in the study. Twenty-five snakebite events with incomplete data

were excluded from the study.

3. Data Collection/Source

Data was extracted from the health facility Outpatient Department (OPD) and Referral registers from 1st March to 7th March 2022 for the period 1st January 2017 to 31st December 2021. Variables that were collected include the number of cases reported, age, sex, month, year, case outcome, reporting health facility, and reporting districts of the cases.

3.1 Data Analysis

The extracted data were exported into Microsoft Excel 2010, cleaned and checked for completeness and data quality. Variables like age were analyzed using median and interquartile range (IQR) and age groups were established using the same interval. Sex was analyzed descriptively by person and place using Epi Info 7.2 and presented in frequencies and proportions using tables, graphs and charts. The distribution of cases and deaths were summarized using maps for each year under review. We calculated the incidence of snakebite by adding the number of snakebites recorded per year and divided by the mid-year population of each year using the Gambia's Ministry of Health projected population.

4. Ethical Issues

The Regional Health Directorate of North Bank West of The Gambia approved the use of the data for the study. Snakebite data was securely stored, handled as confidential, and utilized solely for the study. Health facility officers in charge were assured of data confidentiality. No informed consent was obtained from each subject hence personal identification information of the patients like name, phone numbers and physical address were not collected. There was no contact with the patient. However, all methods were carried out in accordance with relevant guidelines and regulations.

5. Results

A total number of 197 snakebite cases were reported during the period under review with a median age of 20 (IQR:13 -30) years. The age group of 10-19 years accounted for 35.0% (69/197) of all snakebite cases reported, followed by 20-29 years 23.9% (47/197). Majority of the cases 69.0% (136/197) were males. There was preponderance of male cases compared to female cases for each age category. Snakebite cases were mostly reported during the rainy season, 72.6% (143/197).

Snakebite Incidence by Place

Among the three districts, Jokadou District recorded the highest incidence of cases (14 cases per 10,000), except for 2020 which shows Lower Nuimi District equaling it (Table 1).

District	Incidence/10,000				
	2017	2018	2019	2020	2021
Jokadou	14	1	4	7	3
Lower Nuimi	2	1	2	7	2
Upper Nuimi	0	0	1	4	2
TOTAL	16	2	7	18	7

Table 1: Incidence of Snakebite reported per district in North Bank West Region, The Gambia, 2017 – 2021

The Quarterly Trend of Snakebite Cases in NBWR, 2017-2021

Snakebite cases were mostly reported between June 7.6% (15/197) to November 17.3% (34/197). This corresponds to the

period of intense farming activities (planting and harvesting). The peaks of snakebite cases were recorded during July 18.2% (36/197) and November 17.3% (34/197, Figure 2).

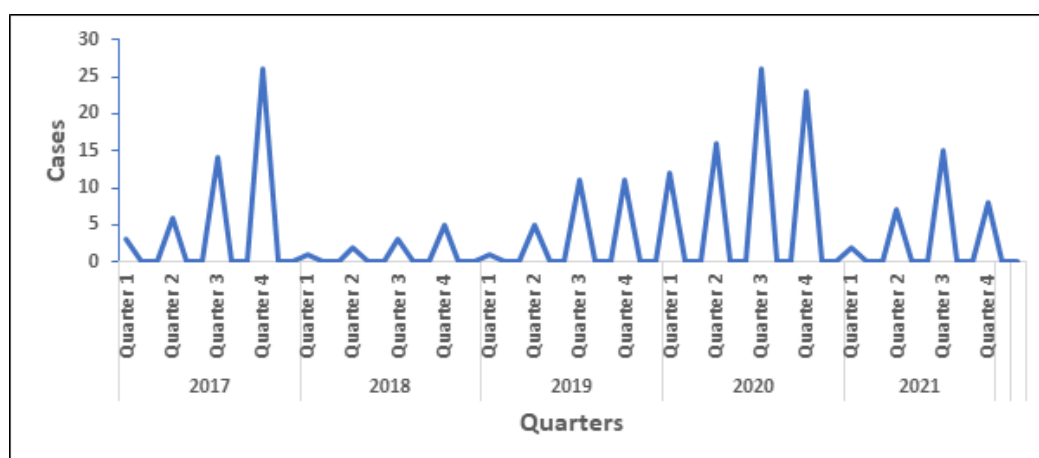


Figure 2: Quarterly distribution of snakebite cases, North Bank West Region, The Gambia 2017-2021

Of the 197 cases reported, all deaths were in Lower Nuimi District. there was a case fatality ratio of 4.1% (8/197) deaths, of

which 62.5% (5/8) were males. Overall, half of the deaths occur among the age group 40-59years, 50% (4/8) (Figure 3).

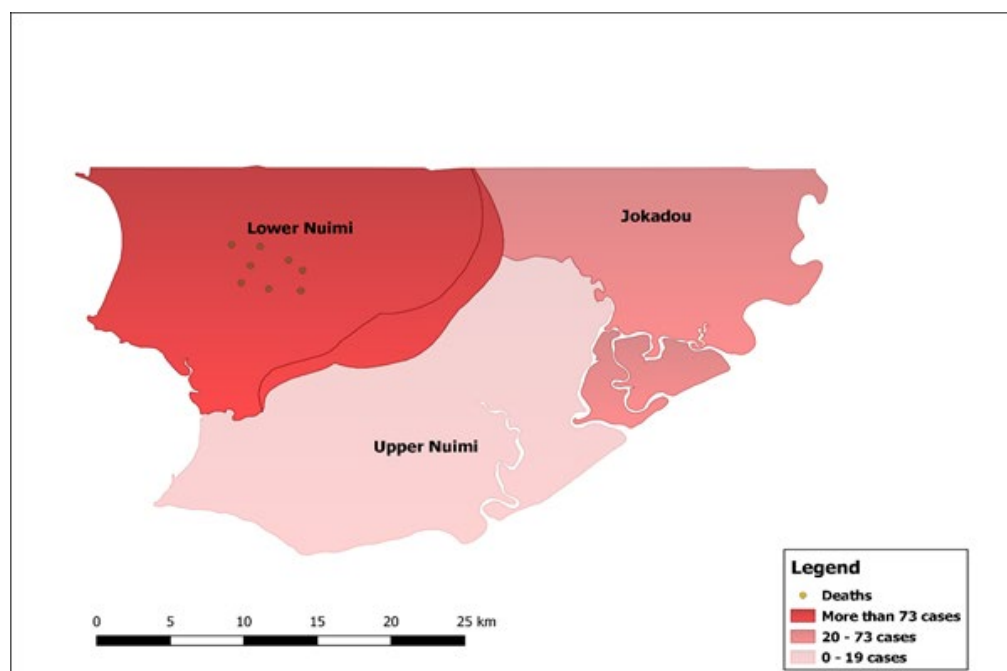


Figure 3: Snakebite mortality at North Bank West Region, The Gambia, 2017-2021

Incidence of Snakebite

Overall, 31 cases per 100,000 population were reported during the 5 years. The incidence was higher in 2020 with 59 cases per

100,000 population and the lowest incidence was 9 cases per 100,000 population in 2018 (Table 2).

Year	Mid-year Population	No. of cases	No. of deaths	Case fatality Ratio (%)	Incidence/100,000
2017	121,254	49	3	6.1	40.4
2018	124,164	11	2	18.2	8.9
2019	127,144	28	3	10.7	22.0
2020	130,196	77	0	0.0	59.1
2021	133,320	32	0	0.0	24.0
Total	636,078	197	8	4.1	31.0

Table 2: Incidence of snakebite at North Bank West, The Gambia, 2017 - 2021

6. Discussion

The study revealed that males made up the majority of snakebite cases, while young persons aged 10-19 years were the most vulnerable. There was a high incidence of snakebite cases recorded and Jokadou District recorded the highest with the peak occurring during the rainy season.

The study showed a high incidence of snakebite reported over the 5 years. This is higher than research conducted in Ghana's Volta and Oti Regions, which found a local annual incidence rate of 24 cases per 100,000 persons over 5 years [10]. Another study in Eastern Senegal Kedougou Region recorded a similar high incidence [16]. Some of the contributing factors to high incidence might be the population size of the region compared to the number of cases seen. However, looking at the geography of Sub-Saharan African countries, the incidence recorded in our study might be underestimated due to the fact that majority of

snakebite patients consider to seek treatment from traditional healers rather than health clinics, which contributes to an underestimation of snakebite occurrence in many African nations, including The Gambia [17].

In our study males constitute the majority of the cases. This finding is consistent with that of a similar study conducted in Nigeria of which 55 (75.3%) were males and a study conducted in Ghana's Western Region, which found 52% of cases to be males, (2) and two other studies in Saudi Arabia and West Bengal reporting male dominance [18-20]. The nature of men's activities in the region, such as crop farming and cashew farming, could be a contributing factor to the high frequency of snakebites among this gender.

Snakebites have been documented in people of all ages, however, the majority of those who have been bitten are between the

ages of 10-19 years. This finding contrasts with a similar study conducted in Cameroon, which reported that snake biting rates were greater among people aged 31-40 years (40.1%), as well as a study conducted in Kenya, which recorded a high peak of bites among children aged 1 to 15 years old and another study in West Bengal which reported the age group of ≤ 30 years (61.1%) reporting more cases [21,22]. People in this age category are frequently seen in the open and engage in active farming, putting them at risk of snakebite [23]. This has significant public health implications, as these age groups should be prioritized in any snakebite intervention because they are the most productive members of society. The majority of bites are likely due to their extensive involvement in crop farming and cashew harvesting and their presence during hard farm activity during the rainy season when schools are closed.

Our study also revealed that the Lower Nuimi district had the highest number of cases. The biggest proportion of cases was documented in this part of the region, which has a district hospital where referral from other health facilities is carried out. Another contributing factor to this high frequency could be attributed to the district's intense farming activity rendering residents particularly vulnerable to snakebites. However, Jokadou District reported a high incidence of 14 cases per 10,000 population in 2017 and an overall incidence of 58 cases per 100,000 within the 5-year period. This could be attributed to cases referred from other health facilities within the district because it is the sole health center in the area.

The peak of snakebite cases, according to our findings, occurred from July to November, during the rainy season and harvesting period. In contrast, a study conducted at two Ghanaian district hospitals indicated that the month with the highest number of snakebites was April (14.3%) [24]. According to another study by Musah et al, 83% of cases occur during the rainy season which is comparable to our findings [25]. Snakebites are more likely to occur during this period since it is the busiest season for farmers in The Gambia, particularly in the North Bank West Region, to engage in both cashew and agricultural farming operations, increasing the risk of snakebites.

The study recorded a case fatality ratio of 4.1% over the 5 years similar to a study in the Gambia, among 28 snakebite cases, a retrospective study conducted over 3 years reported a case fatality rate of 14.3% [26]. This is in contrast to a study conducted in Eastern Senegal, which reported a case fatality rate of nearly 1% (mortality = 0.24 deaths per 100,000 people), this study recorded a substantial case fatality rate [16]. Even though the country is yet to map out various snake types within the region, the high case fatality rate reported could be attributed to bites from venomous snakes being present within the environment of the region. The total number of deaths due to snakebite might be underestimated due to fact that not all deaths are reported to the health facility.

Therefore, for the improvement of surveillance, the Ministry of Health (MoH) should work with the other Ministries like Environment, Livestock and Forestry in mapping out the type of

snake existing in the environment and recommend the efficient and effective antivenom supply for any case at the health facility. They should also include more variables (bite site, duration from bite, occupation, mode of death, etc) to health facility registers and DHIS2 to allow for more accurate data analysis for planning and intervention.

7. Study limitations

Major limitation of the study includes; Inadequate information collected during health facility patient registrations, and DHIS2 not capturing some critical factors including the bite site and occupation of the patients are some of the study's weaknesses. Only individuals who reported to the health facility were eligible, our findings may not accurately reflect the true incidence of snakebite in the region.

8. Conclusion

A total of 197 snakebite incidences were recorded during the 5 years, with an average incidence of 31 per 100,000 population. Males made up the majority of snakebite cases, while young persons aged 10-19 years were the most vulnerable. Snakebite high incidences were most common in Jokadou District. Staff from regional and health facilities should raise community awareness about snakebites at the beginning of the rainy season and conduct periodic data analyses to determine the distribution of snakebites. There is also need for further research to describe more variables like location of person during incident, and mode of death (if any death occurs).

9. Recommendations

1. The Ministry of Health should include more variables (bite site, occupation, etc) in health facility registers and DHIS2 to allow for more accurate data analysis for planning and intervention
2. Regional Health Directorate should analyze data on the incidence, morbidity, and mortality of this neglected health problem and later shared to health facilities as feedback
3. The health facility staff should ensure routine surveillance, required reporting, and weekly follow-up are conducted to determine the scope of the problem in their catchment area
4. The health facility staff should regularly conduct health promotion and education on preventive measures in the communities to reduce risk factors related to snakebite

10. Declarations

Ethics Approval and Consent to Participate

The Regional Health Directorate of North Bank West of The Gambia approved the use of the data for the study. Snakebite data was securely stored, handled as confidential, and utilized solely for the study. Health facility officers in charge were assured of data confidentiality. The personal identification information of the patients like name, phone numbers and physical address were not collected. There was no contact with the patient.

Consent for Publication

Not applicable

Availability of Data and Materials

The data associated with this work is freely available and attached with this submission.

Conflict of Interest

The author declared no conflict of interest.

Funding

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Authors Contribution

MKON and PA conceptualized the study, and designed the methods,

MKON and AK conducted designed the methods, data analysis, interpretation and review

MKON, PA, CDU and MLF conducted data analysis, and review MKON and CDU review and finalized

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