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Original Research Article

PREVALENCE OF BOVINE TUBERCULOSIS BASED ON ABATTOIR DATA IN BENUE STATE, NIGERIA: A 5-YEAR RETROSPECTIVE STUDY

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ABSTRACT
Bovine tuberculosis (TB), a chronic zoonotic disease caused by *Mycobacterium bovis*, significantly affects cattle in Nigeria and poses a public health threat. This retrospective study assessed the prevalence of TB based on abattoir records from 2019 to 2023 in Benue State. An overall prevalence of 3.0% (2,790/92,866) was recorded. Annual prevalence increased from 1.83% in 2019 to a peak of 4.76% in 2022, then declined to 3.31% in 2023. Monthly prevalence ranged from 2.76% to 3.50%. Seasonal differences between the dry and rainy seasons were not statistically significant ($\chi^2 = 0.4423$; $p = 0.5060$). These findings highlight the persistence of bovine TB in the state and underscore the need for enhanced surveillance and further investigation into transmission dynamics in Nigeria.

Keywords: Abattoir, Bovine Tuberculosis, Nigeria, Prevalence, Public Health

INTRODUCTION
Tuberculosis (TB) is a chronic bacterial disease caused by members of the Mycobacterium tuberculosis complex, primarily *M. bovis* (Ahmad *et al.*, 2017, *Gelalcha et al.*, 2019). It is a chronic debilitating disease that affects cattle and a major zoonotic disease that affects humans (O'Reilly & Daborn 1995). Other domestic animals like goats, sheep, dogs and wild animals like buffalo, antelopes and wild boar are susceptible (WOAH, 2022). TB typically has a prolong course with clinical symptoms often take several years to manifest. The disease is accompanied by the formation of tubercles in tissues of the lungs, liver, kidneys, intestines, lymph nodes and other tissues where bacteria have localized (Shitaye *et al.*, 2006). Multiple foci of caseous necrosis in the lungs are pathognomonic of TB that can be observed during post mortem (Ramos *et al.*, 2015). Extra-pulmonary lesions like pin-point tubercles may be present in all organs of the gastrointestinal tract in generalized TB. The bacterium is hardy and can survive under harsh environmental conditions (Fine *et al.* 2011). Tuberculosis can infect both humans and animals through the consumption of infected carcasses, raw milk, through aerosol discharges; contact with contaminated manure and through watering sites (Silaigwana *et al.*, 2012).

Tuberculosis is widespread and an economically significant disease of cattle, negatively impacting livestock productivity particularly beef and milk output. It is responsible for economic losses due to deaths and processing costs associated with tuberculous animals and it affects the international trade of animals and animal products (De Garine-Wichatitsky *et al.*, 2013; Rodriguez-Campos *et al.*, 2014). TB is a major zoonosis of public health concern and is responsible for more deaths than any other microbial disease to date (Thoen *et al.*, 2016). The annual reports of the World Health Organization (WHO) declared that approximately 10.8 million new Tuberculosis cases were recorded in 2023 and Nigeria accounted for 4.6% of those cases (WHO 2024).

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In Nigeria, the livestock sector plays in key role in the economy and sociocultural aspect of the population with over 21 million herds nationally (FAOSTAT 2021). There is limited data for monitoring of TB in cattle in Nigeria and Benue state specifically in cattle and therefore, there is an urgent need to evaluate the magnitude of TB occurrence in cattle. Post-mortem slaughter reports are the most economically efficient method of detecting infections in cattle and therefore an important source of information on the epidemiology of TB (Shittu *et al*., 2013).

The objective of this study was to determine the prevalence of TB based on records from different abattoirs and slaughter points in Benue state from 2019 to 2023.

MATERIALS AND METHODS

STUDY AREA

Benue state (Figure I) lies in central Nigeria, between latitude 6º25′ N and 8º8′N, and longitude 7º47′E and 10ºE. It is bounded by Nasarawa state to the north, Taraba state to the East, Cross River, Ebonyi and Enugu to the south, Kogi state to the west and an international border with Cameroun Republic to the southeast. The state has 23 local government areas and lies within the Guinea Savannah region with an abundance of trees. The state experiences two seasons: dry season (October – March) and rainy season (April – September). Based on projections the state has a population of 6,141,300 inhabitants (City Population 2024). The majorities of the population resides in the rural areas and are predominantly farmers.

DATA SOURCE

Records of monthly abattoir reports from abattoirs in Benue state were retrieved from the Department of Livestock Services, Ministry of Agriculture and Food Security for the five-year period (2019-2023).

STATISTICAL ANALYSIS

All the data were entered and stored in Microsoft Excel 2021. The data was analyzed using Epi Info™ developed by the United States Centers for Disease Prevention and Control. The overall prevalence was calculated as the total number of cattle with TB lesions divided by the total number of cattle examined at post-mortem during the five-year study expressed in percentage. The annual prevalence was calculated as the number of cattle with tuberculosis lesions divided by the number of animals examined at post mortem during that particular year and expressed in percentage. The seasonal prevalence was determined by calculating the total number of TB lesions recorded for dry (October, November, December, January, February, March) and rainy (April, May, June, July, August, September) seasons, divided by the total number of cattle examined at post mortem during that particular season and expressed as a percentage. The data was also presented in descriptive statistics in the form of tables and figures. Chi Square analysis was used to test for statistical association between occurrence of TB during dry and rainy seasons.

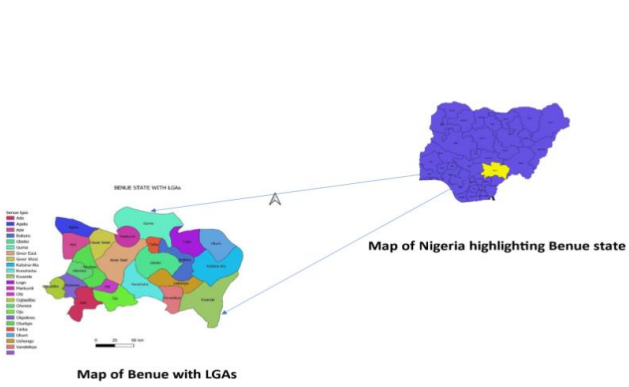

Figure I: Map of Benue state with Local Government Areas

RESULTS

Table I shows that 2020 had the least number of cases (349) while 2022 had the highest number of cases as well as the highest prevalence (4.76%) and 2019 had the lowest prevalence of 1.83%.

TABLE I: ANNUAL PREVALENCE OF BOVINE TUBERCULOSIS IN SLAUGHTERED CATTLE IN BENUE STATE, 2019 – 2023

Year	Cases	Slaughter figure	Prevalence %
2019	430	23462	1.83
2020	349	13450	2.59
2021	428	16282	2.63
2022	885	18548	4.76
2023	698	21088	3.31
Total	2790	92866	3.00

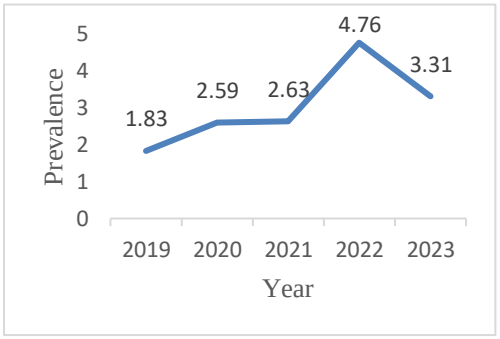

Figure II: Trend of tuberculosis in slaughtered cattle in Benue State, 2019 – 2023 shows the prevalence of tuberculosis increased from 1.8% in 2019, peaked at 4.76% in 2022 and dropped to 3.31% in 2023 over the course of the study period

TABLE II: MONTHLY FREQUENCIES OF AND PREVALENCE OF TUBERCULOSIS CASES IN BENUE STATE, 2019- 2023

Month	TB cases	Total slaughter	Prevalence %
January	286	9816	2.91
February	264	9575	2.76
March	252	7693	3.28
April	189	6727	2.81
May	183	6584	2.78
June	207	6566	3.15
July	194	6434	3.02
August	204	6599	3.09
September	207	7073	2.93
October	253	7224	3.50
November	240	7505	3.20
December	311	11077	2.81

In table II, May recorded the least number of cases (183) while December had the highest number of cases (311) and the prevalence was lowest in February (2.76%) while October had the highest prevalence (3.50%) during the 5-year study period.

TABLE III: ASSOCIATION OF SEASON WITH PRESENCE OF TUBERCULOSIS IN SLAUGHTERED CATTLE IN BENUE STATE, 2019 - 2023

Season	Present	Absent	Prev. %	Chi Square	p-value
Dry season	1606	51284	3.13	-	
Rainy season	1184	38799	3.05	0.4423	0.5060

Table III describes the seasonal association with the presence of tuberculosis. In this study the prevalence for dry and rainy seasons are 3.13% and 3.05% respectively for the 5-year study.

DISCUSSION

In Nigeria, population studies of tuberculosis in cattle are prohibitive due to financial cost and the absence of regional laboratories thus resulting in a knowledge gap in the epidemiology and public health information. Abattoir meat inspection is important in tuberculosis surveillance and monitoring in cattle. Reliance on post-mortem diagnosis of tuberculosis remains the best option in the absence of well-equipped laboratories in developing countries including Nigeria. Meat inspection data are a good source of information which can play an important role in the epidemiology, surveillance and monitoring of tuberculosis but has not fully been utilized in Benue state. In this context, our study aimed at determining the magnitude of tuberculosis in Benue State using abattoir reports from January 2019 to December 2023. Information available to us suggests this is the first study conducting the prevalence of tuberculosis from abattoir reports in Benue state.

Based on the detailed reports, the overall prevalence of bovine tuberculosis in cattle in this study of 3.0% over 5 years was in the range of similar reports across the country which reported prevalence between 0.54% and 6.1% (Aliyu *et al*., 2009, Ajogi *et al.*, 2012; Sa'idu *et al*., 2017). There was an increase in the prevalence from 2019 to 2022 before a decrease in 2023, which could be attributed in part to The Regional Disease Surveillance Systems Enhancement (REDISSE), a World Bank – Federal Government of Nigeria intervention project that supported surveillance activities but scaled down activities in 2023. Tuberculosis showed minor monthly fluctuations throughout the study period ranging from 2.76% to 3.50% which was not statistically significant (p>0.05). This finding is in agreement with previous report by Nwanta *et al*. (2011) which showed that variation in seasonal prevalence of tuberculosis in cattle was not significant. However, Pollock & Neill (2002) and Ahmed *et al*. (2013) reported a strong association between season and tuberculous lesions but the reason for the seasonal variations was not stated.

CONCLUSION

In conclusion, the findings of the present abattoir reports have provided baseline data for monitoring tuberculosis in cattle in Benue state, Nigeria. The results demonstrated that tuberculosis prevalence was in the range of previous reports from abattoirs within the country and the need for enhanced surveillance, farm monitoring and creating awareness for farmers. However, the lack of biodata (age, sex, breed, and source) on the monthly reports, meant analysis was not tested for associations with these risk factors and the need for further research on the spatial distribution.

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