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Retrospective study of bovine tuberculosis, cysticercosis and fasciolosis in cattle slaughtered at Jos abattoir, Plateau State, Nigeria

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Abstract

Abattoirs play a critical role in ensuring meat safety and serve as an important point for monitoring zoonotic diseases. This study assessed the prevalence of bovine tuberculosis, bovine fascioliasis and bovine cysticercosis in cattle slaughtered at the Jos abattoir, Plateau State, Nigeria. A five-year (2020–2024) retrospective review of slaughter records covering 44,401 cattle was conducted. The highest annual slaughter occurred in 2022 (9,637) while the lowest was in 2020 (8,291). The overall prevalence rates were 0.28% for bovine tuberculosis, 12.4% for bovine cysticercosis and 13.4% for bovine fasciolosis. Seasonal trends showed peak cases of bovine tuberculosis in August (0.43%), October (0.42%) and November (0.40%); bovine cysticercosis, in March (15.26%), July (15.52%), and August (15.37%); and bovine fasciolosis in March (15.65%), August (14.82%) and September (14.80%). These findings highlight the need for enhanced abattoir-based surveillance to support zoonotic disease control and protect public health.

Keywords: Bovine tuberculosis, Cysticercosis, Fasciolosis, Jos abattoir, Prevalence, Retrospective study, Slaughtered Cattle

Introduction

Abattoirs are officially registered facilities where veterinary officers conduct antemortem and postmortem inspections of food animals. These routine inspections are essential to ensure that the

meat consumed by the public is of the highest quality and free from zoonotic diseases that pose risks to consumer health and food safety (Adebowale *et al*., 2022). Beyond their role in safeguarding meat hygiene, abattoirs provide crucial opportunities for detecting prevalent food animal diseases through systematic slaughterhouse inspections and serve as valuable sources of data for monitoring animal disease outbreaks and surveillance (Pascual-Linaza *et al.,* 2017; Fasanmi *et al*., 2018). Nonetheless, abattoirs can also act as hubs for the dissemination of meat-borne zoonoses either through direct human contact with infected animals or indirectly via the consumption of contaminated meat (Fasanmi *et al.,* 2018). Meat inspection records are valuable epidemiological tools, widely applied to evaluate the prevalence and economic impacts of animal diseases globally (Ezatpour *et al.,* 2015; Jaja *et al*., 2017). Hence, an abattoir plays a crucial role in the meat supply chain, impacting both local food security and the regional economy. Nigeria is among the leading sub-Saharan African nations in cattle production, and beef makes up a significant percentage of the total portion of meat consumed in the country (Kubkomawa, 2017). However, diseases such as bovine tuberculosis (BTB), bovine cysticercosis (BC) and bovine fasciolosis (BFAS) remain important causes of carcass condemnation, posing significant risks to public health and contributing to economic losses in the meat supply chain (Okeke *et al*., 2014; Nwankwo *et al*., 2019; Bikom *et al*., 2021; Banwo *et al*., 2023; Danladi *et al*., 2024).

BTB, caused mainly by *Mycobacterium bovis*, is a chronic zoonotic disease transmitted through aerosols, close contact, or consumption of contaminated meat and milk (El-Sayed *et al*., 2016). The disease has major economic and public health implications, accounting for up to ₦24 million in annual losses from condemned carcasses in Nigeria (Kwaghe *et al.,* 2015; Gwaka & Dubihlela, 2020). In 2024, Nigeria accounted for 4.8% of global incident TB cases. It remains one of the top eight countries contributing to two-thirds of the global TB burden. It is classified as one of the 30 high-burden TB countries, and it ranks sixth globally and first in Africa among high-burden TB nations (Federal Ministry of Health, 2024; World Health Organization, 2025). Abattoir-based surveillance remains a critical component of BTB monitoring and control (Ramanujam *et al*., 2022). There are no reliable national TB species-level data for Nigeria. However, local molecular and surveillance studies (2020–2025) detect *Mycobacterium bovis* among a minority of human TB isolates and show wide geographic variation; published study samples suggest a range from low single-digits up to about 15–17% in certain datasets, but a precise national percentage is not currently available (Damina *et al*., 2023).

BC, caused by the larval stage of *Taenia* saginiata, is acquired when cattle ingest Taenia eggs from contaminated environments (WHO, 2023). The presence of *Cysticercus bovis* in meat reflects poor sanitation, and Nigeria reports a 2–5% prevalence (Karshima *et al.,* 2013). The disease is of zoonotic and economic significance, with the WHO classifying taeniasis/cysticercosis as a neglected tropical disease (WHO, 2023).

BFAS, caused by *Fasciola hepatica* and F. gigantica, is a common trematode infection in ruminants, leading to liver condemnation and productivity losses (Nyindo & Lukambagire, 2015; Yatswako & Alhaji, 2017). Nigerian studies have reported prevalence rates ranging from 15% to 50% (Jeremiah & Folorunsho, 2019; Okonkwo *et al.,* 2023). Abattoir surveillance provides essential data for assessing the prevalence and seasonal variations of such infections. This study analyzes retrospective records of BTB, BC, and BFAS in cattle slaughtered at the Jos abattoir, Plateau State, Nigeria (2020–2024), to determine their prevalence patterns, seasonal variations, and contributing factors.

Materials and Methods

Study area

The study was conducted at the Jos abattoir, located in Jos North Local Government Area (LGA), Plateau State, Nigeria. Plateau State covers 26,899 km² and is divided into 17 LGAs (Figure 1).

The state lies between latitudes 8.50° to 10.46°N and longitudes 8.20° to 10.36°E. The climate is tropical in nature and characterized by a cold period between November and February. The vegetation type is Guinea savannah, which is suitable for livestock, poultry, and crop production. Agriculture is the predominant occupation, with an estimated livestock population of 1.3 million cattle, 1.8 million goats, and 1.2 million sheep. The Jos abattoir, supervised by the Veterinary Services Division of the Plateau State Ministry of Agriculture, serves as the major centre for livestock slaughter in the Jos metropolis.

Ethical considerations

Approval to access abattoir records was obtained from the Veterinary Services Division, Ministry of Agriculture, Plateau State. In addition, verbal consent

was obtained from the head of the Jos abattoir before data collection commenced.

Study design and data collection

A retrospective study was conducted using abattoir records obtained from the Veterinary Services Division, Ministry of Agriculture, Plateau State, covering five years (2020 to 2024). The records were reviewed to determine the prevalence and distribution of three major zoonotic diseases in cattle (BTB, BC and BFAS), slaughter and postmortem inspection reports. It also includes the total number of cattle slaughtered, cases of suspected BTB, BC, and BFAS, as well as animal characteristics (breed, sex, and age), and temporal factors (month, season, and year of slaughter).

BTB diagnosis was based on the observation of tuberculous-like lesions by certified veterinarians, typically in the lungs, and others. Cases of BC and BFAS were identified through carcass and viscera inspection in accordance with standard abattoir procedures.

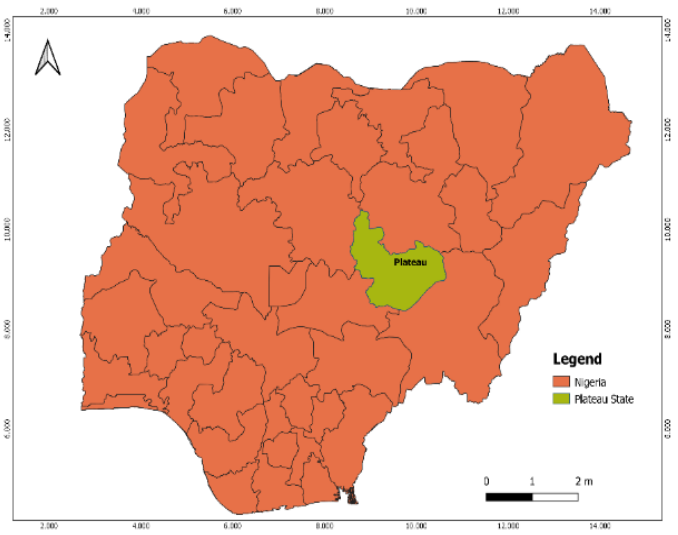

Figure 1: Map of Nigeria showing Plateau State (Drawn with QGIS Version 3.44.4)

Data management and analysis

For data analysis, cattle were categorized by sex (male and female), age (young and adult), and breed. Seasons were defined as wet (April to October) and dry (November to March). The cleaned dataset was analyzed using R Studio version 4.5.0. Descriptive statistics were computed. Annual, monthly, and seasonal prevalence distributions were presented as frequency tables and graphical plots. Associations between categorical variables (year, month, season, sex, age, and breed) and disease occurrence were tested using the Chi-square test for univariate analysis.

The authors wish to declare the completeness of the abattoir records used in this study before describing and analysing the data.

Result

Demographic data

From 2020 to 2024, a total of 44,401 cattle were slaughtered at the Jos abattoir. Of these, more females (55.78%, 24,693/44,266) were slaughtered compared to males (44.22%, 19,573/44,266). The majority of the breeds were white Fulani (79.3%, 34,683/ 43,749), while Red Bororo accounted for 20.41% (9,066/44,401). Adults comprised 90.43% (39,594/43,784) of slaughtered cattle, while young animals represented only 9.57% (41,90/43,784). Records with incomplete demographic information were excluded from analysis (Table 1). Data for age and sex were then excluded from further analysis due to missing data.

Temporal distribution of slaughtered cattle

Monthly distribution showed the highest slaughter figures in November (10.0%, 4,460) and the lowest in June (6.5%, 2,894) (Table 2). Annual records indicated that the highest number of cattle was slaughtered in 2022 (9,637), followed by 2021 (9,225), while the lowest occurred in 2020 (8,291). Seasonal analysis revealed that more cattle were slaughtered during dry season (57%, 25,461) compared to the wet season (43%, 18,940) (Table 3).

Prevalence of zoonotic diseases

Between 2020 and 2024, these three major zoonoses were reported: BTB, BC and BFAS. Of the 44,401 cattle slaughtered, the overall prevalence was 0.29% (128/44,401) for BTB, 12.4% (5545/44,401) for BC, and 13.4% (5966/44,401) for BFAS (Table 4).

Table 4: Prevalence of bovine tuberculosis, bovine cysticercosis and bovine fasciolosis in cattle slaughtered in Jos abattoir from 2020 to 2024.

Monthly disease distribution

BTB prevalence peaked in August 0.43% (17/3,935), October 0.42% (18/4,249) and November 0.40% (18/4,460), while the lowest prevalence was recorded

Table 1: Demographic data of slaughtered cattle in Jos abattoir between 2020 to 2024

Demographics	Numbers	Percentage (%)
Age		
Adult	39,594	90.43
Young	4,190	9.57
Total	43,784	
Missing data	617	
Sex		
Male	19,573	44.22
Female	24,693	55.78
Total	44,266	
Missing data	135	
Breed		
White Fulani	34,683	79.28
Red Bororo	9,066	20.72
Total	43,749	
Missing data	652	

Table 2: Cumulative monthly record of cattle slaughtered in Jos abattoir 2020-2024

Month	Total Number slaughtered (N)	Percentage (%)
January	3273	7.37
February	3305	7.44
March	3533	7.96
April	3399	7.66
May	3166	7.13
June	2894	6.52
July	3872	8.72
August	3935	8.86
September	3946	8.89
October	4249	9.57
November	4460	10.04
December	4369	9.84
Total	44401	

Table 3: Annual record of the number of cattle slaughtered in different seasons at the Jos abattoir 2020-2024

Year	Number of cattle slaughtered	Percentage (%)
2020	8291	18.67
2021	9225	20.77
2022	9637	21.70
2023	8391	18.89
2024	8857	19.94
Total	44401	
Season		
Wet	18,940	43
Dry	25,461	57
Total	44401	100

Table 4: Prevalence of bovine tuberculosis, bovine cysticercosis and bovine fasciolosis in cattle slaughtered in Jos abattoir from 2020 to 2024

Disease	Number of cases	Percentage (%)	Total
Bovine Tuberculosis	128	0.29	44,401
Bovine Fasciolosis	5966	13.44	44,401
Bovine cysticercosis	5545	12.49	44,401

in July, 0.03% (1/3,872). BC prevalence was highest in July 15.52% (601/3,872), August 15.37% (605/3,935), and March 15.26% (539/3,533), and lowest in December 8.93% (390/4,369) and November 9.98% (445/4,460). Bovine fasciola spp. showed peaks in March at 15.65% (553/3,533), August 14.82% (583/3,935) and September 14.80% (584/3,946), with the lowest prevalence in December 10.30% (450/4,369) and January 11.79% (386/3,273) as indicated in Table 5: Months of slaughter were significantly associated with all three diseases ($p<0.05$).

Annual trends

From 2020 to 2024, BC prevalence declined markedly from 22.87% to 2.52%, and BFAS prevalence fell from 20.9% to 2.88% (Table 6). In contrast, BTB prevalence remained low but showed a slight increase, from 0.23% in 2020 to 0.45% in 2023, with 0.42% recorded in 2024. Years of slaughter were significantly associated with BFAS prevalence ($p < 0.05$) but not with BTB and BC ($p > 0.05$) (Table 6).

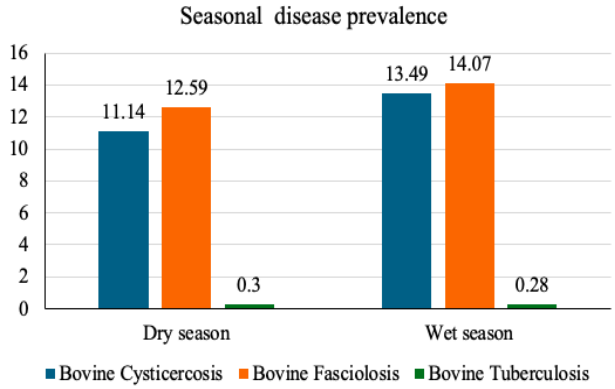

Figure 2: Bar chart showing Disease prevalence in different seasons

Seasonal distribution of diseases

BTB prevalence was slightly higher in the dry season (0.30%) compared to the wet season (0.28%). In contrast, BC and BFAS were more prevalent during the wet season (13.5% vs. 11.1% and 14.1% vs. 12.6%, respectively). Seasonal differences were statistically significant for BFAS ($p < 0.05$), but not for BTB and BC ($p > 0.05$) (Table 7, Figure 2).

Discussion

Abattoirs play a crucial role in the farm-to-fork continuum, serving as both slaughter points and important surveillance centres for livestock diseases (Banwo *et al*., 2023). Analysis of Jos abattoir records (2020–2024) showed that the majority of slaughtered cattle were adult females, particularly of the White Fulani breed. This aligns with national patterns where older or less productive female animals are commonly culled (Bikom *et al*., 2021; Adebowale *et al*., 2022). Slaughter numbers were higher during the dry season, which is contrary to the findings of

Adebowale *et al*.(2022), where more animals were slaughtered in the wet season.

Among the three diseases studied, BTB holds the highest public-health significance because of its zoonotic potential and long-standing endemicity in Nigeria. Although the recorded prevalence in this study was relatively low, similar to findings from Abuja (Adamu *et al*., 2021) and lower than values reported in Enugu (Nwanta *et al*., 2011) and Maiduguri (Lawan *et al*., 2020), where its presence remains a public-health concern. The slightly higher occurrence in the dry season was not statistically significant, differing from some earlier reports (Oluwasile *et al*., 2013). The year-to-year

Table 5: Cumulative monthly frequency of diseases in slaughtered cattle in Jos abattoir from 2020 to 2024 N (%)

Month	Number of cattle slaughtered	No of bovine tuberculosis cases (%)	No of bovine fasciolosis cases (%)	No of bovine cysticercosis cases(%)
Jan	3273	6(0.18)	386(11.79)	367(11.21)
Feb	3305	10(0.30)	441(13.34)	369(11.16)
Mar	3533	13(0.37)	553(15.65)	539(15.26)
Apr	3399	10(0.29)	489(14.39)	464(13.65)
May	3166	6(0.19)	430(13.58)	358(11.31)
Jun	2894	6(0.21)	396(13.68)	340(11.75)
Jul	3872	1(0.03)	552(14.26)	601(15.52)
Aug	3935	17(0.43)	583(14.82)	605(15.37)
Sep	3946	14(0.35)	584(14.80)	581(14.72)
Oct	4249	18(0.42)	548(12.90)	486(11.44)
Nov	4460	18(0.40)	554(12.42)	445(9.98)
Dec	4369	9(0.21)	450(10.30)	390(8.93)
P value		0.0008	0.000	0.000

Table 6: Annual prevalence of diseases in cattle slaughtered in Jos abattoir 2020-2024

Year	No of cattle slaughtered	Number of cases of bovine Tuberculosis (%)	Number of cases of bovine fasciolosis (%)	Number of cases of bovine cysticercosis (%)
2020	8291	19 (0.23)	1733 (20.9)	1896 (22.87)
2021	9225	19 (0.21)	1709 (18.53)	1674 (18.15)
2022	9637	15 (0.16)	1494 (15.5)	923 (9.58)
2023	8391	38 (0.45)	775 (9.24)	829 (9.88)
2024	8857	37 (0.42)	255 (2.88)	223 (2.52)
P-Value		0.51	0.01	0.08

Table 7: Disease prevalence in slaughtered cattle in Jos abattoir wet and dry season 2020-2024

Diseases	Number of cases in dry season N=18,940 (%)	Number of cases in wet season N=25,461 (%)	P value
Bovine tuberculosis	56(0.30)	72(0.28)	0.51
Bovine fasciolosis	2384(12.59)	3582(14.07)	0.01
Bovine cysticercosis	2110(11.14)	3435(13.49	0.08

fluctuation, especially the peak in 2023, may reflect environmental conditions and variations in animal sourcing (Awah-Ndukum *et al*., 2010). Despite the relatively low prevalence, continued abattoir-level surveillance remains essential.

Fasciolosis prevalence in this study was higher than that reported in some regions (Adebowale *et al*., 2022; Ola-Fadunsin *et al*., 2020) but comparable to findings from Zamfara (Ahmad *et al*., 2020). The higher burden during the wet season underscores the role of rainfall in maintaining habitats for snail intermediate hosts (Njoku-Tony, 2011). The seasonal peaks observed in March, August, and September correspond to periods when animals graze on recently flooded or marshy pastures (Dauda *et al*., 2025). The decline noted in 2024 may reflect improved anthelmintic use or better farm management practices. Persistent fasciolosis suggests the need for strategic deworming and farmer education.

The prevalence of cysticercosis was higher than that reported in some Nigerian settings (Ola-Fadunsin *et al*., 2020) but lower than figures from other regions (Kadir *et al*., 2025). The seasonal pattern, with higher values recorded during the wet season, may result from improved egg survival and pasture contamination. The steady decline from 2020 to 2024 could be associated with improved hygiene practices and increased awareness among cattle traders and butchers. Although its prevalence was lower compared with fasciolosis in this study, cysticercosis remains important due to its zoonotic nature and the significant economic losses it causes through carcass condemnation (Arbabi *et al*., 2018). Control efforts must focus on improved sanitation, strengthened meat inspection, and community health education. This study confirms the persistence of bovine tuberculosis, fasciolosis, and cysticercosis among cattle slaughtered at the Jos abattoir, Plateau State, with notable seasonal peaks during the rainy season. These findings highlight ongoing zoonotic risks linked to inadequate farm-level control, poor sanitation, and suboptimal meat inspection practices. Strengthening BTB surveillance, implementing routine deworming programs, and promoting awareness on cysticercosis prevention are essential for reducing public health risks. Additionally, instituting compensation schemes for condemned carcasses could enhance compliance with meat inspection regulations. Overall, these results provide evidence-based guidance for policy interventions aimed at improving meat hygiene, animal health, and zoonotic disease control in Nigeria.

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Conflict of Interest

The authors declare no conflict of interest.

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