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Prevalence of bovine tuberculosis lesions in cattle slaughtered in the Federal Capital Territory Abattoirs, Nigeria - A short communication

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Abstract

Bovine tuberculosis (bTB) is a devastating disease that affects animals and humans alike globally. It is one of the most important illnesses of cattle with a worldwide distribution. The objective of this study was to provide baseline information on the prevalence of bTB using gross pathological lesions in the government abattoirs in the Federal Capital Territory in Nigeria. This retrospective study was conducted in three Abattoirs (Karu, Kubwa, and Gwagwalada) in the Federal Capital Territory (Abuja) of Nigeria from 2015 to 2019. Records were obtained from the veterinary record book domiciled in various offices in the abattoir. A total of 227,395 slaughtered heads of cattle were examined at postmortem during the study period and 1704 (0.75%) had tuberculous lesions. A total of 341 cases of bTB was recorded per year in this study with the highest cases recorded in 2018 (383).The highest number of cases (190) and consequently the highest prevalence (1.03%) was recorded in June, while the least number of cases was recorded in January (87) also with a corresponding low prevalence of 0.45%.The total occurrence of bTB cases in Abuja during the rainy (wet) season was higher (1177) than during the dry season (527) ($P< 0.0001$). Bovine tuberculosis in the Federal Capital Territory is endemic which a prevalence of 0.75%. There was a

significant increase in of bTB cases during the wet season than in the dry season between 2015 and 2019.

Key words: Abuja, location, *Mycobacterium bovis*, season

Introduction

Bovine tuberculosis (bTB), caused by *Mycobacterium bovis*, is a corrosive, insidious, debilitating, and contagious infectious disease of domesticated and wild animals, and humans. It has a worldwide distribution and is one of the most important illnesses of cattle. It spreads extensively within animal populations before clinical signs and the effects of the disease become visible (Dibaba *et al*., 2019). The World Organization for Animal Health (OIE) listed bTB to be a notifiable disease because of its socioeconomic and public health importance, especially in developing countries (Benkirane 1998; Skuce and Neill 2004).

The disease is characterised by the development of tuberculous granulomas in the lungs, lymph nodes, intestines, liver, kidneys and other organs in the various species, thereby affecting their health that is eventually detrimental to their productivity (Ayele *et al.,* 2004; Dibaba *et al*., 2019). It is also a zoonotic disease of significant public health importance, following human contact with infected animals (Michel *et al*., 2010), and consumption of *M. bovis* contaminated, unpasteurised milk and milk products (Cosivi *et al*., 1998). Other zoonotic routes are through venereal transmission *via* artificial insemination (Wentik *et al*., 2000), and air borne transmission (Vekemans *et al*., 1999; WHO, 2009). bTB is one of the most challenging endemic diseases because of its complex epidemiology, surreptitious nature, and the several hosts that sustain the infection within ecosystems. It is generally considered to be a neglected zoonotic disease, which is increasingly attracting the international community attention because of the quest eradicating human tuberculosis in the foreseeable future (Dibaba *et al*., 2019).

Many factors make it extremely difficult to determine the extent of zoonotic tuberculosis (TB) in cattle populations. These include lack of and the complexity of the required routine diagnostic procedures; and the importance of obtaining appropriate samples for culturing *M. bovis* (Muller *et al*., 2013).

In many African countries, abattoir records are the only sources of information about the occurrence and prevalence of bTB in a given locus. Abattoir meat inspection provides useful insights into the prevalence of many animal diseases including bTB (FAO 1994; Cassidy *et al.,* 2008), although by their nature, abattoirs records are limited in detail in the data they provided (Aliyu *et al.,* 2009), but their importance

cannot be over emphasized. In Nigeria, most of the studies were based on gross pathological examination at the abattoir (Ejeh *et al.,* 2013). Okeke *et al*. (2016) reported 11% bTB lesions in cattle slaughtered at Jos abattoir Plateau State, 12.73% peak prevalence in Yola, Adamawa (Ejeh *et al*., 2013), 4.47% in Oyo (Jerkins *et al*., 2011) and 0.54% in Ogbomoso, Oyo State (Ameen *et al*., 2008). So far this information is not available from the abattoirs in Federal Capital Territory of Abuja. This study aimed at providing baseline information on the prevalence of bTB using gross pathological lesions in the government abattoirs of the Federal Capital Territory, Nigeria.

Methods

Study area

This study was conducted in three abottroirs located in the surbabs of Abuja, the capital city of the Federal Capital Territory (FCT) of Nigeria. Abuja was established in 1976 from four states namely old Kwara, Niger, Kaduna and Plateau States with the bulk of landmass carved out of Niger State. It is located within latitude 7° 25' N and 9° 20° North of the Equator and longitude 5° 45' and 7° 39'. The Federal Capital Territory has a landmass of approximately 8,000 Km^2, and it is situated within the Savannah region with moderate climatic conditions with an average annual rainfall of 1389 mm. The FCT experience two distinct seasonal variations, with the rainy season beginning from April and ending in October while the dry season commence from November March (Anon, 2008). Federal Capital Territory consists of six area councils which have at least one abattoir or slaughter house.

Statement of ethics

The protocol for this study was approved by the University of Abuja ethics committee on animal use (UAECAU/2020/01. Verbal consent was obtained from the officers in charge of the respective abattoirs.

Study design

A retrospective study on bTB cases recorded in Karu, Kubwa and Gwagwalada abattoirs in the (FCT) were carried out from 2015 to 2019. Records were obtained from the veterinary meat inspection record books in these abattoirs. Slaughtered cattle examined at postmortem and found with typical tuberculous lesions at the abattoirs were considered as cases for the study. Post mortem examinations were carried out by veterinarians in the three surveyed abattoirs as described by Corner (1994) and Grist (2008). In each abattoir, we collected the monthly records of the total slaughtered cattle annually and the number of animals adjudged to have tuberculous lesions at the postmortem examination.

Data analysis

Descriptive and analytic statistics were used to analyse the obtained data. The monthly prevalence of the disease was calculated as the total number of bTB lesions detected in a month divided by the total number of cattle slaughtered that month, while the annual prevalence was determined as the total number of bTB lesions detected in a year divided by the total number of cattle slaughtered that year, all expressed in percentage. The overall prevalence was calculated as the total number of cases detected over the total years under investigation divided by the total number of cattle slaughtered for all the years, presented in percentage. The seasonal prevalence was also determined by calculating the number of cases recorded during the rainy season (April to October) and the dry season period (November to March), both presented in percentage. Data obtained were further subjected to chi square, odds ratio and ANOVA for the establishment of significance using SPSS statistic software version 23.

Results

Prevalence of bovine tuberculosis (bTB) cases in Abuja

A total of 227,395 cattle were slaughtered and examined postmortem from 2015 to 2019. A low proportion (0.75%, n=1704) tuberculous lesions was identified. An average of 341 bTB cases was recorded per year, with the highest cases recorded in 2018 (n=383) and the least in 2015 (n=316). Although the highest prevalence was recorded in 2015 (0.8%) and the least in 2019 (0.7%), generally the annual prevalence did not vary significantly ($p > 0.05$) (Table1).

Table 1. Prevalence of bovine tuberculosis (bTB) cases in abottoirs in Abuja (FCT) surburbs in Nigeria during 2015 to 2019

Year	bTB cases	Slaughtered cattle	Annual Prevalence (%)
2015	316	39418	0.80
2016	344	45301	0.76
2017	329	44870	0.73
2018	383	50468	0.76
2019	332	47338	0.70
Pooled	1704	227395	0.75

Monthly distribution of bTB cases

Generally, an average of 18,950 cases was slaughtered monthly during the study period. The highest number of cases was 190 and consequently the highest prevalence

of 1.03% was recorded in June, which was significantly different (P<0.001) from the least number of cases (87) recorded in January, with a corresponding low prevalence of 0.45% (Table 2).

Table 2. Monthly distribution of bTB cases in Abuja between 2015 and 2019

Month	bTB cases	Slaughtered cattle	Monthly prevalence (%)
Jan	87	19136	0.45
Feb	84	17797	0.47
Mar	110	19713	0.56
Apr	164	17742	0.92
May	148	17744	0.83
Jun	190	18470	1.03
Jul	181	18610	0.97
Aug	169	18895	0.89
Sep	149	18647	0.80
Oct	176	19450	0.90
Nov	137	19989	0.69
Dec	109	21202	0.51
Pooled	1704	227395	0.75

Seasonal pattern of occurrence of bTB

The total number of bTB cases in Abuja during the rainy (wet) season (April-October) in the period 2015-2019 was 1,177 while during the dry season (November-March) it was 527, which was statistically significant (P< 0.001). Bovine tuberculosis cases are more prevalent in the rainy season, 0.91%, than in the dry season, 0.54%, indicating a 5.9 times likelihood of cases occurring in the wet season than in the dry season in the FCT (OR=5.9, 95% C. I. 4.9 – 7.3) (Table 3).

Overall prevalence of bTB cases based on location of abattoir

Based on the locations, Karu abattoir presented the highest number of cases (n=1396), while the least amount of cases was recorded in Kubwa (n=108). However, the prevalence was higher in Gwagwalada (0.92%) than in Karu (0.77%) and Kubwa (0.43%), which was statistically significant (P<0.05) (Table 4).

Discussion

This study has recorded a cumulative prevalence of 0.75% in five years from the three major abattoirs in Abuja surburbs with an average of 341 cases of bTB per year. This low prevalence is in consonant with low prevalence (0.78%) obtained in

Table 3. Seasonal pattern of occurrence of bovine tuberculosis (bTB) lesions

Season	bTB cases	Slaughtered cattle	*Season prevalence (%)	Chi square (χ^2), P-value	OR (95% C.I.)
Dry	527	97,837	0.54	392, P<0.001	5.9 (4.9 – 7.3)
Wet	1177	129,558	0.91		
Pooled	1704	227395	0.75		

OR- Odds ratio, C.I. – Confidence interval

Table 4. Prevalence of bTB cases based on the locations of the abattoirs in the FCT

Location	bTB cases	Slaughtered cattle	Season prevalence (%)	F-ratio (ANOVA), P-value
Gwagwalada	200	21,640	0.92	4.57, 0.03
Karu	1396	180,720	0.77	
Kubwa	108	25,035	0.43	
Pooled	1704	227395	0.75	

Gombe abattoir, Nigeria (Sa'idu *et al*., 2017) but contrasts the results obtained in Yola, Nigeria (Ejeh *et al*., 2013) which reported 8.78% and a 1.3% prevalence reported in Bauchi, Nigeria by Jajere *et al*. (2018). The relatively low prevalence observed in this study may be due to adequate disease surveillance and veterinary services in the capital area of Nigeria. It may not also stem from the level of awareness, selection of cattle for slaughter by the inspectors and the apparently well-nourished animals brought to the FCT for slaughter. It may also be due to lower sensitivity of the meat inspection procedure used as compared to other studies that used simple intradermal tuberculin tests and or interferon – ã tests (Ibrahim *et al*., 2010; Birch *et al*., 2018) at antemortem or postmortem examinations that include histopathological analysis of tuberculous lesions.

Nonetheless, the average number of recorded cases per year (341) appeared to be higher than those from other regions. This may be due to the corresponding higher number of slaughtered cattle in FCT when compared with other regions (higher population) and also a better detection, monitoring and reporting system by the inspectors. Between 2015 and 2019, the number of recorded cases vis-à-vis

slaughtered cattle seemed to remain unchanged each year. This calls for concern as this may reflect lack of appropriate measures to determine sources of these animals brought for slaughter.

Generally, total cases and prevalence recorded in June and July (the peak of the wet season) had the highest number of bTB cases, while January and February (the peak of the dry season) appeared to have the least number of cases and prevalence (Table 2). This finding on seasonality trends of bTB cases corroborates most of the studies carried out in the country (Ejeh *et al*., 2013; Okeke *et al*., 2016; Sa'idu *et al*.,2017), which all reported higher cases during the wet season. The reason for this marked seasonal variation in this study may be attributed to reports that herdsmen brought their cattle to the southern part of Nigeria to graze during the dry season and move back up north once the rain begins, and possibly, these cattle might have acquired the infection before moving back to the north as latent bTB (Awah-Ndukum *et al.*, 2010). Another study by Sa'idu *et al*., (2017) reported pathophysiology and immunology of the bTB as chronic with a delayed hypersensitivity that could be manifested in rainy season due to associated immunocompromised state of the cattle.

This study found bTB cases from the three municipal abattoirs in the FCT. There was difference in the number of cases and prevalence in the various locations. The overwhelming high number of cases reported from Karu abattoir when compared with Gwagwalada and Kubwa abattoirs could be attributed mainly to the fact that the slaughtered cattle in Karu were approximately seven times more than the other locations. Kubwa recorded the least prevalence and number of bTB cases despite recording more slaughtered cattle than Gwagawalada. The low prevalence in Kubwa is unclear and can hardly be attributed to the sources of the cattle brought into Abuja for slaughter, rather it may be different abattoir management practices relating to preferential selection towards apparently healthy cattle before slaughter during antemortem inspections.

Despite the low prevalence of bTB reported in this study, the zoonotic nature and public health importance of the disease (Mueller et al., 2013) calls for further curbing the disease. There is need to generate more data, especially from undocumented regions; and a recommendation of taking proactive measures including public health education on the risks associated with bTB. This study used gross pathological lesions to determine occurrence, there is need for more investment in more confirmative laboratory tests especially after post mortem examination.

Conclusion

Bovine tuberculosis in the Federal Capital Territory of Nigeria is endemic with an overall prevalence of 0.75%. There was a significant increase in bTB cases during the wet season than in the dry season. The study has shown that bTB cases occurred more commonly in Karu than in Kubwa and Gwagwalada council abattoirs.

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