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## Full Length Article

## Retrospective study of bovine tuberculosis in Gombe Township Abattoir, Northeastern Nigeria

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## ABSTRACT

Tuberculosis is a major global public health problem. The World Health Organization (WHO) estimates that there are 8 million new cases and 3 million deaths in humans due to the disease each year. A retrospective abattoir study of bovine tuberculosis in Gombe Township Abattoir in Northeastern Nigeria was carried out from 2008 to 2015 using the abattoir records. Out of 154,562 slaughtered heads of cattle examined at postmortem, 1202(0.78%) had typical tuberculous lesions and overall total prevalence rate of 0.78%. The annual prevalence was significantly higher in 2015(1.04%) with the lowest records in 2011 (0.34%). The annual prevalence rate showed intermittent increase in levels above the expected prevalence and there was a statistically significant difference in the relative annual prevalence rate of the disease in the abattoir. The distribution and occurrence of the disease in rainy season was higher than that in the dry season. The disease also appeared to be more prevalent in the rainy season 792(65.90%) compared with the dry season 410(34.10%) and the difference was statistically significant ( $\chi^2 = 15.45, p < 0.05$ ). It was concluded that bovine TB is prevalent in Northeastern Nigeria, with indications of epidemics status in Gombe state.

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## 1. Introduction

Bovine tuberculosis (bTB) is a chronic infectious and contagious zoonotic disease of domestic animals, wild animals and humans [1]. It also occurs in a wide range of mammalian species [2]. It is characterized by the formation of granulomas in tissues, especially in the lungs, lymph nodes, liver, intestines and kidney [3]. Tuberculosis is a major health problem with 8–9 million new cases and 3 million deaths annually worldwide [4]. The majority of these occur in the developing nations. In Nigeria, there have been limited studies to determine the prevalence or relationship between bovine and human TB, especially with the emerging culture of eating improperly cooked beef and mutton, along with the drinking of unpasteurized fresh milk [5]. According to a previous study [6],

an economic loss of ₦13, 871,014/annum due to bovine tuberculosis (7.95%) as a result of condemnations in some abattoirs in - Nigeria has been reported. Another study [7] reported an annual socioeconomic loss of ₦14–24 million/annum because of carcass condemnation in the abattoirs in Northeastern, Nigeria.

Bovine tuberculosis is caused by *Mycobacterium bovis* which is a member of *Mycobacterium tuberculosis* complex [8,9]. The organism may be transmitted by aerosol or droplets of exudates containing the bacilli. It can be transmitted by ingestion of feed and water contaminated with urine, faecal material or exudates that contain the tubercle bacilli from diseased animals [10].

In developing countries, especially Nigeria and particularly the northeastern region, there is paucity of information on the prevalence of bTB and though, it is a notifiable disease in many countries, the lack of effective disease surveillance and disease reporting system [11] and the insidious nature of the disease has contributed to decreased recognition and reporting, leading to a lack of effective and sustainable measures for its control. This study was therefore conducted to determine the prevalence of bTB in Gombe, Northeastern Nigeria.

The actual impact of animal bTB on human health is generally considered low in developing countries like Nigeria which may

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be based on the rare identification of *Mycobacterium bovis* isolates from human patients [12]. However, zoonotic bTB is present in most developing countries where surveillance and control activities are often inadequate or unavailable [13]. The human cases of tuberculosis associate with *M. bovis* infection, both pulmonary and extra pulmonary have been described in Nigeria [14–16]. From the limited survey conducted in Nigeria, on life tissues and lymph nodes of cattle from abattoirs and slaughterhouses have yielded *M. bovis* in majority of cases with few other *Mycobacterium* such as *M. tuberculosis* and *M. africanum* as occasional findings [16]. Nigeria is one of the African countries where bTB is widespread in both cattle and human [17]. This research will contribute in providing epidemiological data of bTB in Gombe Township Abattoir for epidemiological surveillance, baseline for academics and improving veterinary education, and human and animal health.

## 2. Materials and methods

### 2.1. Study area

This research was conducted in Gombe Township Abattoir. Gombe Township Abattoir was officially established to its full operation on July 4, 2007. The abattoir lies between the latitude 10.17°N and longitude 11.11°E whereas Gombe lies between latitude 10.08°N and 11.24°E and longitude 11.02°N and 11.18°E. Gombe is the capital city of Gombe state which is located in the centre of the northeastern part of the country. It borders Borno and Yobe to the east and north respectively, Adamawa and Taraba to the south, and Bauchi States to the west, with a total land mass area of 20, 265 km<sup>2</sup>. The wet season is from April to October and the dry season is from November to March. Gombe has a population density of 2,353,879 [18]. Guinea Savannah grassland is the natural vegetation with some woodland. This makes Gombe a conducive grazing land and pasture for cattle rearing and predominantly an agrarian state with more than 80% of the population engaged in agricultural production [18].

### 2.2. Study design

A retrospective study on bTB cases recorded in Gombe Modern Township Abattoir was carried out from 2008 to 2015. Records were obtained from the Veterinary record book (NADIS/IBAR diseases' reporting network) at Gombe Area Veterinary Office and Gombe Township Abattoir. Slaughtered cattle examined at post-mortem and found with typical tuberculous lesions at the abattoir from 2008 to 2015 as described by [19] and [20] were considered as cases for the study.

### 2.3. Routine postmortem procedures

Standard daily Postmortem examination was employed in the abattoir as routine meat inspection procedures by the assigned meat inspectors (Veterinarians) at the abattoir. The sequelae are the suspected tuberculous bovine lesions recorded during this study period. Cattle brought in for slaughter were routinely subjected to procedures such as ante-mortem inspection and post-mortem examinations (by meat inspectors), before the carcasses were conveyed to the market, to minimize to a reasonable level the Public Health risk associated unwholesome meat. Post-mortem examinations of the carcasses were carried out by carefully inspecting the lymph nodes of the head, tonsils, thoracic cavity, and abdomen, including deep and superficial cervical, popliteal and sacral lymph nodes. The meat inspection procedures employed visual examination and palpation of the lungs, liver, kidneys, lymph nodes of the carcass including the mesenteric lymph nodes

and intestines. For this study, diagnosis of bovine tuberculosis was based on gross detection of typical tubercle, yellowish granulomatous caseated lesions or sometimes 'gritty' calcification in carcasses in the afore mentioned organs on incision and with the use of protective clothing. In addition, all nodular lungs were carefully inspected visually, palpated and incised [19–21].

### 2.4. Determination of prevalence

The monthly prevalence rate of the disease was calculated as the total number of cases of TB detected in a month divided by the total number of cattle slaughtered that month while the annual prevalence rate was calculated as the total number of bTB detected in a year divided by the total number of cattle slaughtered that year and expressed in percentage. The overall prevalence rate 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 and presented in percentage. The seasonal prevalence rate was also determined by calculating the number of cases recorded during the rainy season (April–early–October) and the dry season period (November–March) and presented in percentage.

### 2.5. Data analysis

The data retrieved were statistically analyzed using the "Microsoft Excel 2010 (Version 1.0) and SPSS-Version 20.0". The data were also presented using descriptive statistics in the form of table. Chi-square test of association ( $\chi^2$ ) was used to determine possible association between season and disease occurrence in the abattoir, respectively.  $P < 0.05$  was considered significant throughout the study.

## 3. Results

### 3.1. Prevalence of bovine TB (bTB) from the PM-records (2008–2015)

Out of 154,562 slaughtered heads of cattle examined at post-mortem from 2008 to 2015, 1202(0.78%) had tuberculous lesions. The total annual prevalence rate (0.78%) of bTB recorded in the study varied significantly ( $\chi^2_{99.624}$ ,  $p < 0.05$ ), with the highest in 2015(1.04%) and the lowest in 2011(0.34%) (Fig. 1). The overall annual prevalence rate showed intermittent increase in levels above the expected prevalence (Table 1).

### 3.2. Monthly distribution and occurrence of bTB

Of the total of one thousand two hundred and two (1202) of bTB lesions obtained at postmortem examination, 73(6.07%) typical tubercle granuloma cases suspected to be bTB were recorded in January, 107(8.90%), 126(10.48%) and 112(9.32%) in June, July and August, respectively. This showed the higher distribution and occurrence of the disease at the peak of rainfall period. While, the occurrence of 126(10.48%), 98(8.15%) and 68(5.66%) in October, November and December respectively, showed the lesser occurrence in winter (Table 2). The Table also showed the monthly cumulative percentage rates of bTB over the eight (8) years period of the study as 9.53%.

### 3.3. Seasonal pattern of occurrence of bTB lesions

The distribution and occurrence of the disease in rainy season was higher 792(65.90%) at the abattoir than that in the dry season of 410(34.10%) and there was a statistically significant ( $\chi^2 = 15.447$ ,  $p < 0.05$ ) difference between the two seasons. The

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