



Research Article

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AN ASSESSMENT OF MEAT INSPECTION FOR BOVINE TUBERCULOSIS AND THE FUNCTIONAL CONDITIONS OF MAJOR ABATTOIRS/SLAUGHTER SLABS IN RIVERS STATE

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Abstract


Bovine tuberculosis (bTB) is a chronic zoonotic disease caused by *Mycobacterium bovis* characterized by the formation of tubercles. This study assessed meat inspection for bTB and the functional conditions of the major abattoirs in Rivers State between March and July, 2019 and revealed that of the five major slaughter slabs within Port Harcourt, the state capital and its suburbs namely: Rumuokoro, Choba, Trans-Amadi, Aluu, and Mile 3 slaughter slabs, only Trans-Amadi abattoir had meat inspection going on as it was the only one having meat inspectors. The total occurrence of bTB at the Trans-Amadi abattoir was 1.25% (173/13835). It was 0.54% (15/2780), 0.46% (13/2840), 2.02% (56/2770), 1.72% (47/2735) and 1.55% (42/2710) for the months of March, April, May, June and July respectively, the highest being in May which corresponded to the month with the highest rainfall within the study period suggesting that the causative agent thrives more in wet and cold environment. The organs affected were the lungs (22.5%), liver (26.6%), spleen (8.7%) and their associated lymph nodes (42.2%). The highest percentage of bTB lesions on the lymph nodes suggests that the majority of the animals were immunocompetent. There were no meat inspectors, sanitary workers, records of diseases detected at the Rumuokoro, Aluu, Choba and Mile 3 slaughter slabs and no concerns to detect diseased animals in these slaughter slabs. The situation in the minor slaughter slabs in the local government areas was even worse. Overall, the abattoir/ slaughter slabs were in a sorry state. Abattoir workers were not properly dressed. There was very little or no meat inspection in Rivers State and even when done, meat inspectors often couldn't condemn infected carcasses. There were never situations where whole carcass was condemned in generalized cases due to lack of compensation by the government. The infected carcasses were put for sale and purchased by the unsuspecting public. Consequently, public health was undermined. It is therefore recommended that the government rehabilitate the abattoir/ slaughter slabs, employ qualified meat inspectors to train abattoir workers and meat handlers on the ethics of meat hygiene, and carry out meat inspection on daily basis so as to screen the meat put in market. The government should also have the political will to compensate farmers when animals are condemned in generalized cases.

Keywords: Assessment, Meat inspection, Bovine tuberculosis, Functional conditions

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1. Introduction

The rapid increase in human populace leads to a corresponding increase in food demand especially animal protein (Sen et al., 2020). Meat, specifically beef and milk are amongst the highly priced food commodities in Nigeria thereby placing the burden of providing required animal protein on cattle production industries (Abubakar et al., 2005). However, the ability to meet this demand of the populace is amongst others, threatened by this infectious disease, Bovine Tuberculosis (bTB), as it is a major health risk to humans and one of the major causes of infectious disease mortality in the world (OIE, 2009). Meat hygiene, which refers to the scientific steps employed in the processing of food animals in such a manner that their meat and meat products are fit for use by humans and animals is therefore very crucial (Vijender, 2007). The functional or hygienic condition of the abattoir/ slaughter slabs these food animals are processed is also very crucial to the delivery of wholesome meat to the populace (Akinro et al., 2009).

bTB is a chronic infectious disease of animals caused by a bacterium called *Mycobacterium bovis* (*M. bovis*), which is closely related to the bacteria that causes human and avian tuberculosis. It is characterized by formation of granulomatous nodules called tubercles whose locations depend largely on the route of infection (Carter and Changappa, 1993). The definitive hosts of *M. bovis* are cattle which appear normal and may as well shed the causative organisms for years without showing signs of the disease. The clinical signs of this disease can only occur in the advanced stages of the disease, thus most infected cattle are slaughtered or culled for other reasons before they attain the advanced stages (North and Jung, 2004).

Tuberculosis is among the top 10 major causes of death and the leading cause from a single infectious agent (above HIV/AIDS) in 2018. However, the incidence of tuberculosis is dropping at about 2% per year (WHO, 2019). It is the commonest infection in people living with HIV/AIDS and it is responsible for most of the mortality in this group. It killed a total of 1.5 million people with 251,000 of them with HIV in 2018 (WHO, 2019). According to a study carried out by Nwidu et al (2008) on 'The Prevalence of Tuberculosis and Leprosy in Primary Health Care Levels in Rivers State, Nigeria' from 2001 till 2005; there were increase of 30 to 345 and 115 to 1087 occurrences of tuberculosis in Obio/Akpor and Port Harcourt Local Government Areas respectively.

An abattoir refers to a specially designed premise approved and registered by the controlling authority for receiving, holding, slaughtering and hygienically

inspecting meat animals and meat products before they are released to the public (Alonge, 2005). Meat inspection, which is the expert supervision of the whole process of producing meat products with the goal of providing meat that is suitable for human consumption and preventing danger to public health, involves inspection of live animals prior to slaughter (ante-mortem examination), inspection of slaughtering, carcasses and organs for disease lesions (post-mortem examination) and inspection of waste disposal. These abattoir procedures are very vital to the delivery of wholesome meat and surveillance of animal diseases, especially those of public health significance (FAO, 1992; Nwanta et al., 2008).

At post mortem examination of infected cattle, lesions of tuberculosis are majorly found in the lymph nodes, lungs, liver, spleen, and gastrointestinal tract. These organs especially the liver are edible organs/tissues highly demanded by the public for home and commercial consumption. Detection of tuberculosis lesions on these organs at post mortem usually suggests advanced stages of the disease (Corner, 1994; Shitaye et al., 2006).

2. Materials and Methods

2.1. Study Area

Rivers State is located in the South-South geopolitical zone of Nigeria with human population of about 5.2m (NPC, 2006). It is made up of 23 Local Government Areas namely: Abua/ Odual, Ahoada East, Ahoada West, Akuku Toru, Andoni, Asari-Toru, Bonny, Degema, Eleme, Emohua, Etche, Gokana, Ikwerre, Khana, Obio/Akpor, Ogba/Egbema/ Ndoni, Ogu/Bolo, Okrika, Omuma, Opobo/Nkoro, Oyigbo, Port Harcourt and Tai Local Government Areas. However, the major abattoir/ slaughter slabs are located in Port Harcourt, the state capital and its suburbs. They are the Rumuokoro, Choba, Trans-Amadi, Aluu, and Mile 3 abattoir/ slaughter slabs with waypoint coordinates of 4°51'N 6°58'E, 4°53'N 6°54'E, 4°48'N 7°2'14"E, 4°93'N 6°94'E, and 4°80'E 6° 99'E respectively. The other slaughter slabs are minor and are located in the capital of each local government area. Meat inspection is not carried out in them.

The state is known more for crude oil exploration activities from its vast reserves of crude oil and natural gas than cattle rearing. The vast majority of cattle slaughtered are transported from the Northern part of the country. They are only maintained for a few months in Rivers State before they are slaughtered.

2.2. Study Population

The abattoir/ slaughter slabs and all the cattle slaughtered, abattoir workers which include meat

inspectors (veterinarians), meat processors, meat sellers, meat buyers and sanitary workers formed the study population.

2.3. Data Collection

Post mortem examination of carcasses and organs for lesions of bTB, check available records in the abattoirs on the occurrence of bTB and observation of the safety measures adopted by the abattoir workers.

2.4. Data Analysis

Data analysis was done using MS Excel in combination with SPSS and results were expressed in simple percentages.

3. Results

The occurrence of bTB across the months at the Trans-Amadi abattoir is shown in Table 1. The overall occurrence of the disease was 173/13835 (1.25%). The occurrence of the disease in the months of March, April, May, June and July were 15/2780 (0.54%), 13/2840 (0.46%), 56/13835(2.02%), 47/2735 (1.72%), and 42/2710 (1.55%) respectively. The highest occurrence of the disease was in May followed by June (Figure 1).

The distribution of tuberculosis lesions detected at post mortem examination of different organs of positive animals is shown in Table 2. The highest proportions of lesions were detected on the lymph nodes (mediastinal, bronchial, retropharyngeal and mesenteric lymph nodes) 73/173 (42%), followed by liver 46/173 (26.6%), then the lungs 39/173 (22.5%) and then the spleen 15/173 (8.7%). There were few cases of generalized infection.

Table 1. Monthly occurrence of bTB in Trans-Amadi abattoir

Month	Number of cattle examined	Number of cattle infected (%)
March	2780	15 (0.54)
April	2840	13 (0.46)
May	2770	56 (2.02)
June	2735	47 (1.72)
July	2710	42 (1.55)
Total	13835	173 (1.25)

bTB= bovine tuberculosis

Table 3. Functional features and cases of detected bTB at the abattoirs/ slaughter slabs

Abattoir / Slaughter slab	Meat Inspectors	Records of Diseases	No. of cases of bTB	Sanitary
Rumuokoro	—	—	nb	—
Choba	—	—	nb	—
Trans-Amadi	+	+	173	+
Aluu	—	—	nb	—
Mile 3	—	—	nb	—

+= present, -= absent, nb= not bothered, bTB= bovine tuberculosis.

4. Discussion

The study showed that meat inspection was only carried out at Trans-Amadi abattoir. This was because there were very few qualified meat inspectors (Veterinarians) in the employ of the Rivers State Government to cover all

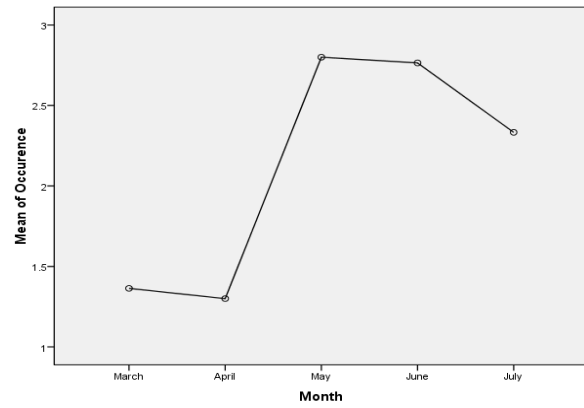


Figure 1. Occurrence of bTB across the months.

Table 2. Distribution of tuberculosis lesions on infected organs

Organ	Frequency	Percentage (%)
Lymph nodes	73	42.2
Lungs	39	22.5
Liver	46	26.6
Spleen	15	8.7

The functional features and cases of bTB detected at the abattoir /slaughters slabs are shown in Table 3. Meat inspectors were present at the Trans-Amadi abattoir but absent at the Rumuokoro, Choba, Aluu and Mile 3 abattoir/ slaughter slabs. There were no records of diseases detected at the Rumuokoro, Choba, Aluu and Mile 3 abattoirs/ slaughter slabs but at the Trans-Amadi abattoir. Unlike at the Trans-Amadi abattoir where 173 cases of bTB were detected, there were no concerns for meat inspection and consequent detection of bTB at the Rumuokoro, Choba, Aluu and Mile 3 abattoirs/ slaughter slabs. Sanitary workers were only found at the Trans-Amadi abattoir.

the abattoirs/ slaughter slabs, so they confined themselves to the Trans-Amadi abattoir which also housed the state veterinary clinic. Also, the Trans-Amadi abattoir was the first abattoir established by the Rivers State Government and the only qualified to be called an

abattoir in the state because it was the only one having the basic facilities of an abattoir, although in a state of disrepair. Nwannta et al., (2008b) had previously reported that there is only one abattoir in Rivers State. Others are slaughter slabs and they came into being as a result of expansion of the city due to population growth. The overall occurrence of bTB was 173/13835 (1.23%) within the study period. It is lower when compared with the findings of Tillo et al (2017) who reported a prevalence of 2.36% in a study between the months of April-July at Yola, Adamawa State. It is however higher than the 1.1% reported by Ibrahim and Ameh (2008) between the months of May and June at Maiduguri, Borno State. Other studies in Nigeria reported annual prevalence of the disease. The month of May had the highest occurrence of the disease (2.02%) with the lowest (0.46%) occurring in April. The occurrence of bTB increased as rainfall increased, with the month of May having the highest rainfall and occurrence of the disease. This may be so because the causative agent, *Mycobacterium bovis* is an acid-fast bacterium found in cattle manure and its cell wall is high in lipid and wax content making it resistant to water and persists in the environment (Manyi-Loh et al., 2016; Russell, 1996). Forages and drinking water are contaminated by the bacterium making it easy for cattle to ingest and become infected. This agrees with the discovery of Fine et al., (2011) in a Study of the Persistence of *Mycobacterium bovis* in the Environment under Natural Weather Conditions in Michigan, USA, that *Mycobacterium bovis* could persist long enough (88 days in soil, 58 days in water and hay, and 43 days on corn) to represent a risk of exposure for cattle. Okeke et al., (2016) in a retrospective study of bTB carried out between 2007-2012 in an abattoir in Jos, Plateau State, Nigeria reported that there was a seasonal variation of bTB, being lowest in the month of January and peaks mostly in July and August as the rains increase. In another study, Oragwa et al., (2017) reported that monthly prevalence of bTB was highest in November and lowest in April. However, there were multiple peaks with no clear seasonal variation due to irregular entries from weeks to months as a result of workers' strike action.

The tuberculosis lesions were found more on the lymph nodes of the organs of the thoracic and abdominal cavities than the organs (lungs, liver, spleen, intestines). This finding agrees with previous report that at necropsy, immunocompetent infected cattle have more of the lesions on the lymph nodes of the respiratory system than the organs (Verma et al., 2014; Ameni et al., 2011). The finding also indicates that the occurrence and spread of lesions depend on the route of infection (Araujo et al., 2005) and site can vary, although most often than not they are found in thoracic lymph nodes due to infection via inhalation (Whipple et al., 1996; Gizaw et al., 2017) and mesenteric lymph nodes through ingestion (Radostits and Blood, 1994). These findings were in tandem with the previous reports (Shitaye et al., 2006;

Reggassa et al., 2010; Gathogo et al., 2012; Mosaad et al., 2012).

The abattoir workers were never appropriately dressed hence increasing their risk of infection during slaughtering of these infected cattle. Also, ante-mortem examinations were not carried out prior to the slaughtering of these cattle. Therefore, only post-mortem examinations were carried out on the carcasses which in most cases were already put up for sale. There were never situations in which the whole carcass was condemned even in the generalized cases of bTB. This is opposed to the recommendation of FAO (1994) and Corner (1994) that the entire carcass be seized and destroyed in generalized cases of the disease and in localized cases, only the parts drained by the affected lymph nodes. Hence, infected carcasses were circulated in the market and they were purchased by ignorant citizens for home consumption and commercial purposes. This action is most likely due to the failure of government to make financial provisions for the necessary compensation of these beef sellers. Abattoirs served as inspection points for food animals entering the human food chain for zoonotic diseases and they have played a very crucial role in the surveillance of animal and human diseases (Vilas et al., 2008). Unfortunately, this no longer seem to be the case in most slaughter slabs in Rivers State as there were no meat inspectors and sanitary workers, records of diseases diagnosed in all but one of the slaughter slabs in Rivers State and the butchers never bothered about the presence or absence of diseases like bTB. Animals were slaughtered on the bare floor and there was inadequate supply of clean water and proper waste disposal systems. Adeyemo (2002) and Lawan et al., (2013) had reported the unavailability of slaughtering and processing facilities, poor sewage and disposal systems and poor supply of clean water and refrigeration in most abattoirs in Nigeria. Akpabio et al., (2015) also had a similar finding that the Aba Abattoir, in Abia State was not fit to be called an abattoir because of its design and the lack of basic facilities. These highlight the earlier findings of Nwannta et al. (2008) that government authorities in Nigeria responsible for managing abattoirs have, over the years, abandoned their responsibility and this has led to their worsening conditions, poor meat hygiene, inappropriate meat hygiene and inspection, inadequate knowledge of meat processing and poor environmental hygiene, consequently undermining public health.

In conclusion, bTB is endemic in Rivers State and all the major abattoir/ slaughter slabs are in a sorry state disrepair, with only one having the presence of meat inspectors. The situation in the minor slaughter slabs scattered across the Local Government Areas of the state is even worse. There is therefore very little or no meat inspection to detect diseases (e.g. bTB) in the state. Consequently, the health of the public is endangered. I therefore recommend that Rivers State Government as a matter of urgency rise to its responsibility and

rehabilitate the existing abattoir/ slaughter slabs to international standard, employ qualified meat inspectors (Veterinarians) to train abattoir workers and meat handlers on the ethics of meat hygiene and to carry out meat inspection on daily basis in all the abattoirs/ slaughter slabs to screen the meat put for sale to the public. The state government should also have the political will to compensate farmers in cases of condemnation of whole carcass in generalized bTB.

Conflict of interest

The authors declare that there is no conflict of interest.

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