

Investigation of Epidemiology of Bovine Tuberculosis in Yewa Division of Ogun State, Nigeria

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Abstract

Understanding the epidemiology of bovine tuberculosis (bBT) is very imperative to the control of the disease. Despite the endemicity of bTB and the associated risks of exposure of humans to the infection, information on the epidemiology of the disease is limited in Yewa Division of Ogun State. An epidemiology study of bovine tuberculosis was carried out in slaughterhouse and heterogeneous cattle herds in Yewa Division of Ogun State, Nigeria for a period of four months. A total of 118 samples consisting of 50 milk samples and 50 nasal secretions from selected cattle herds as well as 18 granulomatous lesions suggestive of tuberculosis from slaughterhouse were collected. These samples were decontaminated and cultured on paired Lowenstein Jensen media with and without pyruvate. The results showed 3.4% prevalence rate for all samples collected, with 0.0%, 4.0% and 11.1% from milk, nasal secretions and granulomatous lesions, respectively. The 11.1% prevalence from the slaughtered cattle at Yewa Division of Ogun State suggests the risk of exposure of abattoir workers to tuberculosis considering poor hygienic practices among the occupationally exposed group. Again, the 4% rate obtained from the nasal secretions implies that tuberculosis infected animals could transmit infections to other animals and humans in close contact with them through aerosols. The zero prevalence recorded from milk samples might reiterate the fact that pulmonary infection is more common than the extra pulmonary infection among cattle herds due to congregational tendencies. It is therefore, concluded that bovine tuberculosis is still endemic in cattle population most especially in Yewa Division of Ogun State, and the need to enlighten the general public, livestock workers and veterinarians against the risk of direct contact with the disease.

Keywords: Epidemiology, Bovine Tuberculosis, Cattle, Yewa Division, Ogun State

Investigation De L'épidémiologie De La Tuberculose Bovine Dans La Division De Yewa De L'état D'ogun, Nigéria



Résumé

Comprendre l'épidémiologie de la tuberculose bovine (bTB) est essentiel pour le contrôle de la maladie. Malgré l'endémicité de la bTB et les risques associés d'exposition des humains à l'infection, les informations sur l'épidémiologie de la maladie sont limitées dans la Division de Yewa de l'État d'Ogun. Une étude épidémiologique sur la tuberculose bovine a été réalisée dans des abattoirs et des troupeaux hétérogènes de bovins dans la Division de Yewa de l'État d'Ogun, Nigéria, pendant une période de quatre mois. Un total de 118 échantillons comprenant 50 échantillons de lait, 50 sécrétions nasales de troupeaux sélectionnés, ainsi que 18 lésions granulomateuses suggérant la tuberculose prélevées dans des abattoirs, ont été collectés. Ces échantillons ont été décontaminés et cultivés sur des milieux Lowenstein Jensen avec et sans pyruvate. Les résultats ont montré un taux de prévalence de 3,4 % pour tous les échantillons collectés, avec 0,0 %, 4,0 % et 11,1 % provenant respectivement des échantillons de lait, des sécrétions nasales et des lésions granulomateuses. Le taux de prévalence de 11,1 % chez les bovins abattus dans la

Division de Yewa de l'État d'Ogun suggère un risque d'exposition des travailleurs d'abattoirs à la tuberculose, compte tenu des mauvaises pratiques d'hygiène parmi ce groupe exposé professionnellement. De plus, le taux de 4 % obtenu à partir des sécrétions nasales implique que les animaux infectés par la tuberculose pourraient transmettre des infections à d'autres animaux et à des humains en contact étroit avec eux par le biais d'aérosols. La prévalence nulle enregistrée pour les échantillons de lait pourrait réitérer le fait que l'infection pulmonaire est plus courante que l'infection extra pulmonaire parmi les troupeaux de bovins en raison de leurs tendances à se regrouper. Il est donc conclu que la tuberculose bovine est toujours endémique dans la population bovine, en particulier dans la Division de Yewa de l'État d'Ogun, et qu'il est nécessaire d'informer le grand public, les travailleurs du bétail et les vétérinaires des risques liés au contact direct avec la maladie.

Mots-clés : *Épidémiologie, tuberculose bovine, bovins, Division de Yewa, État d'Ogun*

Introduction

Bovine tuberculosis (bTB) is a contagious, debilitating disease of both animals and humans. It is caused by the bacterium *Mycobacterium bovis*, part of the *Mycobacterium tuberculosis* complex which also includes *M. tuberculosis* which is referred to human tuberculosis and *M. avium* (Holkwe *et al.*, 2017). However, this contagious disease is still prevalent resulting in economic loss in animal production most especially in developing countries including Nigeria where livestock production offers important socio-economic, cultural and religious rite. According to WHO (2022), the burden of tuberculosis (TB) is highest in Asia and the Africa regions. However, Nigeria is ranked sixth among the countries in the world with a high TB burden (WHO, 2022). Bovine tuberculosis (bTB) is endemic in the country with the previous reports showing varying prevalence in cattle and humans (Abubakar *et al.*, 2011; Adesokan *et al.*, 2012) with attendant shortfalls including high animal morbidity and mortality that eventually reduce the financial capital and increase production costs and also account for human health problems and even deaths (Oluwasile *et al.* 2013, Agbalaya *et al.*, 2020). The primary site of infection is the lymph nodes, but spread to other organs such as lungs as the disease progresses.

Cattle production and its products (meat and milk) have usually been the major host for *M.*

bovis but other species of animals such as swine bison and cervids (deer and elk) can transmit the infection to human. According to Subbians *et al.* (2014), humans get exposed to *M. bovis* through consumption of uncooked infected meat or infected unpasteurized milk, close contact with cattle such as direct inhalation from animals. Herdsmen, butchers and veterinarians as well as the general public that consume infected meat are exposed to bTB (Bilal *et al.*, 2010, Aduloju *et al.*, 2019). Bovine tuberculosis is either only partially controlled or not controlled at all which makes people working with cattle such as herdsmen, veterinarians and livestock workers to be at high risk of bovine tuberculosis infection (Shitaye *et al.*, 2007). Moreover, from the epidemiology viewpoint, it is revealed that major endemic nature for bovine tuberculosis prevalence is tailored to abattoir, cattle hosteling and cattle markets in most part of the country (Adamu *et al.* 2011).

The Yewa community in Ogun state accommodate Fulani herdsmen who mostly practice transhumance which enhances mixing of cattle and increases the risk of exposure of the animals to bTB. Despite this, the bTB prevalence status of the cattle remains grossly not investigated. This study was, therefore, aimed at determining the epidemiology of bovine tuberculosis in Yewa Division of Ogun State, Nigeria.

Materials and Methods

Study Area

Yewa division is located in Ogun State, south west Nigeria. It is made up of five local government areas namely Imeko Afon, Yewa North, Yewa South, Ipokia and Ado Odo/Ota. Yewa division is bound to the West by Republic of Benin, which shares a long stretch of international boundary. It is located around latitude 7°15'N and longitude 3°3'E in a deciduous/derived Savannah zone of Ogun State (Onakomaya *et al.*, 1992). Major occupation of the people includes farming and animal rearing with the Fulani cattle rearers who practice transhumance spread all over the community.

Samples collection

Major cattle settlements, including Iselu, Eggua, Imoto, Ayetoro, Atokun and Olodo which were located in the Yewa North Local Government Area were purposively selected for sampling. Using simple random sampling technique, 15mL of milk was drawn from washed and disinfected udder of selected cow into sterile universal sample bottle as described by Kazwala *et al.* (1998), while the nasal secretion was taken using sterile cotton swab tipped applicator stick by rubbing the applicator against the nasal mucosa wall, following consent of the cattle owners to participate in the study. Within the same study period, samples of lesions suggestive of tuberculosis were purposively collected from slaughtered cattle at the abattoir in the Local Government Area for a period of eight weeks. The samples were kept in a cooler box with ice packs and transported to the Food Hygiene Laboratory of the Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Ibadan for analysis. All samples were kept frozen until were assayed.

Sample processing and Isolation of Mycobacteria

All samples were decontaminated and processed following the procedure described

by Becton Dickinson (1999). One milliliter of distilled water was added to each of milk samples and nasal swabs in test tube and 1mL of Mycoprep added and left for 15 minutes. For the lesions, each granulomatous lesion sample was crushed in mortar and pestle with distilled water and 1mL resultant sample was added to 1mL of Mycoprep and left for 15 minutes. Thereafter, 3mL of phosphate buffer solution was added to each of the mixture and centrifuged for 15 minutes. The mixture was then allowed to cool, and the supernatant was decanted, while part of the sediment was stirred with the swab and smeared on the Lowenstein Jensen medium slope and then incubated at 37°C for 12 weeks.

Data analysis

Descriptive statistics was used to express data as frequencies and percentages, while association between bTB prevalence and variables including sex, age and breed of cattle was tested using Chi square test

Results

Out of the overall 118 samples screened for tuberculosis, only four was positive giving a prevalence of 3.4%. Of the 50 nasal swabs, two were positive for tuberculosis with higher prevalence in male (9.09%), < 1 year old (20.0%) White Fulani breed (6.25%) of cattle (Table 1). However, none of the variable was significantly associated with bTB. A zero prevalence was recorded for the milk samples.

For the lesions, highest prevalence was obtained among sedentary cattle (11.76%) and mesenteric lymph nodes (2.94%) with respect to heterogeneous grouping and predilection sites of lesion, respectively (Table 2). There was no significant association between bTB prevalence and heterogeneous system as well as predilection site.

Discussion

The present study investigated the epidemiology of bTB in slaughter cattle and cattle herds in Yewa Division of Ogun state,

south west Nigeria. Our findings showed an overall prevalence of 3.4% of bTB in all the samples collected, indicative of the endemicity of the disease in cattle population in the area. Besides, there was no significant association between bTB prevalence and sex, age, breed of cattle as well as heterogeneous system and predilection site of the disease.

The higher prevalence of bTB recorded in male (9.09%) than the female cattle (0.0%) based on nasal swab sampling in this study is in disagreement with the findings of previous workers (Firdessa *et al.*, 2012; Maxwell *et al.*, 2012, Oluwasile *et al.*, 2013) who reported that females are more prone to tuberculosis infection than male. Also, the 11.1% prevalence obtained among slaughtered cattle in this study were above the value recorded by Igbokwe *et al.* (2001); Cadmus *et al.*, (2010). The higher value in the present study might be as result of the animals screened were from neighbouring African countries suggestive of higher rates in these countries. However, our finding was lower than 29.16% reported by Saidu *et al.* (2015) in Bauchi State. As reported by Okeke *et al.* (2016), detection of bTB lesion requires diligence and thoroughness of the inspector conducting the examination. This might explain the differences in the rates across the different studies.

Moreover, the prevalence of 4% obtained from nasal swabs reiterates the pulmonary route as a major route for tuberculosis infection. This is in agreement with the findings of Cadmus *et al.*, (2008) who reported shedding of tubercle bacilli from the nasal secretions of slaughtered cattle in Bodija Abattoir in Ibadan. This might potentiate the spread of the infection to other animals through oral and nasal routes and to the handlers as well as the public through the consumption of unpasteurized milk and close proximity to infected animals (Agbalaya *et al.*, 2020). In particular, the herdsman who live in close contact with longer contact hours

with their cattle are mostly at risk. Again, the zero prevalence recorded for the milk collected could be attributed to the fact that pulmonary infection is more common than the extra pulmonary among cattle in the herds due to congregational tendencies.

Although, a higher prevalence was observed in mesenteric lymph nodes compared to the lungs, gross lesions indicated the lungs as the most affected part as revealed in the present study. This observation corresponds with the findings of Opara *et al.* (2012) who reported that the lungs were the major affected organs followed by liver and spleen by gross postmortem examination. This further reiterates that the inhalation route rather than ingestion is a more readily route of transmission of bTB infection among animals as reported by Ameen *et al.* (2008). In addition, our findings were in agreement with the report of Cadmus *et al.* (2004) which opined that postmortem examination still remains the immediate bTB diagnostic tool to be used in endemic slaughterhouses and abattoirs in the states of Nigeria.

Our findings notwithstanding, this study had some limitations. First, the sample size used was small; larger sample size would have given better insights into the epidemiology of bTB in the study area. Second, molecular characterization of the isolated mycobacterial species was not done as knowing the species of the *Mycobacterium* would have provided better understanding of the epidemiology of the disease.

Conclusions and Recommendations

Our findings revealed that bovine tuberculosis is prevalent in cattle in Yewa Division of Ogun State with serious public health implications particularly for veterinarians, cattle handlers and abattoir workers as well as meat consumers.

It is therefore recommended that general enlightenment campaigns should be conducted among occupationally exposed

groups on the endemicity of bovine tuberculosis and its zoonotic implications. Also, meat inspection in the slaughter house should be carried out on all meat for human consumption by veterinary and trained meat inspectors. In addition, the Ministry of Agriculture and Rural Development should institute mandatory routine tuberculin

screening in order to eliminate infected cattle from herds. It is also of utmost importance that strict border control be put in place considering the fact that many of the cattle in the study area were from neighbouring African countries where the disease is endemic.

Table 1. Distribution of cattle screened for tuberculosis using nasal secretions

Variable	No. screened	No. positive	X ² (p-value)
Sex			
Male	22	2 (9.09)	2.66 (P>0.05)
Female	28	0	
Age (Years)			
<1	5	1 (20)	4.57 (P>0.05)
1-3	27	0	
>3	18	1 (5.55)	
Breed			
White Fulani	32	2 (6.25)	1.17 (P>0.05)
Red Bororo	6	0	
Djali	7	0	
Sokoto Gudali	5	0	

Table 2. Distribution of slaughtered cattle screened for tuberculosis

Variables	No. screened	No. positive	X ² (p-value)
Heterogeneous system			
Sedentary	17	2 (11.76)	4.10 (p>0.05)
Transhumance	14	0	
Trade cattle	19	0	
Predilection sites			
Spleen	28	0	10.1 (P>0.05)
Lung	66	1 (1.52)	
Mesenteric lymph node	34	1 (2.94)	

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