



Evaluation of Bovine Tuberculosis in Slaughtered Cattle, Based on Post-Mortem Meat Inspection in Yobe State, Nigeria

Abubakar, U. B.¹, Ibrahim, S.¹, Danbirni, S.¹, Abdulkadir I. A.¹, Mohammed F. U.², Surajo M.³, Usman A. A.⁴, Kwaga J.P.⁵, Abdulrazaq G. H.⁶, Muhammad H.⁶.

1. Department of Veterinary Medicine, Faculty Veterinary Medicine, Ahmadu Bello University, Zaria.
2. Veterinary Teaching Hospital, Ahmadu Bello University, Zaria.
3. Department of Biochemistry, Ahmadu Bello University, Zaria.
4. Department of Library Science and Information, Ahmadu Bello University, Zaria.
5. Department of Veterinary Public Health and Preventive Medicine, Ahmadu Bello University, Zaria.
6. Department of Medicine, Aminu Kano Teaching Hospital/Collage of Health Science, Bayero University, Kano.

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ABSTRACT

Tuberculosis is one of the most important infectious diseases of cattle in Nigeria and Africa. This study aimed at determining the prevalence of Bovine tuberculosis, based on post-mortem meat inspection in slaughtered cattle in Yobe State. The study was carried out in 10 major abattoirs/slaughter houses that supply meat to the public in Yobe State. A total of 2207 slaughtered cattle, comprising 1004 males and 1203 females, were subjected to detailed post-mortem examination for the presence of tuberculosis-like nodules. Epidemiological data such as sex, breed and age of the affected cattle were recorded. These carcasses were examined visually for changes in colour, (pale yellow or gray) or morphology and then palpated before incision from the surrounding tissues.

A total of One Thousand Nine Hundred and Twenty Three (1923) cattle, consisting Eight Hundred and Thirty Six (836) males and One Thousand Eighty Seven (1087) females were Examined for gross TB lesions. The overall positives out of 1923 cattle examined were One Hundred and Sixty Seven (167) with a prevalence of (8.7%, 95%CI = 6.1-11.8). Based on sex 71(8.5%, 95%CI = 5.9-10.9) males were positives while 96(8.8%, 95%CI = 6.4-11.9) females were positives. The chi-square (χ^2) test of significance based on sex shows the difference was not statistically significant at ($P < 0.05$). This study found that breeds and age groups of cattle examined were statistically associated with prevalence of bovine tuberculosis lesions in slaughtered cattle ($P < 0.05$). Out of the 2207 carcasses examined, 212 had tuberculosis-like nodules with a prevalence of 9.6% (95% CI = 6.7-13.8). Findings from this study further showed that 9.7% of the males examined had tuberculosis-like nodules, whereas 9.6% of the females examined had tuberculosis-like nodules. There was however no significant difference between the prevalence of tuberculosis-like nodules in males when compared with females ($p > 0.05$). In terms of breed, tuberculosis-like nodules were observed in 8.7%, 10.7%, 10.5% and 8.9% in Bunaji, Rahaji, Wadara and Sokoto Gudali breeds of cattle, respectively. Tuberculosis-like nodules were detected in 4.4%, 7.8% and 12.9% of slaughtered cattle within the age groups of ≤ 4 years, > 4 to ≤ 6 years, and > 6 years, respectively. There was a significant difference between the occurrence of tuberculosis-like nodules among the different age groups of cattle that were examined ($P < 0.05$). The TB-like nodules were observed in the lung (141=66.5%), lymph node (50=23.6%), liver (11=5.2%), intestine (7=3.3%), and spleen (3=1.4%).

This study highlights the possibility of bovine tuberculosis in slaughtered cattle, and the attendant public health implications of such findings in the study area. Measures for control were also suggested.

Keywords: Tuberculosis-like Nodules, Cattle, Meat Inspection, Yobe State, Nigeria.

***Corresponding Author**

INTRODUCTION

Bovine tuberculosis (BTB), predominantly caused by *Mycobacterium bovis* infection, is one of the most important infectious diseases of livestock [1]. In Africa, BTB has received low attention, and many countries including Nigeria have no control or eradication policy [2]. It has been estimated that nearly 85% of cattle and 82% of the human population in the continent live in areas where the disease is prevalent or only partially controlled [3]. An increased risk of infection for humans exist in these communities due to close contact between people and their livestock and consumption of unpasteurized milk as part of the societies characteristics [4]. In countries where pasteurization of milk is rare and BTB in cattle is common, 10% to 15% of tuberculosis (TB) in human may be caused by *M. bovis* [5]. The current HIV/AIDS epidemic, especially in areas where BTB is prevalent in domestic and wild animals, poses an additional serious public health threat [6-7] as TB is the most frequent opportunistic disease associated with HIV infection [8-9].

In Nigeria, BTB is considered an endemic disease and has been reported in many regions [10-13] with prevalence ranging from 2.5% to 14%. In a country confronted with challenges of increasing human population, the control of BTB must be given special attention in poverty alleviation through improved livestock productivity. Moreover, with increased incidence of TB/HIV/AIDS co-infection in the country and high risk of exposure of the population to zoonotic TB, adequate information on BTB in cattle is a prerequisite for intervention strategies [14].

Definitive diagnosis of *Mycobacterium bovis* infection often requires isolation and identification of the causative agent from tissue specimens [15]. Furthermore, several new laboratory procedures have been introduced as an aid in the diagnosis of the infection [16]. However, because of technical problems and cost, they have not come into widespread use in Veterinary Diagnostic Laboratories [17]. Therefore, in countries like Nigeria, implementation of detailed post-mortem

examination of carcasses at slaughter houses continues to be an important step in surveillance of BTB [18].

The main aim of this study was to describe the magnitude and distribution of gross TB lesions compatible with bovine tuberculosis in slaughtered cattle in Yobe State, Nigeria.

MATERIALS AND METHODS

Study Area

The study was performed between 2011 and 2012 in Yobe State, Nigeria. The state is located in North eastern part of Nigeria. A mainly agricultural state, it was created on August 27, 1991. Yobe State was carved out of present-day Borno State, with an area of about 45,502 km² and lies within latitude 11-12°N and longitude 10-13°E and lies within the savannah region of Nigeria. According to the 2006 census, the population of the state is estimated to be 2,532,395. The state borders the Nigerian states of Bauchi, Borno, Gombe, and Jigawa. It borders the Diffa Region and the Zindar Region to the north in The Republic of Niger. Because the state lies mainly in the dry belt, the state is dry and hot for most of the year, except in the southern part of the state which has a milder climate.

Post-mortem Examination

A total of Twenty Two Thousand, Five Hundred and Eighty one (22,581) cattle were slaughtered in the state during the study period, out of which One Thousand Nine Hundred and Twenty Three (1,923) were examined for TB-like nodules based on judgemental or purposive sampling technique. The study was carried out in 10 major abattoirs/slaughter houses that supply meat to the public in Yobe State. Epidemiological data such as sex, breed and age of the slaughtered cattle. These carcasses were examined visually for changes in colour, (pale yellow or gray) or morphology and then palpated before incision from the surrounding tissues.

Data Analysis: The chi-square (χ^2) was used to calculate the expected values with their appropriate degrees of freedom (df). The calculated chi-square values were compared with the tabulated chi-square values to specify the level of significance or association between variables, with $P < 0.05$ regarded as significant. The prevalence and appropriate confidence interval of the TB-like nodules were calculated using Minitab version 16

RESULTS

The result of post-mortem meat inspection conducted in 10 abattoirs/slaughter houses within the study area is presented in Table 1. A total of One Thousand Nine Hundred and Twenty Three (1923) cattle, consisting of Eight Hundred and Thirty Six (836) males and One Thousand and Eighty Seven (1087) females were Examined for gross TB lesions. The overall positives out of 1923 cattle examined were One Hundred and Sixty Seven (167) with a prevalence of (8.7%, 95%CI = 6.1-11.8). Based on sex 71(8.5%, 95%CI = 5.9-10.9) males were positives while 96(8.8%, 95%CI = 6.4-11.9) females were positives. There was however no significant difference between the prevalence of TB-like lesions in males when compared with females ($p > 0.05$) this study found that breeds and age groups of cattle examined were statistically associated with prevalence of bovine tuberculosis lesions in slaughtered cattle ($P < 0.05$). The prevalence of TB-like nodules among the major breeds of cattle examined is presented in Table 2. Out of the 1923 cattle examined 660, 519, 431 and 313 were Bunaji, Rahaji, Wadara, and Sokoto

Gudali breeds of cattle respectively. Out of the 660 Bunaji cattle examined, 55 had TB-like nodules with a prevalence of 8.3% (95% CI = 10.1-11.5). For the 519 Rahaji breed examined, 46 had TB-like nodules with a prevalence of 8.9% (95% CI = 9.2-14.7). For the 431 Wadara breed examined, 37 had TB-like nodules with a prevalence of 8.6% (95% CI = 8.1-13.8) whereas for the 313 Sokoto Gudali breed examined, 29 had TB-like nodules with a prevalence of 9.3% (95% CI = 7.1-13.2). There was a significant difference between the prevalence of TB-like nodules in the breeds of cattle examined ($P < 0.05$). The prevalence of TB-like nodules among different age groups of the cattle examined is presented in Table 3. The ages of cattle examined were classified in to three groups (≤ 4 yrs, > 4 yrs – ≤ 6 yrs and > 6 yrs). Out of 1923 slaughtered cattle examined at post-mortem meat inspection for gross TB lesions, 167, 971 and 787 were between the ages of ≤ 4 yrs, > 4 – ≤ 6 yrs and > 6 yrs respectively. For the age group of ≤ 4 yrs, 10 had TB-like nodules with a prevalence of 3.6% (95% CI = 11.1-7.8), while for the age group > 4 to ≤ 6 yrs, 56 had TB-like nodules with a prevalence of 5.8% (95% CI = 7.3-11.4) and for those that were over 6 yrs, 105 had TB-like nodules with a prevalence of 13.3% (95% CI = 8.8-13.2). There was a significant difference between the prevalence of TB-like nodules among the different age groups of cattle that were examined ($P < 0.05$).

Table 1: Prevalence of Tuberculosis-like Nodules among Male and Female Cattle Slaughtered in Yobe State, Nigeria.

Sex	Cattle Examined	Positive	Prevalence[95% CI]	(P-Value)
Male	836	71	8.5 [[9.2-11.2]	0.35
Female	1087	96	8.8 [8.5-13.7]	
Total	1923	167	8.7 [8.2-12.4]	

Table 2: Prevalence of Tuberculosis-like Nodules among Breeds of Cattle Slaughtered in Yobe State, Nigeria.

Breed	Cattle Examined	Positive	Prevalence[95% CI]	(P-Value)
Bunaji	660	55	8.3 [[9.1-11.5]	(0.045)
Rahaji	519	46	8.9 [9.2-14.7]	
Wadara	431	37	8.6 [8.9-13.8]	
Sokoto Gudali	313	29	9.3 [7.1-13.2]	
Total	1923	167	8.7 [8.7-13.8]	

Table 3: Prevalence of Tuberculosis-like Nodules among Different Age Groups of Cattle Slaughtered in Yobe State, Nigeria.

Age	Cattle Examined	Positive	Prevalence[95% CI]	(P-Value)
≤4yrs	165	10	3.6 [11.1-7.8]	(0.019)
>4 – 6yrs	971	56	5.8 [7.3- 11.4]	
>6yrs	787	105	13.3 [8.8-13.2]	
Total	1923	167	8.7 [8.7-13.8]	

DISCUSSION

The detection of TB-like nodules in 8.7% of the slaughtered cattle examined in Yobe State may have serious epidemiological and public health importance. This poses great danger of contracting the disease by the public especially abattoir workers and herdsman. It further confirms that control measures are either not in place or inadequately applied; because in countries where control of bovine TB is in place, detection of lesions at the abattoir during meat inspection is usually very minimal [19]. This finding, also agrees with an earlier suggestion that, abattoir monitoring could be an essential element in the national bovine tuberculosis campaign and the most effective means of detecting residual infection in herds especially in countries that have achieved control of the disease [20]. The association between the occurrence of TB-like nodules and sex of cattle examined was not statistically significant ($P < 0.05$). This is in agreement with previous studies in Africa and Nigeria [21-22-23]. Variation in susceptibility of BTB among breeds of cattle has been documented [24] and supported by our findings, which showed that the Bunaji breed of cattle was less likely to develop TB-like nodules compared to the other breeds of cattle examined in this study. We however, suggest that further studies need to be carried out to elucidate genetic traits that may be responsible for possible tolerance to tuberculosis among different ecotypes/genotypes of zebu cattle. The preponderance of TB-like nodules in older cattle, as reported in the present study, is in agreement with previous findings [25-26] and may partly explain the importance of longevity and prolonged exposure to the pathogen, added to the possible reactivation of latent infections in old and stressed animals (27). Although, gross TB lesions result is not confirmatory for tuberculosis infection, because other tubercle bacilli and other organism like nocardia could have lesions compatible with TB [28], since culture is not usually done in most abattoir and slaughter houses as a diagnostic tool in Nigeria, as in most economically constrained countries [29-30].

Conclusion and Recommendation

From this study, TB-like nodules were observed in 8.7% of the slaughtered cattle in Yobe State, Nigeria. Proper abattoir hygiene, proper post-mortem meat inspection and clean handling of milk and meat before consumption are necessary to prevent infection in humans. However, this study indicates that a widespread and detailed epidemiological study is needed to ascertain the true extent of tuberculosis in Nigerian livestock before initiation of a control program.

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Conflict of Interest: The authors declare no conflict of interest

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