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HERD PREVALENCE OF BOVINE TUBERCULOSIS BASED ON MANAGEMENT SYSTEMS IN ADAMAWA AND TARABA STATES, NORTH EASTERN NIGERIA

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ABSTRACT

The prevalence of bovine tuberculosis in cattle on the basis of management systems was investigated in Adamawa and Taraba States. A cross sectional study using purposive sampling technique was carried out in One hundred and eighty-five herds numbering 5,987 cattle kept under nomadic and sedentary management systems in 10 Local Government Areas of Adamawa and Taraba States. Cattle were screened for bovine tuberculosis with bovine purified protein derivatives using intradermal caudal fold tuberculin test. The result showed bovine tuberculosis was present in both nomadic and sedentary cattle. There was a significant association ($p<0.05$) between management practices and the occurrence of tuberculosis in the herds. The prevalence was higher in cattle that were kept under sedentary management system (12.9%) than in cattle raised under nomadic management system (4.1%). Regular screening of cattle especially those under sedentary management system is recommended.

INTRODUCTION

Bovine tuberculosis (BTB) is primarily a zoonotic disease which is transmitted to humans through infected aerosols and contaminated meat, milk and other products obtained from infected cattle (Bilal *et al*., 2010). Nearly 85 % of cattle and 82% of the human population in Africa live in areas where the disease is prevalent or partially controlled (Ayele *et al*., 2004) From the limited survey works which have been reported over the last thirty years in Nigeria, BTB prevalence due to *M. bovis* ranged from 2.5 % in 1976 to 17 % in 2010 (Danbirni *et al*., 2010). Today, pockets of bovine tuberculosis study have reported various prevalences most of which were abattoir surveys (Danbirni *et al*., 2013, Ejeh *et al*., 2013), Acid-fast test and Molecular differentiation of a few isolates (Abubakar, 2007, Cadmus, 2007) or tuberculin test using a limited number of herds (Ibrahim *et al*., 2010, Abubakar *et al*., 2013). Contact between cattle and humans in Nigeria due to urbanization may not only predispose humans to tuberculosis but may be responsible for the recent communal conflicts between farmers and herdsmen in some parts of Nigeria. In searching for the type of cattle management system in resolving farmer-herdsmen conflict in Nigeria, management system related diseases especially zoonotic ones like BTB should be investigated in cattle population systems. A large scale data on BTB involving a large sample size cattle raised under specific management systems in Nigeria is lacking. This study was therefore, designed to determine the prevalence of BTB in 5,987 cattle kept under nomadic and sedentary management systems in 10 Local Government Areas of Adamawa and Taraba States using intradermal single caudal fold tuberculin test.

MATERIALS AND METHODS

Adamawa State is one of the six major cattle producing States in Nigeria (Aliyu *et al*., 2009) and lies between latitude 9° 20' N and longitude 12° 30' E in the Sub Sudan and Northern Guinea Savannah Zones of Nigeria. The State is bordered by Borno State to the north, Gombe State to the north-west, Taraba State to the south and to the east by the Republic of Cameroon with which it had its longest border of about 492 kilometers (Anon, 2012). Topographically, the valleys of Cameroon, Mandara and Adamawa mountains form part of the landscape of Adamawa State. The State has a long period of dry season extending from October to May, and a short-wet season from June to September (Aliyu *et al*., 2009). The short period of wet season compels the herdsmen to shuttle along the Nigeria-Cameroon border in search of greener pasture for their cattle. Adamawa State comprised of 22 local government areas with Yola as the State capital and also the administrative centre of the State. Yola has a population of 88,500 (2004 national population census estimate – Anon, 2012, 2013).

Taraba State is named after the Taraba River which traverses the southern part of the state. Taraba's capital is Jalingo. The state lies between latitude 8° 00'N and longitude 10° 30'E covering an area of 54,473 km^2 (21,032 sq miles) with an estimated population of 2,688,944 (2005 estimate) and is bounded in the west by Plateau and Benue States and on the east by the Cameroon. Taraba State lies largely within the middle of Nigeria and consists of undulating landscape dotted with a few mountainous features. These include the scenic and prominent Mambilla Plateau. The state lies largely within the tropical zone and has a vegetation of low forest in the southern part and grassland in the northern part. The Mambila Plateau with an altitude of 1,800 meters (6000 ft) above sea level has a temperate climate all year-round (Anon. 2008).

Rivers Benue, Donga, Taraba and Ibi are the main rivers in the state. They rise from the Cameroonian mountains, straining almost the entire length of the state in the North and South direction to link up with the River Niger. Taraba State consists of sixteen local government areas (LGAs). The major occupation of the people of Taraba State is agriculture. Cash crops produced in the state include coffee, tea, groundnuts and cotton. Crops such as maize, rice, sorghum, millet, cassava, and yams are also produced in commercial quantity. In addition, cattle, sheep and goats are reared in large numbers, especially on the Mambila Plateau, and along the Benue and Taraba valleys. Similarly, the people undertake other livestock production activities like poultry production, rabbit breeding and pig farming in fairly large scale. Communities living on the banks of River Benue, River Taraba, River Donga and Ibi engage in fishing all year-round (Anon. 2008)

Target population

The target cattle populations for the tuberculin test were those raised under normadic and sedentary management system.

Study design

A cross sectional study was carried out and selection of the testing areas within each state was done through the assistance of the Directors of Veterinary Services based on their knowledge of cattle population in the local government areas (L.G.A), management system, physical accessibility to the herds, restraint facilities and consent of the cattle owners. Five L.G.As were selected in each state.

Sampling method

A judgmental/purposive sampling technique in sampling cattle for the tuberculin test in each selected L.G.A in Adamawa and Taraba states was used. This was based on the availability of cattle populations, management system, physical accessibility to the herds, availability of cattle restraint facilities, consent of the cattle owners as there was no law compelling them to submit their cattle for testing and above all no reliable data on the actual population of cattle in both Adamawa and Taraba states.

Judgmental/purposive sampling criteria

i) Herd selection criteria: A herd must have at least 20 cattle that must have stayed together for a period not less than 3 months (adequate contact with each other for transmission of *M. bovis* infection to occur) was tested.

ii) Individual cattle exclusive criteria: The categories of cattle excluded from the tuberculin test included: cows in advanced (3rd trimester) stage of pregnancy, cattle less than one year of age, cachectic or debilitated cattle and any cattle with concurrent swellings at the caudal fold and the cervical region were also excluded.

Case definition of BTB

Any cattle that had nodular or diffused swelling at the site of the PPD inoculation at the caudal fold after 72 hours was regarded as positive. Visual observation and Palpation method was used in detecting the swelling as described by Alhaji (1976).

Cattle identification

An oil-based paint applied on the back of the cattle was used in numbering those that do not have ear tags for identification.

Tuberculin test procedure

Purified Protein Derivative (PPD) purchased from Europe (Prionics Lelystad, Prod. Nr. 7600040, Box BO201-XX, Netherlands) was used in screening the cattle for tuberculosis using the single intra-dermal caudal fold by means of standard method (Alhaji, 1976). Each cow was physically restrained and 0.1 ml of bovine PPD (30,000 IU/ml) was injected intra-dermally at the caudal fold, about 5 cm away from the base of the tail. A palpable swelling of either diffused or nodular nature after 72 hours indicated a positive reaction.

Data Analysis

The data obtained were subjected to chi-square at 95% confident interval using SPSS version 20.

RESULTS AND DISCUSSION

The prevalence of BTB in Adamawa and Taraba States was higher in the cattle kept under sedentary management system with 12.9% (133/1,031) than those raised under nomadic management system where 4.1% (203/4,956) was observed (Table 1). There was a significant association between herd management system and bovine tuberculosis occurrence in the herds ($p < 0.05$). Cattle that were kept under sedentary management system seemed to have higher prevalence of bovine tuberculosis (12.9%) than those herds that were kept under nomadic management system (4.1%) (Table 2). The difference in the prevalence could be attributed to the fact that tuberculosis is a disease of close and adequate contacted spread primarily through infected aerosols. The sedentary farm management system provided an excellent opportunity for close contact between the animals for an infected aerosol to be spread within the herd. The

situation is different in the nomadic management system where the animals were kept in the open with adequate ventilation as reported by Ayanwale *et al*. (1984). Similar observation was made by Acha and Szyfres, (1987) that the prevalence of BTB within a country varies from area to area; the highest incidence of BTB is generally observed where intensive dairy production is common, notably in the milk sheds of larger cities (sedentary cattle). Furthermore, there was history of introduction of new exotic breeds of cattle with unknown tuberculosis status from abroad into one of the sedentary cattle farm. This observation agrees with the report of Alhaji, (1976) that the introduction of European breeds of cattle and the subsequent development of intensive agriculture rapidly changed the distribution of the BTB in Nigeria. It was also gathered that, this same farm recorded substantial cattle mortality due to tuberculosis in recent past. This might have been responsible for the higher prevalence observed in cattle kept under sedentary management system. This study also observed a significant association ($p < 0.05$) between the herd management systems and the prevalence of BTB (Table 2) which differed from the observations made by Abubakar *et al*. (2013) that there was no significant effect of management system on the prevalence of the disease but similar to what other researchers (O'Reiley and Daborn 1995; Shirima *et al*., 2003; Kempf *et al.*, 2005) who have reported that indeed management system influences the prevalence of tuberculosis among cattle population which they observed to be more in intensively managed cattle (sedentary) than semi-intensive cattle population.

Table 1: **Prevalence of Bovine tuberculosis in Cattle on the basis of management systems in Adamawa and Taraba States using intradermal caudal fold tuberculin test**

Management System	No. of herds tested	No. of cattle tested	No. of cattle positive	No. of cattle negative	Prevalence (%)
Nomadic	152	4, 956	203	4, 753	4.1
Sedentary	33	1, 031	133	898	12.9
Total	**185**	**5, 987**	**336**	**5, 651**	

Table 2: **Assessment of association between management system and Cattle tuberculin status in Adamawa and Taraba States**

Management system	Total no. of Cattle tested	Cattle tuberculin status		p-value
		positive (%)	negative (%)	
Nomadic	4, 956	203 (4.1)	4, 753 (95.9)	
Sedentary	1, 031	133 (12.9)	898 (87.1)	0.000
Total	**5, 987**	**336 (5.6)**	**5, 651 (94.4)**	

$\chi 2 = 124.882$, df = 1, $p < 0.05$

CONCLUSION

This study has shown that BTB was present in both nomadic and sedentary farm management systems and the prevalence of BTB in either of the management systems depends on the practices and precautions taken by the farmer such as seasonal migration and importation of animals from countries with herds of unknown BTB status. This study may serve as a base line data to the federal and State Governments in screening cattle of management related diseases especially those that are zoonotic in nature as they consider the option of creating ranches for our teaming nomadic herdsmen as a measure in minimize the conflict between farmers and nomadic herdsmen.

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