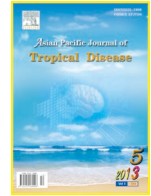




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Seroprevalence of bovine brucellosis in northern Plateau State, North Central Nigeria

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PEER REVIEW

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Comments

The study determined the seroprevalence of brucellosis among cattle which is an evidence of exposure of the animals to the brucella agent in the population. The results are interesting as they indicate the threat that these apparently healthy cattle may pose to public health and the role they play in the dissemination/spread of the disease agent during their migration (especially the pastoralist herds).

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ABSTRACT

Objective: To determine the seroprevalence of brucellosis among cattle in some local government areas (LGA) of the northern part of Plateau State, Nigeria.

Methods: Sera obtained from a total of 270 randomly selected cattle from different herds in the four selected LGAs were for *Brucella* antibodies using the Rose Bengal Plate Test (RBPT).

Results: An overall brucellosis seroprevalence of 9.6% (26/270) was obtained. The seroprevalence of *Brucella* antibodies among the cattle across the LGA ranged from 0%–37.3% with Riyom and Bassa LGA having the lowest and highest seroprevalence respectively while Barkin Ladi LGA had no sero-positive cattle. Females had a higher percentage of seropositives compared to males while cattle reared under extensive system of management had a higher (11.6%) percentage of sero-positives compared to cattle kept under the intensive system of management. However, there was no statistically significant ($P>0.05$) association between serological status and sex or management practice.

Conclusions: The results of this study indicates that bovine brucellosis is still a problem among the cattle population in Plateau State, Nigeria. And the public and other animals are at risk of exposure to the disease agent in these animals which are still shedding the organism.

KEYWORDS

Brucellosis, Cattle, Seroprevalence, Plateau State, Nigeria

1. Introduction

Brucellosis is an infectious disease of both animals and humans caused by facultative, intracellular, coccobacilli,

Gram-negative bacteria of the genus *Brucella* which consists of ten species namely, *Brucella abortus* (cattle), *Brucella melitensis* (goat and sheep), *Brucella suis* (pig), *Brucella canis* (dog) which also affect man, *Brucella ovis*

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(sheep), *Brucella neotomae* (desert woodrat)[1]. *Brucella ceti* (cetaceans), *Brucella pinnipedialis* (pinnipeds) are species isolated from marine mammals and occasionally cause infection in man[2]. A novel species *Brucella microti* was isolated from the Vole (*microti arvalis*) has been approved as a cause of brucellosis[3]. So also, another new species has been described from a human breast implant named *Brucella inopinata*[4].

Brucellosis is endemic in Nigeria and causes severe economic losses to livestock farmers. It is a serious risk to human health and has been documented in different part of the country especially in ranches, livestock breeding centre and dairy farms in Nigeria[5–8]. The aim of this study was to determine by serology the prevalence of brucellosis in Northern Plateau State, Nigeria.

2. Materials and methods

Study Area: This study was conducted in the Northern part of Plateau State located at Latitude 090 52N and Longitude 80 54E in North–Central Nigeria. Northern Plateau is made up of six Local Government Areas (LGA) as follow; Jos–North, Jos–South, Jos–East, Bassa, Barki–Ladi and Riyom.

A cross–sectional survey was conducted and a total of 270 cattle were randomly sampled from four LGA of northern Plateau State namely; Jos South, Barkin Ladi, Riyom and Bassa LGA. Five milliliter of blood free of anticoagulant was from the jugular vein of each of the cattle after proper restraint. The clotted blood samples were subjected to centrifugation at 3000 r/min for 5 min. The clear sera were harvested using the Pasteur pipette into serum vials and stored at –20 °C until required for used. Information such as sex, location and management system of the cattle were also collected.

Rose Bengal Plate Test (RBPT) was used to determine the presence of *Brucella* antibodies in the sera samples was carried out as described by Alton *et al*[9]. The RBPT antigen was obtained from Central Veterinary Laboratory, Weybridge, United Kingdom. The RBPT was carried out at the *Brucella* Research Laboratory, National Veterinary Research Institute, Vom, Plateau State, Nigeria. Briefly, equal volume (30 µL) of test serum and RBPT antigen was placed beside the test serum on a white ceramic tile and mixed thoroughly using sterile applicator stick for 4 min. The mixture was then observed for agglutination. Samples that show distinct agglutination were recorded as positive and those without agglutination were

considered negative.

Data obtained was presented in form of tables. Fisher's Exact test was used to analyze the data with the aid of Statistical Package for Social Science (SPSS) version 17.0 (SPSS Inc. Chicago IL, USA). The prevalence of bovine brucellosis was calculated by dividing the total number of seropositive animals by the total number of animals sampled and expressed as a percentage.

3. Results

Twenty six (9.6%) out of the 270 cattle tested were positive for *Brucella* antibodies with RBPT. Bassa LGA had the highest prevalence of 37.3%, followed by Jos South LGA (3.7%), Riyom LGA (2.5%), while Barkin Ladi LGA had no positive sample (Table 1).

Table 1

Seroprevalence of Bovine Brucellosis based on location.

Location	Total number sampled	Number positive	% positive
Jos South	162	6	3.7
Barkin Ladi	16	0	0
Riyom	40	1	2.5
Bassa	51	19	37.3
Total	270	26	9.6

A seroprevalence of 3.1% (2/64) and 11.6% (24/206) was obtained in the cattle managed under the intensive and extensive systems respectively. There was no statistically significant association ($P>0.05$) between seroprevalence of brucellosis and management system. A seroprevalence of 2.6% (5/81) and 7.4% (14/189) was obtained in the male and female cattle respectively. There was no statistically significant association ($P>0.05$) between seroprevalence of brucellosis and sex of the animal.

4. Discussion

This study reported an overall prevalence rate of 9.6% in the study area. This findings is comparable to reports of previous work from other State of Nigeria and other parts of the world, while some previous investigators reported higher prevalence, other reported lower prevalence compared to this study. Wungak *et al.* reported prevalence rate of 3.8% in Jos–South LGA of Plateau State which is lower than the one obtained in this study, Cadmus *et al.* reported 5.82% in Ibadan, South–West Nigeria, Apan *et al.* reported 3.2% prevalence in Turkey and Nakaune *et*

al. reported 3.3% prevalence in cattle in Central Africa Republic^[10–13]. One reason that could be attributed to the high (9.6%) prevalence in Northern Plateau State could be the very low temperature in Jos, plateau state. Low temperatures are known to favour the growth and survival of the *Brucella* organism for long periods^[14].

The high prevalence in Bassa LGA could be attributed to the concentration of Fulani herdsmen in the location and because of this there will be contamination of pasture as a result moving around to graze by the cattle which could result to the high prevalence obtained in the location follow by Jos–South LGA which is commercial heart of the State in which the cattle are brought in from different location of the State, and neighboring State to market their cattle, though consist of the highest number sampled but is still low (3.7%) compared to Bassa LGA, the reason could be that the farmers could identify the sign of brucellosis and culled the cattle out by slaughtering. Riyom LGA have the prevalence rate of 2.5% and Barkin–Ladi without any positive does not mean that there is absence of brucellosis in the area but may be the number of cattle sampled is too small (16) to make us draw conclusion on it.

Though, there was no statistical association between serological status and management system. Management could be a contributory factor to the spread of bovine brucellosis. The low prevalence (3.1%) in those reared under intensive management may be attributed to good sanitation practice in the farms which prevents the cattle from getting in contact with other animals which may likely serve as source of infection to the cattle. In the extensive system of management cattle move from one location to another in search of pasture which also exposed them to the risk of contracting the disease from pastures contamination by aborted fetuses or materials as well as contact with animals shedding the organism. This is supported by high seroprevalence (11.6%) among those under this system of management.

The higher (7.4%) and lower (2.6%) prevalence recorded in female and males cattle respectively is in agreement other findings^[15], who reported 7.7% and 4.8% in female and male respectively in Maiduguri, North–East Nigeria. Though sex is not a condition for brucellosis infection the higher prevalence tends in female compared to males, may be due to the fewer number of males in a herd. Female cattle are preferred to male because of their economic benefits *i.e.* able to give birth to the younger calves to increase the herd size and income. The low

prevalence in males in this study may also be attributed to the practice of culling diseased male animals (because brucellosis in male cattle is characterized by orchitis manifesting as swollen testes animals with such infirmities are culled and sold out).

The findings of this study indicates that bovine brucellosis is still endemic in Nigeria and may pose a significant public health threat as a result of consumption and contact (with contaminated) food or materials.

There is need for urgent control policy to drastically curtail the negative health effect of brucellosis on both human and animals. Test and slaughter method with compensation should be embark on followed by mass vaccination of sero–negative animals.

Conflict of interest statement

The authors have no conflict of interest to declare.

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Comments

Background

Brucellosis is a zoonotic disease caused by *Brucella* species. Reports have indicated an endemicity of the disease among the cattle population in Nigeria and has also implicated cattle especially those managed by the pastoralists in its spread due to their migratory nature. the disease is a poses a public and veterinary health threat worldwide with its highest number of cases in developing countries of Africa and Asia. It is transmitted from contact with infected materials or consumption of products of animals shedding the agent.

Research frontiers

The study was conducted to determine the seroprevalence of brucellosis in cattle in four local government areas in Northern Plateau, state which has pastoralist and sedentary cattle herd.

Related reports

The results of this study support other reports of endemicity of the disease in Nigeria. The relatively higher prevalence (9.6%) obtained in this study is in contrast to the findings of other studies in Nigeria such as those of Wungak *et al.*, 2011 and Cadamus *et al.*, 2006). The higher seroprevalence in this study may have been influenced by the climatic conditions of the study area. The study area is characterized by a cold environment which has been reported to favour the survival and multiplication of the pathogen (Aune *et al.*, 2011).

Innovations & breakthroughs

Data from the research has established a seroprevalence of 9.6% indicating an increase in prevalence of the disease among cattle population in the state when compared to results of previous studies.

Applications

Knowledge of the status of brucellosis among these animals is important for implementation of the national brucellosis control and eradication programme. It is also an important public health threat as especially because milk is consumed from these animals and also abattoir, animal health worker and the herds men have frequent contact with these animals without using protective clothing.

Peer review

The study determined the seroprevalence of brucellosis among cattle which is an evidence of exposure of the animals to the brucella agent in the population. The results are interesting as they indicate the threat that these apparently healthy cattle may pose to public health and the role they play in the dissemination/spread of the disease agent during their migration (especially the pastoralist herds). It also highlights the role these animals may play in thwarting the brucellosis national brucellosis control programme. It also highlights the importance of the use of protective clothing when having contact with animals.

References

- [1] Martín-Martín AI, Sancho P, Tejedor C, Fernández-Lago L, Vizcaíno L. Differences in the outer membrane-related properties of the six classical *Brucella* species. *Vet J* 2011; **189**: 103–105.
- [2] Falenski A, Mayer-Scholl A, Filter M, Gollner C, Appel B, Nockler K. Survival of *Brucella* spp. in mineral water, milk and yogurt. *Int J Food Microbiol* 2011; **145**: 326–330.
- [3] Scholz HC, Hubakki Z, Sedlacek L, Vergnaud G, Jomaso H, Al Dahouk S, et al. *Brucella microti* species Nov.; isolated from the common vole (*Microtus sarvalis*). *Int J Syst Evol Microbiol* 2008; **58**: 375–382.
- [4] Scholz HC, Nockler K, Gollner C, Bahn P, Vergnaud G, Tomaso H, et al. *Brucella inopinata* species Nov. isolated from a breast implant infection. *Int J Syst Evol Microbiol* 2009; **60**: 650–654.
- [5] Bale OOJ, Kumi-Diaka J. Serological and bacteriological study of bovine brucellae from livestock investigation and breeding centre in Nigeria. *Brit Vet J* 1981; **137**: 256–261.
- [6] Mohammed FU, Ibrahim S, Ajogi I, Olaniyi BJ. Prevalence of bovine brucellosis and risk factors assessment in cattle herds in Jigawa State. *ISRN Vet Sci* 2011; doi: 10.5402/2011/132897.
- [7] Mai HM, Irons P, Kabir J, Thompson PN. A large seroprevalence survey of brucellosis in cattle herds under diverse production system in northern Nigeria. *BMC Vet Res* 2012; **8**: 144.
- [8] Ocholi RA, Kwaga JK, Ajogi I, Bale JO. Abortion due to *Brucella abortus* in sheep in Nigeria. *Rev Sci Tech* 2005; **24**(3): 973–979.
- [9] Alton GG, Jones LM, Angus RD, Verger JM. *Techniques for the Brucellosis Laboratory*. Paris: Institut National de la Recherche Agronomique; 1988.
- [10] Wungak YS, Aworh MKF, Maurice NA, Balami AG, Danmarwa A, Danthe HD. Serological survey of antibodies against *Brucella abortus* in cattle in Jos–South Local Government Area. *Vom J Vet Sci* 2011; **8**: 39–42.
- [11] Cadmus SIB, Ijagbone IF, Oputa HE, Adesokan HK, Stack JA. Serological survey of brucellosis in livestock animals and workers in Ibadan, Nigeria. *Afr J Biomed Res* 2006; **9**: 163–168.
- [12] Apan TZ, Yildirim M, Istanbuluoglu E. Seroprevalence of brucellosis in human, sheep, and cattle in population in Kirikkale (Turkey). *Turk J Vet Anim Sci* 2007; **31**(1): 75–78.
- [13] Matopea G, Bhebhea E, Mumac JB, Lundd A, Skjerve E. Herd-level factors for *Brucella* seropositivity in cattle reared in smallholder dairy farms of Zimbabwe. *Prev Vet Med* 2010; **94**: 213–221.
- [14] Aune K, Rhyan JC, Russell R, Roffe TJ, Corso B. Environmental persistence of *Brucella abortus* in the Greater Yellowstone area. *J Wildl Manage* 2012; **76**: 253–261.
- [15] Adamu NB. Epidemiology of *Brucella* infection in ruminants and humans and its public health implications in Borno state, Nigeria[D]. Kaduna state: Ahmadu Bello University; 2009, p. 101–200.