JOURNAL OF VETERINARY AND APPLIED SCIENCES
2019 VOL. 9 (1): 8 - 13
Manuscript No. JVAS/2018/026; Received: 13/11/2018; Accepted: 02/05/2019
Published by: Faculty of Veterinary Medicine, University of Nigeria, Nsukka, Nigeria

SEROPREVALANCE OF BRUCELLA ANTIBODIES IN TRADE CATTLE AND GOATS SLAUGHTERED AT NSUKKA, NIGERIA

Lynda O. Majesty-Alukagberie*, Joseph I. Onunkwo, Ifeoma A. Titus and Jessica K. Ugwu

Department of Veterinary Public Health and Preventive Medicine, University of Nigeria, Nsukka, Enugu State, Nigeria.

==========

ABSTRACT

A cross sectional sero-epidemiological survey was used to determine the prevalence of Brucella antibodies in trade cattle and goats slaughtered at Nsukka slaughterhouse. The Rose Bengal Plate Test (RBPT) was used for the study. In all, a grand total of 400 animals made up of 200 cattle (164 males and 36 females) and 200 goats (8 males and 192 females) were screened for Brucella antibodies using Brucella abortus and Brucella melitensis antigens. An overall seroprevalence of 12% (4.5% in cattle and 7.5% in goats) was recorded from the study. Antibodies to Brucella abortus were generally more prevalent (4.5%) than those of Brucella melitensis (1.5%). Brucella antibodies were more prevalent in female (4.5%) than male (1.2%) cattle while more male (25.0%) than female (6.8%) goats had antibodies. There was no statistical association between the prevalence of Brucella antibodies and sexes of goats and cattle.

Keywords: *Seroprevalence, Brucella, Antibodies, Cattle, Goats, Nsukka, Nigeria.*

==========

INTRODUCTION

Brucellosis is a contagious disease that affects mainly cattle, swine, sheep, goats, dogs and humans. Other species affected include horses and camels. It has been reported worldwide and is quite endemic in Nigeria [1].

Brucellosis in cattle is usually caused by biovars of *Brucella abortus.* In some countries, particularly in Southern Europe and Western Asia, where cattle are kept in close association with sheep or goats, infection can also be caused by *B. melitensis*. Occasionally, *B. suis* may cause a chronic infection in the mammary gland of cattle, but it has not been reported to cause abortion or spread to other animals [2]

Brucellosis in sheep and goats is primarily caused by *Brucella melitensis* and incidentally by *Brucella abortus* [3] although the association of *Brucella abortus* with abortion in sheep has been demonstrated in several countries through isolation of the organisms [4,5]. *Brucella melitensis* is the most important species in sheep and goats, and *Brucella ovis* causes infertility in rams.

***Correspondence: E-mail: onyinye.obodoechi@unn.edu.ng; Tel: +234 8037989457**
ISSN: 2315 – 6856; e-ISSN: 2636 – 5553; *Website: www.jvasonline.com*

Brucellosis is worldwide in distribution but is well controlled in most developed countries. The disease is characterized by abortion, retained placenta, orchitis and epididymitis [6]. It is a worldwide zoonotic disease that is recognized as a major cause of heavy economic losses to the livestock industry and also poses serious threat to human health [4,7]. Although the disease has been eradicated in most industrialized regions, its occurrence is increasing in developing countries [8]. Brucellosis is endemic in Nigeria and as elsewhere, causes severe economic losses to farmers and ranchers and is a serious risk to human health [7,9]. In some countries, particularly those in Southern Europe and Western Asia, where cattle are kept in close association with sheep or goats, infection in cattle can also be caused by *B. melitensis*. Occasionally, *B. suis* may cause a chronic infection in the mammary gland of cattle, but it has not been reported to cause abortion or spread to other animals [2].

Abattoir workers such as butchers, veterinarians and abattoir attendants in the course of their work, come in contact with live and slaughtered animals in slaughter houses which may expose them to infection with brucellosis. The abattoir workers sometimes do not wear protective clothes and hand gloves, leaving them exposed to infected materials such as urine, aborted fetuses, especially placenta from infected animals [7,10]. Economic losses arising from brucellosis occurs due to abortion, diminished milk production, culling of infected animals and condemnation of carcasses. These losses are major challenges facing the sheep and goat industry and it is of great concern to researchers, public health authorities and stakeholders. In Nigeria where malaria is endemic, the recurring fever which is characteristic of brucellosis is overlooked. Following this development, prevalence or incidence of brucellosis is underestimated. Decision makers at local, national and international levels, rely on data of morbidity and mortality to make decisions on budgetary allocation for the control and eradication of diseases. When such data are lacking, these diseases may not be prioritized. It is against this background that this study was designed to ascertain the seroprevalence of *Brucella* antibodies in trade cattle and goats slaughtered in Nsukka; an area where there has not been any reported cases of brucellosis in the past.

MATERIALS AND METHODS

The study was conducted at Ikpa Market Slaughterhouse in Nsukka urban, Nsukka Local Government Area (LGA) of Enugu State, Nigeria. Nsukka has a total land mass of 45.38 square kilometres. The dry season lasts from November to March while the rainy season starts from April and ends in October. Average daily temperature ranges from 29ºC -34ºC [11] almost throughout the year. A grand total of 400 animals (164 male and 36 female cattle and 8 male and 192 female goats) were sampled in a descriptive cross-sectional survey between February and September, 2016. Collection of samples was done between 7.00 and 10.00 hours every other day.

About 3 ml of blood was collected during slaughter from the jugular vein into properly labeled sterilized bijoux bottles and taken to the laboratory in ice packs. The samples were centrifuged and the serum recovered for *Brucella* testing. The Rose Bengal Plate Test (RBPT) antigen for *Brucella melitensis* and *Brucella abortus* were procured from Veterinary Laboratory Agency, Addlestone, Surrey, KT15-3NB United Kingdom. The phenol crystals and sodium chloride were from Sigmaaldrich.

Antigens were stored at -20 ^{0}C until used. The antigens were reconstituted with phenol saline (Sigmaaldrich) solution at the ratio 1:2 before use. The test was carried out according to Morgan *et al.* [11]. Briefly, the antigen was allowed to thaw at room temperature. A drop of each test sera was placed at the two ends of a grease free slide with a wire loop. The wire loop was rinsed in distilled water after each drop, following which the wire loop was used to take a drop of the antigen which was mixed thoroughly with the test sera using another sterile wire loop .The mixture was then rocked gently and properly and then left to stand for about 3 minutes before it was viewed with a hand lens. Mixtures that showed granules which represented antigen-antibody complexes were recorded as positive while those that remained as homogeneous mixtures without granular formation were considered negative. The results of

agglutination were compared with known positive and negative samples that were included as controls. The results were presented using descriptive statistics. Chi- square test was used to check for association between variables.

RESULTS

Out of a grand total of 400 cattle and goat sera examined during the study, 24 (6.0%) were positive for *Brucella* antibodies (Table 1). Antibodies to *B. abortus* were generally more prevalent (4.5%) than those of *B. mellitensis* (1.5%) with a similar pattern in both cattle and goats. In general, female animals also had higher prevalence of *Brucella* antibodies (8.8%) than the males (2.3%).

Among the animal species examined, more positive samples were recorded in goats (7.5%) than cattle (4.5%). Brucella antibodies were more prevalent in female cattle (4.5%) than the males (1.2%) but more males (25.0%) than females (6.8%) were positive in goats.

Table 1. Seroprevalence of Brucella antibodies in trade cattle and goats slaughtered at Nsukka, Nigeria

	Number Examined	Number (%) positive		
		B. abortus	*B. mellitensis*	Total
All animals				
Male	172	1 (0.6)	3 (1.7)	4 (2.3)
Female	228	17 (7.5)	3 (1.3)	20 (8.8)
Total	400	18 (4.5)	6 (1.5)	24 (6.0)
Animal species				
Cattle				
Male	164	1 (0.6)	1 (0.6)	2 (1.2)
Female	36	5 (13.9)	2 (5.6)	7 (19.4)
Total	200	6 (3.0)	3 (1.5)	9 (4.5)
Goat				
Male	8	0	2 (25.0)	2 (25.0)
Female	192	12 (6.3)	1 (0.5)	13 (6.8)
Total	200	12 (6.0)	3 (1.5)	15 (7.5)

DISCUSSION

Brucellosis is a worldwide zoonosis that causes serious economic losses in livestock and poses important health hazards to humans [7,13]. One of the major implications of the burden of this disease in the abattoir setting is the exposure of livestock traders, butchers, veterinarians and other meat processors to the infection.

The overall prevalence of *Brucella* infection (6.0%) recorded in this study is low compared to the 21.3%, 11.1% and 20% in cattle, sheep and goats in Taraba State [14,15]. The high seroprevalence of 7.5% among goats is similar to the 7.8% recorded in some parts of Kaduna [16] and elsewhere in Northern Nigeria [15,17,18]. On the other hand, lower prevalence was recorded in Ibadan (0.86%), Bauchi (4.75%) and Nsukka (2.0%) by Cadmus *et al.* [19], Shehu *et al.* [20] and Onunkwo [21] respectively.

The higher prevalence of *B. abortus* than *B. mellitensis* in cattle may probably be due to the fact that cattle are the preferred host of *B. abortus* [22]. Although, natural infections with *Brucella mellitensis* usually occurs in goats, it has also been reported in cattle [23] but information in literature is scarce regarding the prevalence of *B. mellitensis* in cattle Similarly, *B abortus* was recorded in goats and

occurred in higher prevalence than *B. mellitensis* in goats may probably be due to the higher prevalence of *B. abortus* in the environment than *B. mellitensis*. Furthermore, that both cattle and the small ruminants are grazed and housed together increases contact between them and with the contaminated environment [24]. This may also explain the presence of *Brucella mellitensis* in cattle since the Fulani nomads usually practiced mixed grazing of cattle and small ruminants in Nigeria [20].

The seroprevalence of *Brucella melitensis* in this work is low when compared to *Br. abortus* and this agrees with earlier studies [16]. This prevalence was lower when compared to studies of Egwu et al. [22] but higher when compared to that of Kaltungo et al. [26] in Kaduna. The differences observed between this and other studies may be due to the variations in the sensitivity and specificity of the serological test methods used to detect *Brucella* antibodies, management practices and the sources of the animals. For instance, the RBPT used for this study has been shown to be only 92.1% sensitive [27] which therefore gives room for some errors compared to the reports of Teshale et al. [28] and Ogugua et al. [29] who used both RBPT and competitive enzyme linked immunosorbent assay but found the RBPT to be less sensitive than the competitive ELISA

Brucella infections were generally higher in cows than bulls probably because sexually mature females are usually more susceptible than the males [30]. The glycoprotein, erythritol present in the uterus has been said to enhance the proliferation of *Brucella* organisms [31]. It is also possible that the cows have been kept longer than the bulls and being mated by several different bulls over time, thus making them more susceptible to the disease. This lends credence to the study carried out in Ibadan abattoir [13] which also reported higher prevalence of *Brucella* infection in females than males. They authors suggested that the higher prevalence in the females than the males was because the bacteria are found in tissues and fluid associated with pregnancy; the udder and the lymph nodes which drain the relevant areas. It has also been reported that most male animals are usually sold off at younger age [32] than females and that a female may be mated by several males which could lead to a higher risk of introduction of the bacteria infection. Some workers have also reported that the more violent nature of the males make farmers to keep fewer of them making the females to be greater in number and thus more exposed to infection with *Brucella* organisms. This increase in the percentage prevalence for *Brucella abortus* may be caused by several factors ranging from the husbandry practice and age of the animal to environmental conditions [5,15,24,30,31].

The seroprevalence of antibodies to *Brucella melitensis,* as shown in this study, is higher in males than in females and this is consistent with earlier studies [16] which also recorded a higher prevalence of *Brucella melitensis* in male than female goats. This, however, contrasts with the report of Kebede *et al* [32] that *Brucella melitensis* in goats can occur more in females than males. The variations in prevalence can be attributed to the fact that most farmers practice mixed farming which increases the possibility of cross-infections especially in a flock where female animals are predominant. In the present study, the higher prevalence of *B. mellitensis* in male goats may also be attributed to the small sample size involved in the study. The lack of statistical association between *Brucella* infection and the sexes of the animals in the present study is consistent with previous reports [28,33,34].

The instability in brucellosis vaccination programmes in Nigeria may be responsible for the spread of infection and therefore the high prevalence of antibodies to *Brucella* as was obtained in this study. Moreover, this may promote the spread of the infection among animals in a flock and cross infection between flocks during grazing [18].

REFERENCES

1. Junaidu, A.U and Garba, H. S. (2006). Application of Competitive ELISA (CompELISA) RoseBengal Plate Test (RBPT) and Serum Agglutination Test (SAT) for detection of antibodies to

Brucella infection in slaughter cattle in Sokoto, Nigeria. *Sahel Journal of Veterinary Sciences,* 5: 9 - 12

2. Ewalt, D. R., Payeur, J. B., Rhyan, J. C. and Geer, P. L. (1997). *Brucella suis* biovar 1 in naturally infected cattle: a bacteriological, serogical and histological study. *Journal of VeterinaryDiagnostics Investigation,* 10: 417 - 420.
3. Garin – Bastuji, B., Gerbier, G., Douzal, Y., Vaucel , D., Humemel, N., Thiebaud, M., Grayon, M., Verger, J.M ., (1994). La brucellose animal en France en 1993. *Epidemiologie et Sante Animale.,* 26: 103 - 130.
4. Ocholi, R. A., Kwaga, J. K., Ajogi, I. and Bale, J. O. (2005). Abortion due to *Brucella abortus* in sheep in Nigeria. *Revue Scientifique et technique (Paris),* 24: 973 - 979.
5. Addis, S. A. and Desalegn, A. Y. (2018). Comparative seroepidemiological study of brucellosis in sheep under smallholder farming and government breeding ranches of Central and North East Ethiopia. *Hindawi Journal of Veterinary Medicine*, 1 – 12. https://doi.org/10.1155/2018/7239156.
6. European Commission (2001). Brucellosis in Sheep and Goats (*B. mellitensis*). Report of the Scientific Committee on Animal Health and Animal Welfare, Pp. 3 - 46.
7. Agada, C. A., Mohammed, J., Oko, A. E. J. and Ogugua, J. A. (2018). Prevalence and risk factors associated with brucellosis among high-risk individuals in Lafia, Nasarawa tate, Nigeria. *International Journal of One Health*, 4 (8): 45 – 51.
8. Food and Agricultural Organization (2006). *Brucellosis in Human and Animals*. Produced by World Health Organization in collaboration with the food and Agricultural Organization of the United Nations and World Health Organization for Animal Health.7; 4-21
9. Halle, P. D. and Ajogi, I. (1997). Burcellosis: A review of recent developments. *Israel Journal of Veterinary Medicine,* 52: 125 – 131.
10. Sati, S. N. (2002) *Seroepidimiological survey of Brucella abortus infection in Fulani breeding herds and trade cattle in the middle belt and southeast*. M.Sc thesis submitted to the' Department of Veterinary Pathology and Microbiology, University of Nigeria Nsukka Pp.1- 810.
11. Ezeokpube, N. D., Obiora, C. J. and Phil-Eze, P. O. (2014). Environmental Problems of Sachet Water Waste Disposal in Nsukka Urban, Enugu State, Nigeria. *Civil and Environmental Research*, 6 (1): 105 –113.
12. Morgan, W. J. B., Mackinon, D. J., Gill K. P. W., Gover S. G. M and Norris P. W. (1978). *Standard laboratory techniques for the diagnosis of brucellosis*. 2nd edition, Central Veterinary Laboratory, Weybridge, England.
13. Ishola, O.O and Ogundipe, G.A.T (2000) Seroprevalence of brucellosis in trade cattle slaughtered in Ibadan, Nigeria. *Bulletin of Animal Health and Production in Africa*, 48: (1): 57 – 60.
14. Zubairu, A., Ardo, M. B. and Mai, M. M. (2014). Seroprevalence of ruminant brucellosis in three selected local government areas of Taraba State. Sokoto Journal of veterinary Sciences, 12 (1): 51 – 56.
15. Olufemi, O. T., Danjuma, D. B., Shinggu, P., Nwuku, J. A., Baba-Onoja, E. B. T., Dike, U. A. and Amama, U. F. (2018). Prevalence of Brucella Antibodies in goats and the practices of farmers regarding Brucellosis in Wukari, Taraba State Nigeria. *International Journal of Infectious Diseases,* 73: 68.
16. Dogo, R.., Maikai, B. V. Beatty, V. I. V. (2015). Sero prevalence of *Brucella* antibodies in Goats in Girda Local Government Area of Kaduna State, Nigeria. *Journal of Agriculture and Veterinary Science*, 7: 35 – 40.
17. Junaidu, A. U., Daneji, A. I., Salihu, M. D., Magaji, A. A., Tambuwal, F. M., Abubakar, M. B. and Nawawi, H. (2010). Seroprevalence of brucellosis in goat in Sokoto, Nigeria. *Current Research Journal of Biological Sciences*, 2(4): 275 – 277.
18. Tijani, A. O., Musa, H. I., Ousoumanou, O. and Akintola, O. O. (2010). Prevalence of brucellosis in food animals slaughtered at Damaturu abattoir, Yobe State. *Sahel Journal of Veterinary Science*, 8 (1): 55 – 60.

19. Cadmus, S. I., Ijagbone, I. F., Oputa, H. E., Adesokan, H. K. and Stack, J. A. (2006). Serological survey of brucellosis in livestock animals and workers in Ibadan, Nigeria. *African Journal of Biomedical Research*, 9(3): 163 – 168.
20. Shehu, L. M., Yusuf, H., Kudi, A. C. and Kalla, D. U. (1991). Seroprevalence of brucellosis in ruminants in Bauchi and environs. *Nigerian Veterinary Journal*, 20: 67-74.
21. Onunkwo, J. I. (2005). Seroepidimiological survey of *Brucella* infection in slaughter goats in Nsukka Agricultural area, Enugu State. M. Sc. thesis submitted to the Department Veterinary Public Health and Preventive Medicine, University of Nigeria Nsukka, pp 22-38.
22. Godfroid, J., Cloeckaert A., Liautard, J. P, Kohler, S. Fretin, D., Walravens, K., Garin- Bastuji, B. and Leteson, J. J. (2005). From the discovery of the Malta Fever's agent to the discovery of a marine mammal reservoir, brucellosis has continuously been a re-emerging zoonosis. *Veterinary Research, Biomed Central*, 36 (3): 313 – 326.13.
23. Kabagambe, E. K., Elzer, P. H., Geaghan, J. P. and Scholl, D. T. (2001) Risk factors for *Brucella* seropositivity in goat herds in eastern and western Uganda. Preventive Veterinary Medicine, 52: 91 - 108.
24. Omer, M. K., Skjerve, E., Holstad, G., Woldehiwot, Z. and Macmillan, A. P. (2000). Prevalence of antibodies to *Brucella* sp. in cattle, sheep, goats, horses and camels in the State of Eritrea: influence of husbandry system. *Epidemiology and Infection*, 125: 447 – 453.
25. Egwu, G. O., Adamu, M., Mshelia, G. D., Elelu, N. and Ouda, L. (2012). Studies on farmer awareness on caprine abortion and the presence of *Brucella abortus* and *Brucella melitensis* in selected flocks in an arid zone of Nigeria. *Journal of Veterinary Medicine and Animal Health*, 4 (2): 17 - 21.
26. Kaltungo, B. Y., Saidu, S. N. A. Sackey, A. K. B. and Kazeem, H. M. (2013). Serological Evidence of Brucellosis in Goats in Kaduna North Senatorial District of Kaduna State, Nigeria. ISRN Veterinary Science, 2013: 1 – 6. http;//dx.doi/10.1155/2013/963673.
27. Yohanness, M., Gill, J. P. S., Ghatak, S., Singh, D. and Tolosa, T (2012). Comparative evaluation of Rose Bengal plate test, standard tube agglutination test and Complement fixation test for the diagnosis of human brucellosis. Revue Scientifique et Technique, 31 (3): 979 - 984 30.
28. Teshale, S., Muhie, Y., Dagne, A. and Kidanemariam, A. (2006). Seroprevalence of small ruminant brucellosis in selected districts of Afar and Somali pastoral areas of Eastern Ethiopia : the impact of husbandry practice. Revue Medicina Veterinary, 157 (11): 557 – 563.
29. Ogugua A. J., Akinseye, V..O., Ayola, A. C., Oyesola, O. O., Shima, F. K., Tijani, A .O. and Aderemi, N. A. (2014). Seroprevalence and risk factors of brucellosis in goats in selected states in Nigeria and the public health implications. *African Journal of Medicine and Medical Sciences*, 43 (1): 121 – 129.
30. Nicoletti, P. (1980). The epidemiology of bovine brucellosis. *Advances in Veterinary Science and Comparative Medicine*, 24: 69 – 98.
31. Keppie, J. W., Will, A. E. and Smith, H. (2008). The role of erythritol in the tissue localization of *Brucella*. *British Journal of Experimentat Pathology*, 46: 104 - 108.
32. Kebede, T., Ejeta, G. and Ameni, G. (2008). Seroprevalence of bovine brucellosis in smallholder farms in central Ethiopia (Wuchale-Jida district). *Revue de Médecine Vétérinaire*, 159 (1): 3 – 9.
33. Adugna, W., Tessema, T. S. and Keskes, S. (2013). Sero-prevalence of small ruminants brucellosis in four districts of Afar Natinal Regional State, Northeast Ethiopia, Ethiopia Veterinary Journal, 5 (12): 358 – 364.
34. Ashenafi, F., Teshale, S., Ejeta, G., Fikru, R. and Laikemariam, Y. (2007). Distribution of brucellosis among small ruminants in the pastoral region of Afar, Eastern Ethiopia. *Review of Scientific and Technical International OIE*, 26 (3): 731 – 739.