Asian Journal of Epidemiology

ISSN 1992-1462

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Asian Journal of Epidemiology 7 (2): 36-42, 2014
ISSN 1992-1462 / DOI: 10.3923/aje.2014.36.42

Seroprevalence of Canine Brucellosis in Jos, Plateau State, Nigeria

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ABSTRACT

Serological screening of dogs for brucellosis is not a routine practice in veterinary clinics in Jos. Hence, this study was conducted to determine the prevalence of brucellosis in dogs in Jos North and South Local Government Areas (LGA) of Plateau State. A total of 350 sera samples were collected from dogs presented to the clinics. The samples were analysed using Rose Bengal Plate Test (RBPT) which gave a prevalence of 113 (32.3%). The RBPT positive samples were then subjected to Competitive Enzyme-linked Immunosorbent Assay (c-ELISA) and 33 (29.2%) of them were positive. Sero-prevalence increased with age using the c-ELISA as 1 (20.0%) of the 5 dogs between 0-6 months, 2 (22.2%) of the 9 dogs between 6-11 months and 30 (30.3%) of the 99 dogs above 11 months were positive. Based on sex, 6 (28.6%) of the 21 male dogs and 27 (29.3%) of the 92 female dogs were positive for c-ELISA. Breed-based prevalence recorded 27 (31.0%) of 87 exotic breeds, 1 (16.7%) of 6 cross-breeds a nd 5 (25.0%) of 20 indigenous breeds of dogs assayed. Dogs in Jos South had a higher prevalence of 29 (29.6%) of the 98 dogs tested than those in Jos North which had 4 (26.7%) of the 15 dogs tested. However, there was no statistical significance between brucella infection and age, sex, breed or location of dogs sampled ($p>0.05$). This study indicates that canine brucellosis is prevalent in Jos thus, enlightenment and awareness programmes to educate the dog owners should be carried out by the relevant authorities.

Key words: Seroprevalence, canine brucellosis, veterinary clinics, Jos, zoonosis

INTRODUCTION

Brucellosis is a term used for infections by any member of the genius *Brucella* (Nicoletti, 1993); which are Gram-negative, facultative intracellular bacteria that affect many animal species and man (Corbel, 1997). Four of *Brucella* species are known to infect dogs and they are *Brucella canis*, *B. abortus*, *B. melitensis* and *B. suis* (Hollett, 2006) but *B. canis* has been identified as the causative agent of canine brucellosis (Carmichael, 1996).

In developing countries particularly, canine brucellosis may have important economic, veterinary and public health consequences (Godfroid *et al*., 2005; Franco *et al*., 2007). It is considered as one of the most economically important diseases of pets leading to abortion, sterility and decreased productivity (Leal-Klevezas *et al*., 1995) and its eradication in animals is a necessary step to controlling the disease in man (Reviriego *et al*., 2000). Dog handlers like veterinarians and dog breeders are constantly exposed to infection as a result of poor knowledge of or lack of adherence to preventive measures in the course of their professional duties.

The introduction of dog breeding in Nigeria has contributed to the re-emergence of brucellosis as an international concern for both indigenous and foreign breeds of dogs due to lack of pre movement screening and an increase in the density of possibly infected foreign breeds of dogs (Rhyan, 2000). Thus, exposure to infected dogs by means of contaminated products, aerosols and infected aborted tissues or semen remains highest among veterinary clinicians/laboratory workers, dog breeders/owners and generally dog handlers (Neta *et al*., 2010).

Apart from being pets, type of food and security animals, dog breeding and rearing is a good source of income. Jos has a large population of dogs due to the cultural acceptance as meat as well as good weather condition for keeping exotic breeds (Bata *et al*., 2011). Information on canine brucellosis in Jos is scanty and in most cases not available. Hence, the need to carry out this study which is aimed at investigating the seroprevalence of canine brucellosis in Jos North and South Local Government Areas of Plateau State, Nigeria. It is hoped that the findings of this study will provide useful information on the disease in Jos.

MATERIALS AND METHODS

The study area was Jos, Plateau State, Nigeria. Jos comprises two Local Government Areas namely Jos North which has three districts of Tudun Wada, Dong, Kabong and Jos South with four districts of Du, Gyel, Vwang and Kuru. It has an estimated population of about 900,000 residents based on the 2006 Nigerian census (NPC, 2006). It lies between longitude 9°56' North and latitude 8°52' East.

Sampling: Sampling was done using the cluster sampling method. A Local Government was considered a cluster and three veterinary clinics were randomly selected by ballot system from each LGA from a list of all the veterinary clinics in the two LGA. Dogs presented to the selected clinics were chronologically sampled until the required sample size of 350 was attained. This study was performed between March and June 2013 in Jos, Plateau State, Nigeria.

Dogs were properly restrained and 5 mL of venous blood was aseptically collected from the cephalic vein into a clean and well labelled sample bottle devoid of anticoagulant using sterile hypodermic needle and 10 mL syringe. The blood samples were allowed to clot by laying the sample bottles in a slanting position for an hour and the sera obtained by decantation into new well labelled sample bottles. Sera samples were stored at -20°C in a freezer and finally transported to the Bacterial Zoonoses Laboratory of the Department of Veterinary Public Health and Preventive Medicine, Ahmadu Bello University, Zaria in a Coleman box with ice packs for laboratory analysis.

Rose Bengal Plate Test (RBPT): The antigen, negative and positive controls for the test were obtained from Animal Health Veterinary Laboratory Agency, Weybridge, United Kingdom. The procedure was performed as described by Macmillan (1990).

Competitive Enzyme-Linked Immunosorbent Assay (c-ELISA): The competitive ELISA kit including negative and positive controls was obtained from Animal Health Veterinary Laboratory Agency, Weybridge, United Kingdom. The kit utilizes ELISA based on the antibody-capture technique. The test procedure was performed as instructed by the kit manufacturer.

Statistical analysis: Data obtained from this study was statistically analyzed using Graph Pad Prism 4 for Windows. Results are presented using tables and Chi-square was used to test association between the prevalence of antibodies and factors such as age, sex, breed and location of dog sampled.

RESULTS

The 350 serum samples were subjected to RBPT which gave a prevalence of 113 (32.3%). The 113 RBPT positive samples were further assayed using c-ELISA which confirmed a seroprevalence of 33 (29.2%) for canine brucellosis in Jos as shown by Table 1.

Seroprevalence increased with age using both RBPT and c-ELISA as dogs above 11 months had the highest rate (30.3%) while dogs between 0-6 months had the lowest rate (20.0%). This is presented on Table 2.

Table 3 shows that exotic breeds had the highest prevalence of 31.0% while indigenous breeds had the lowest rate of 16.7%. Cross-breeds had a prevalence of 25.0% as obtained by the c-ELISA. Female dogs had a seroprevalence of 27 (29.3%) while male dogs had a rate of 6 (28.6%) according to the c-ELISA as shown by Table 4.

Table 1: Seroprevalence of canine brucellosis in Jos using RBPT and c-ELISA

		No. of positive (%)	
Test	No. of tested	No.	(%)
RBPT	350	113	32.3
c-ELISA	113	33	29.2

Table 2: Age-based seroprevalence of canine brucellosis in Jos

		No. of positive (%)	
Age (months)	No. of tested	No.	(%)
RBPT			
0-6	20	5	25.0
6-11	31	9	29.0
Above 11	299	99	33.1
Total	350	113	
c-ELISA			
0-6	5	1	20.0
6-11	9	2	22.2
Above 11	99	30	30.3
Total	113	33	

$p = 0.789$, $\chi^2 = 0.475$, $df = 2$

Table 3: Breed-based seroprevalence of canine brucellosis in Jos

		No. of positive (%)	
Breed	No. of tested	No.	(%)
RBPT			
Exotic	154	87	56.5
Cross-breed	135	6	4.4
Indigenous	61	20	32.8
Total	350	113	
c-ELISA			
Exotic	87	27	31.0
Cross-breed	6	1	16.7
Indigenous	20	5	25.0
Total	113	33	

$p = 0.681$, $\chi^2 = 89.152$, $df = 2$

Table 4: Sex-based seroprevalence of canine brucellosis in Jos

		No. of positive (%)	
Sex	No. of tested	No.	(%)
RBPT			
Male	132	21	15.9
Female	218	92	42.2
Total	350	113	
c-ELISA			
Male	21	6	28.6
Female	92	27	29.3
Total	113	33	

$p = 0.944$, $\chi^2 = 0.004$, df = 1

Table 5: Location-based seroprevalence of canine brucellosis in Jos

		No. of positive (%)	
Location	No. of tested	No.	(%)
RBPT			
Jos North	175	15	8.6
Jos South	175	98	56.0
Total	350	113	
c-ELISA			
Jos North	15	4	26.7
Jos South	98	29	29.6
Total	113	33	

$p = 0.8165$, $\chi^2 = 0.253$, df = 1

Dogs in Jos South LGA were more seropositive for brucellosis (29.5%) than those in Jos North LGA (26.7%) although the result was not statistically significant according to Chi-square test. This is shown by Table 5.

DISCUSSION

The study showed that the sero prevalence of canine brucellosis in Jos North and South LGA was 29.2% using c-ELISA. The low level of awareness of dog owners on canine brucellosis, outdoor management system practiced by some dog owners and the lack of screening of dogs before breeding could be responsible for the prevalence of the infection in this locality. This finding is higher than that recorded by Osinubi *et al.* (2005) in the Veterinary Teaching Hospital, Ahmadu Bello University, Zaria where a prevalence of 21.5% was obtained. In Ibadan, South-western Nigeria, Agunloye *et al.* (1999) recorded a much lower prevalence of 4.35%. Previous study carried out on brucellosis in dogs in other parts of the world show a slightly higher prevalence rate (30%) in Central and South America (Lucero *et al.*, 2005) and lower prevalence rates (3.11, 13.33% and 4.87%) in Brazil (Fernandes *et al.*, 2011), Bangladesh (Talukder *et al.*, 2011) and Malaysia (Khairani-Bejo *et al.*, 2006), respectively.

Dogs of sexually active age (11 months and above) were more predisposed (30.3%) in this study. This result is comparable with the study carried out by (Cadmus *et al.*, 2006) were dogs

above one year had the highest prevalence of 5.28%. Oloffs (1996) had stated that *Brucella* infection increases with age and that most diseased animals carry the infection throughout their lives.

Breed-specific seroprevalence of canine brucellosis showed the highest prevalence rate of 31.0% of the infection in exotic breeds when compared to 25% in the indigenous and 16.7% in cross breed dogs. Reports by Okoh *et al.* (1978), stated that the first confirmed report of *Brucella* in dogs in Nigeria was cultural recovery of *B. canis* from a case of abortion in an imported female boxer. This suggests that exotic breeds of dogs imported to the country might contribute to infecting our indigenous breeds and should therefore be thoroughly screened before being allowed into the country and used for breeding.

Sex-based seroprevalence showed a higher prevalence rate in female dogs (29.3%) than male dogs (28.6%). A contributing factor to higher prevalence rates in female could be that a single male dog if infected and used to mate several females can transmit the infection via infected semen. This could be responsible for the observed differences in prevalence rates between the sexes. However, reports by Ajogi *et al.* (2002) and Muma *et al.* (2006) indicated that *Brucella* antibody titres are not associated with sex.

Location-based seroprevalence revealed a higher prevalence rate of 29.5% in Jos South compared to the 26.7% prevalence rate in Jos North. This may be due to the fact that there are more dog breeders and breeding activities in the former than latter. There was no statistically significant association between brucella infection and age, breed, sex or location of dog as tested by the Chi-square formula as the p-value obtained was greater than 0.05.

CONCLUSION

In conclusion, this study has shown that canine brucellosis is prevalent in Jos and this is of economic and public health significance because of its zoonotic implications. Canine brucellosis is a very serious disease as the infected animal becomes unbreedable causing serious economic losses to dog breeders. Other economic losses result from its negative influence on international trade of exotic/indigenous dog breeds. Dogs act as carriers of the infection (Cadmus *et al.*, 2010). In fact, dogs may constitute a greater risk of transmitting the disease to man as severe infections accompanied by heavy excretion of the organism have been recorded (Corbel, 1997). Therefore, it is recommended that enlightenment and awareness programmes to educate dog owners and breeders on brucellosis and other infectious diseases be organised by relevant authorities. A cost-effective federal government policy on the control and eradication of this important zoonotic disease is indicated.

ACKNOWLEDGMENT

My profound gratitude goes to my loving husband for his financial and moral support and my entire family members. I thank my boss, Dr. N.B. Kujul for his assistance and co-operation throughout the course of my studies.

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