

*Full Length Research Paper*

## Risk factors and level of awareness of canine brucellosis in Jos, Plateau state, Nigeria

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Jos has a large population of dogs because of its cultural acceptance as meat, good weather condition for exotic breeds, persistent security challenges and dog breeding activities which is very lucrative. This study was undertaken to determine the risk factors and level of awareness of canine brucellosis among dog owners in Jos by means of a structured questionnaire. Three hundred and fifty respondents were interviewed and 350 sera samples collected from dogs presented by these respondents were analysed using the Rose Bengal plate test (RBPT). The seropositivity of 113 (32.3%) obtained by the RBPT was compared with information provided by the respondents. Seropositivity of dogs managed indoors was 13.9% whereas it was 37.1% in those managed outdoors. A large proportion of 76.9% of the respondents lacked knowledge of canine brucellosis. Likewise, 81.4% of the respondents took no precaution before and after dog handling and a large proportion of 74.6% consumed undercooked dog meat. This study showed that there is a high risk of exposure of dog owners, handlers and Veterinarians to the disease and therefore enlightenment programmes on canine brucellosis as a zoonosis should be carried out in Jos.

**Key words:** Dog handling, structured questionnaire, RBPT, seropositivity, enlightenment, zoonoses.

### INTRODUCTION

Brucellosis is a highly contagious bacterial zoonosis caused by members of the *Brucella* genus that can infect humans but primarily infects domestic animals and livestock (Wilkinson, 1993). Although, *Brucella canis* is the main cause of canine brucellosis (Wanke, 2004), *Brucella abortus*, *Brucella melitensis* and *Brucella suis* infections have also been reported in dogs (Baek et al., 2003; Hinic et al., 2010). It is a rough or mucoid small Gram-negative intracellular bacterium (Hollett, 2006) and

it infects all breeds of dogs. Infections most commonly occur through contact with infected foetal tissues and post-parturient discharges (Godfroid et al., 2011). Household dogs are fed with dead foetuses from cows and remnants from slaughtered cattle with history of bovine brucellosis from abattoirs (Cadmus et al., 2010), and this is a significant means of transmission. In pregnant bitches, the infection localises in the reproductive tract where it causes placentitis with subsequent abortions

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and stillbirths (Lopes et al., 2010). Despite being infected, many dogs in most cases remain asymptomatic and appear to be healthy (Behzadi and Mogheiseh, 2011).

It has a global distribution and is one of the widespread zoonotic disease (Pappas et al., 2006). Infected animals usually serve as reservoirs of human infection (Namanda et al., 2009). Although, the overall proportion of *B. canis* causing human brucellosis is very low, its potential impact on population groups at the highest risk should not be underestimated as it poses a significant public health hazard since it is transmissible to humans especially those handling aborted fetuses (Cadmus et al., 2006). A prevalence rate of 7.6% occurred in 79 humans infected with canine brucellosis (Ofukwu et al., 2004).

Infection due to *B. canis* is endemic in the southern states of the USA and South America but sporadic in Europe and Asia (Corrente et al., 2010). Except in Nigeria (Cadmus et al., 2006), South Africa (Gous et al., 2005) and Zimbabwe (Gomo, 2013; Chinyoka et al., 2014), there is dearth of information on canine brucellosis in Africa. The increase in dog ownership in Nigeria is associated with some risk factors that render them vulnerable to brucellosis and many exotic breeds are imported that are not screened before entry into the country (Tafaderma, 2006; Ryhan et al., 2000). Serological examinations are often used to detect evidence of exposure to *B. canis* since they are relatively easy to perform and may provide a practical advantage of estimating prevalence in populations (Bae and Lee, 2009). Infection has been reported in persons in close contact with infected dogs and in laboratory scientists working with cultured *B. canis* (Lucero et al., 2010).

Overall, the presence and extent of canine brucellosis in the developing world has been poorly investigated in the past, and even presently, only few studies have revealed new data confirming the presence of *B. canis* in dogs, and moreover providing insights into the specific risk factors associated with brucellosis in dogs in different countries and regions. The increase in dog ownership and its associated risk factors coupled with the scanty information on canine brucellosis in the study area created the need for a research to determine the risk factors and level of awareness of canine brucellosis among dog owners in Jos so as to provide baseline information to help regulatory bodies and government agencies to make policies that will help control zoonotic canine brucellosis.

## 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 and 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 (National Population Commission, 2006). It lies between longitude 9° 56' North and latitude 8° 52' East. Cluster sampling method was

used. A Local Government was considered as a cluster and three Veterinary clinics were randomly selected by ballot system from each local government area (LGA) from a list of all the Veterinary clinics in the two LGA. Clients (respondents) that came to the selected clinics with dogs were interviewed and the dogs sampled chronologically until the desired sample size of 350 was attained.

## Questionnaire

The study was clearly explained to the clients/respondents and informed consent obtained before administering questionnaire and to ensure confidentiality, names of respondents were not recorded on the questionnaire. The structured questionnaire was administered by face to face interview to 350 respondents within the study area between April and June, 2013. Some of the questions had "yes" or "no" answer options and some had specific answers as options. The questionnaire had three sections A to C. The bio-data of the dog was contained in section A and had information on the dog's age, breed, sex, location, management system, obstetrical history (stillbirth, abortions) and number of conceptions. Section B contained the bio-data of clients/respondents and had information on educational qualification, occupation and knowledge on brucellosis while section C had information on risk factors for dogs and dog owners and contained questions on dog meat consumption, use of protective clothing and screening of dogs before breeding. The questionnaire was interpreted verbally in local language for those who could not understand English and their responses were written down.

## Sampling

Dogs were properly restrained and five millilitres 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)

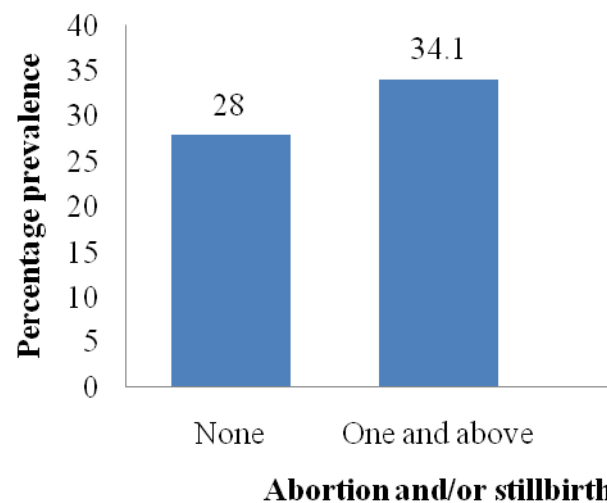
The antigen, negative and positive controls for the test were obtained from Animal Health Veterinary Laboratory Agency, Weybridge, United Kingdom. The procedure was performed as described by MacMillan (1990). Statistical analysis of data was done using GraphPad Prism 4 for Windows. Results are presented using tables and charts. Chi-square was used to test association between the prevalence of antibodies and relevant variables.

## RESULTS

A prevalence rate of 113 (32.3%) of the 350 sera samples tested using the RBPT was obtained. Table 1 shows that canine brucellosis infection was higher among dogs kept outdoors (37.1%) than those kept indoors (13.9%) but the association was not statistically significant. Eighty seven of the 154 exotic breed of dogs presented by respondents to the selected clinics were

**Table 1.** Prevalence of canine brucellosis in Jos based on management system.

| Management system | Number tested | RBPT positive (%) | $\chi^2$ | p-value |
|-------------------|---------------|-------------------|----------|---------|
| Indoor            | 72            | 10 (13.9)         | 0.449    | 0.503   |
| Outdoor           | 278           | 103 (37.1)        | -        | -       |
| Total             | 350           | 113               | -        | -       |

**Figure 1.** Percentage positivity in unscreened and screened exotic breed of dogs in Jos.**Figure 2.** Prevalence of canine brucellosis in Jos based on history of abortion and/or stillbirth.

RBPT positive and of this, 82 were not screened before breeding while 5 were screened before breeding. Figure 1 shows that 26 (31.7%) of the 82 unscreened dogs were positive while 1 (20.0%) of the 5 screened dogs was positive and this was statistically significant ( $p=0.0169$ ) when tested using the Chi square formula.

Eighty three (34.1%) of the 243 dogs that have had one

or more abortion(s) and/or stillbirth(s) were positive for brucellosis while 30 (28.0%) of the 107 dogs that have had no abortion or stillbirth were positive. This is shown by Figure 2. Figure 3 shows the level of awareness of dog owners on canine brucellosis in Jos and 269 (76.9%) of the respondents had no knowledge on brucellosis while 81 (23.1%) knew about brucellosis. Based on the

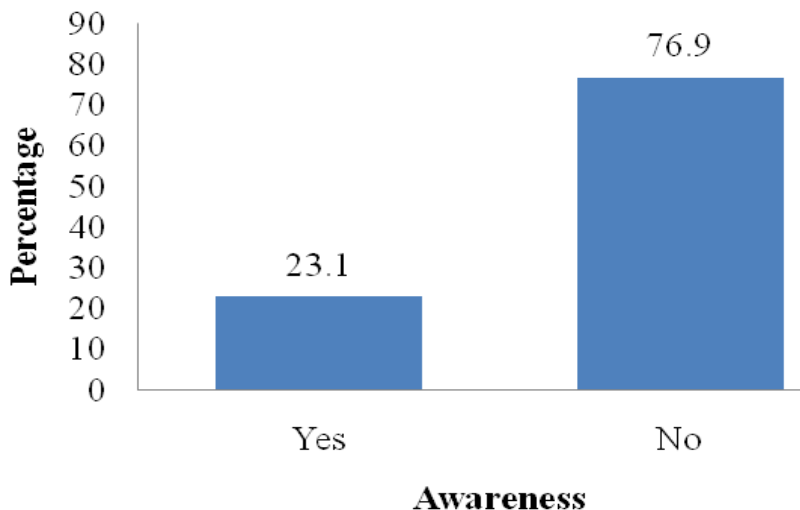


Figure 3. Level of awareness of dog owners on canine brucellosis in Jos.

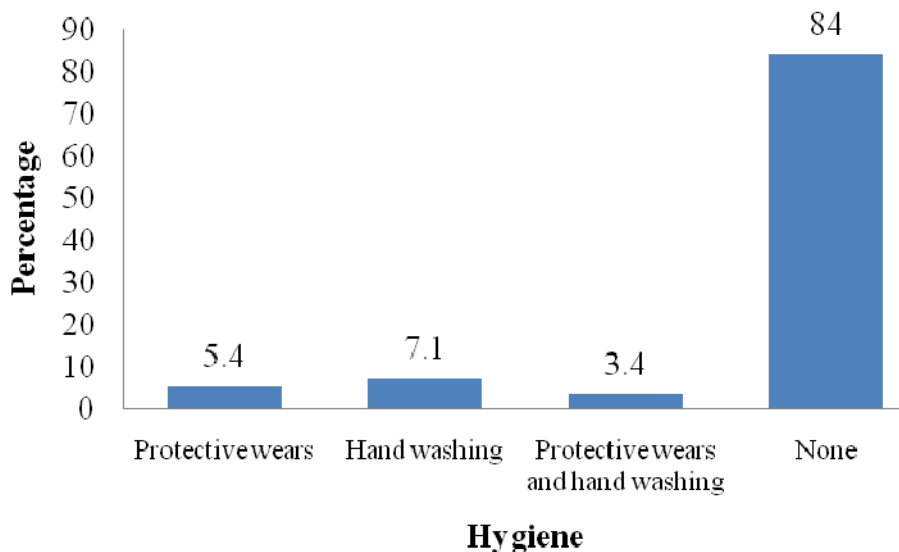


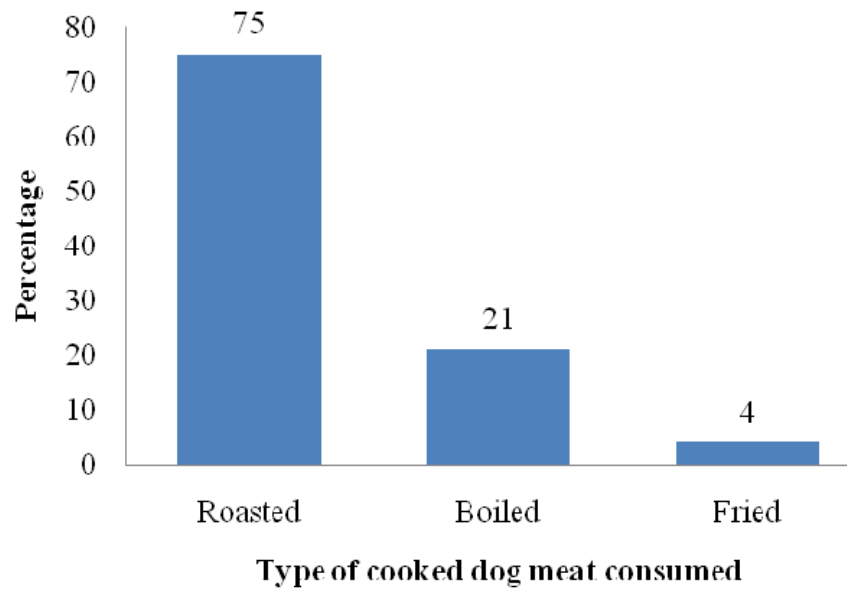
Figure 4. Level of hygiene of dog owners/handlers in Jos.

level of hygiene of the respondents, 294 (84.0%) took no precaution (neither used protective wears nor washed hands) before and after handling of dogs while 12 (3.4%) took precautions before and after handling of dogs. Nineteen (5.4%) used protective wears before handling dogs while 25 (7.1%) washed and disinfected hands after handling dogs. This is shown by Figure 4. The questionnaire revealed that 262 (75%) of the respondents consumed roasted (suya) dog meat, 74 (21%) consumed boiled dog meat and 14 (4%) consumed fried dog meat as shown by Figure 5.

**DISCUSSION**

Brucella infection in dogs in Jos was likely acquired

through indiscriminate breeding and outdoor management system. Dogs kept by the outdoor management system could roam about freely and are at risk of picking up food materials contaminated with Brucella organism such as aborted or after-birth materials, they are also at risk of mating dogs infected with brucellosis. Godfroid et al. (2005) had stated that ingestion of tissues, foodstuff or fluid containing the organism is a major route of the disease transmission and that eating aborted foetuses can also lead to the disease. A previous study demonstrated a higher prevalence of infection in stray compared with non-stray dogs (Chikweto et al., 2013). Dogs have been shown to be mechanical and biological vectors of brucellosis and sexual transmission is also an important means of spread of the infection as males can



**Figure 5.** Type of cooked dog meat consumed by respondents.

excrete the organism in large numbers in their semen (WHO, 1986).

This study shows that seropositivity was higher in unscreened than screened exotic dogs and this was statistically significant as the p-value was less than 0.05 meaning that the occurrence of canine brucellosis is associated with the screening and non-screening of dogs. The importation of exotic breed of dogs into the country without screening could contribute to the prevalence of the infection in the study area and the country at large. Rhyan et al. (2000), stated that many exotic breed of dogs are imported that are not screened before entry into the country and that 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.

The higher prevalence of brucellosis in dogs that have had one or more abortion(s) and/or stillbirth(s) suggests that the infection may be responsible for the abortions and stillbirths. Gyuranecz et al. (2011), stated that *B. canis* can cause abortion and stillbirth in pregnant dogs particularly at the 7<sup>th</sup> to 9<sup>th</sup> week of gestation. Based on the level of awareness of canine brucellosis among dog owners in Jos, more of the respondents were unaware of the disease compared to those who had knowledge on it and this could be responsible for the prevalence of the infection in the study area. Canine brucellosis continues to be a problem common in dogs simply because people lack enough information about it (Gail, 2013). A large proportion of dog owners used bare hands when handling dogs with no protective clothing such as coverall, laboratory coats, boots, hand gloves, or hand washing

after handling of dogs. This is risky as *Brucellae* can enter through intact skin and abrasions (Mantur and Amarnath, 2008).

Most of the respondents consumed undercooked dog meat (roasted meat) and are at risk of contracting the disease because brucellosis can be transmitted through consumption of contaminated raw animal products, like improperly cooked meat (Seleem et al., 2010). Nicoletti (1989) also stated that the risk of infection is proportional to the degree of contact with *Brucella* infected edible by products like dog's offal (Intestine, liver, kidneys, uterus and testicles).

## Conclusion

This study has established risk factors such as outdoor management system, lack of screening of dogs, maintenance of low level of hygiene by dog handlers, consumption of undercooked dog meat among others. There is a low level of awareness of canine brucellosis among dog owners in Jos and therefore awareness and enlightenment programmes on canine brucellosis should be carried out with emphasis on its zoonotic importance. Prevention of stray dogs and indoor management system should be encouraged to reduce indiscriminate mating and consumption of infected food materials and if dog meat must be consumed, it should be properly cooked.

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### Conflict of interest

The authors declare that they have no conflict of interest.

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