Sero-Prevalence of Brucellosis in Cattle in Gwagwalada Area Council, Fct Abuja, Nigeria.

ENID GODWIN[1], SAULAWA MAHMUD ABDULLAHI[2], UMAR ALIYU UMAR[3], CHINWE E. OKOLI[4], ABDULRAHMAN MUSA ADEIZA[5], O. Z. TENUCHE[6], ADAH BRIDGET MARIA JESSICA[7], G. O EGWU[8]

[1, 3, 4, 5]*Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, University of Abuja, Abuja, Nigeria.*

[2]*Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Bayero University Kano, Nigeria.*

[6]*Department of Veterinary Pathology, Faculty of Veterinary Medicine, University of Abuja, Abuja, Nigeria.*

[7]*Department of Veterinary Microbiology, Faculty of Veterinary Medicine, University of Abuja, Abuja, Nigeria.*

[8]*Department of Veterinary Medicine, Faculty of Veterinary Medicine, University of Abuja, Abuja, Nigeria.*

Abstract- ***Brucellosis is an infectious disease caused by bacteria of the genus Brucella. This study was carried out to investigate the status of brucellosis in cattle in Gwagwalada area council of the Federal Capital Territory Abuja. A total of 384 serum samples were collected for the study from various locations namely, Paiko, Tungan maje, Gwako, Staff quarters, Zuba, Kutunku, Dobi, Uniabuja Vet teaching hospital farm, and Army farms and tested using the Modified Rose Bengal Plate Test (mRBPT). The prevalence of brucellosis in cattle within the Gwagwalada area council was found to be high in cattle between 5 - 8 years (5.7%) while 5.0% was recorded between cattle 2-4 years old. However, seropositivity of bovine brucellosis was higher in cross breed 13.33% than local breed. Moreover, the prevalence of brucellosis was higher amongst females 10.8% compared with 4.1% observed in males. (p≥0.05). The results showed no statistically significant association between the variables and seropositivity to bovine brucellosis. The presence of Brucella abortus antigen in the sera of cattle in Gwagwalada area council poses a significant public health risk. Therefore, it is important to carry out further epidemiological studies among the fulani herdsmen and cattle herds in the FCT in order to explore the risk factors associated with the occurrence and perpetuation of brucellosis among cattle herds to ascertain the prevalence and status of the disease among both farms and nomadic herds.***

Index Terms: Brucellosis, Brucella abortus, mRBPT, Cattle, Pathogen, Zoonoses.

I. INTRODUCTION

Background

Bovine brucellosis is a disease with a significant economic and public health importance due to losses incurred as a result of infertility in animals and extensive chronic morbidity in humans (Gwida *et al*., 2016). In Nigeria, bovine brucellosis is a major animal health problem affecting the growth of the cattle industry. It remains a significant disease in animals and humans worldwide and an important cause of reproductive failure such as abortion in cows and sterility in bulls (Mekonnen *et a*l., 2010; Gul *et al*., 2013; Dahouk *et al*., 2013). Brucellosis a foodborne zoonosis which has caused considerable morbidity in humans in many parts of the world with major impacts on young children and elderly people (Corbel *et al*., .2006). Brucellosis has a major occupational disposition among livestock workers, veterinarians, abattoir workers, so also hides, skin and wool workers as well as laboratory personnel (Corbel, 2006; Aworh *et al*., 2013).

The disease can infected humans through drinking unpasteurized milk or its products (Katafasz *et al*., 2012), however, direct contact with livestock abortion material, is more important (Pappas *et al*., 2006; Schelling *et al*., 2007). In few occasions, human to-human transmissions have been recorded through sexual contact, blood transfusion, bone marrow transplant, obstetrical manipulations during child birth and congenital means (Corbel, 2006; Aworh *et al*., 2013; Falade, 2020). Bovine brucellosis still remains the most widespread form of brucellosis even though reported incidence and prevalence of the disease showed that it varies from country to country. The disease is well controlled in most developed countries (Corbel, 1997), but common in Africa, South America, Asia, the Caribbean, Middle East and the Mediterranean basin (Pathak *et al*., 2016; Sarker *et al*., 2016; Anyaoha *et al*., 2020). In livestock production, the major economic effects are due to abortion, premature birth, reduced milk production, repeat breeding and cost of veterinary care (Ghodasara *et al*., 2020). In humans, the disease results in loss of manpower as well as huge costs in medical care (Alumasa *et al*., 2021). *Brucella abortus*, *B. melitensis and B. suis* are the species that have the highest impact on domestic livestock productivity and human health (Godfroid *et al*., 2011) and, although they preferentially infect cattle, small ruminants and swine, respectively, cross-infections may be significant in mixed husbandry systems or at the livestock-wildlife interface (Godfroid *et al*., 2013; Verger *et al*., 1989; Zheludkov and Tsirelson, 2010). Eradication from cattle and small ruminants in a handful of industrialized countries, brucellosis remains endemic in most areas of the world.

In most Africa countries including Nigeria, the disease is endemic in animals (Akinseye *et al*., 2016; Ducrotoy *et al*., 2015) with a prevalence of 16.2% in slaughtered cattle population in sub-Saharan Africa (Mangen, *et al*., 2002) and 3.5% in Nigeria (Olayinka and Ishola ,2000; Bwala *et al*., 2015). Therefore this present study was carried out to elucidate the sero-prevalence of brucellosis in cattle in Gwagwalada area council, FCT, Abuja.

II. MATERIALS AND METHODS

Study Area

The study was carried out in Gwagwalada area council of the Federal Capital Territory which was formed in 1976. Abuja has an estimated human population of 2,690,000 according to Federal Capital Territory Administration (FCTA, 2024). It lies between latitude 8.25 and 9.20 North of the equator, and longitude 6.45 and 7.39 East of Greenwich Meridian. Abuja is geographically located in the centre of the country. The Federal Capital Territory has a land mass of approximately 7,315km^2 of which the actual city occupies 275.3km^2. It is situated within the Savannah region with moderate climatic conditions. In Gwagwalada area council a pastoral or nomadic cattle-grazing system is practiced, where animals are grazed.

Study Population

The study population were purposively selected which included Veterinary teaching Hospital University of Abuja, Army farm, Tungan maje, Paiko, Gwako, staff quaaters, Zuba, Kutunku and Dobi respectively

Study Design and Sample Size Calculation

A cross-sectional study was carried out and the sample size was determined using the formula by Thrusfield (2007) and 384 samples was calculated using 50% prevalence. Samples were allocated to different locations proportionately.

Sampling Technique and

Sample Collection

A total of 384 cattle serum were randomly sampled from various locations within Gwagwalada area council such as Veterinary teaching Hospital University of Abuja, Army farm, Tungan maje, Paiko, Gwako, staff quarters, Zuba, Kutunku and Dobi. An informed consent was obtained from all cattle owners in the study area before blood collection. The blood samples were collected through the jugular vein of each sampled cattle using 18G needle and 10ml syringes after the cattle were effectively restrained by an assistant (Baba *et al*., 2019). The collected blood samples were then decanted into a sterile blood sample bottle without ethylenediaminetetraacetic acid (EDTA). The bottles were then labelled with the tag number or name of the animal including its location. They were then kept in a slanting position in a coleman box in which ice

packs were placed. Other information on the sampled cattle included the location of sampling, sex, age and breed and were recorded in a log book for further use during data analysis. The blood samples were then transported to the bacterial zoonoses Laboratory of the NVRI, Vom, in a coleman box with ice packs and stored at -20^{0}C before being analyze.

Sample Processing

Each blood sample was centrifuged at 1000g for 5 minutes to separate the serum from the clot as previously described (Baba *et al*., 2022). The sera were then transferred into separate serum tubes and labelled according to the previous number of collections. The sera were then kept at -20^{0}C till used (Bertu *et al*., 2010).

Serological analysis

The serological test was performed using the Rose Bengal plate test RBPT as described by Bale (1980) and modified by Bertu (2014). Briefly, 30µl of antigen was placed on a white ceramic tile and the same volume of 30µl test serum was placed beside the antigen. The two were mixed thoroughly using sterile applicator stick and rocked gently for 4 minutes and observed for agglutination. The formation of distinct pink granules (agglutination) was recorded as positive while the absence of agglutination was recorded as negative.

Data Analysis

Using Statistical Packages for Social Sciences (SPSS Version 23.0) data obtained was presented using descriptive statistics in percentages, tables, figures and charts. Chi – square was used to test for association and 95% confidence interval was used where appropriate to test for association to determine whether there were significant association between *Brucella* antibody prevalence and sex, age and breed. P-value ≤ 0.05 was considered as significant.

III. RESULT

Table 4.1 shows the prevalence of *B.* spp based on age. The highest percentage prevalence recorded in cattle between 5 - 8 years was 5.7% while the lowest percentage prevalence of 5.0% was recorded between cattle 2-4 years old. There was no association between *Brucella* antibody and age.

Table 4.1 Sero-prevalence of Bovine Brucellosis according to age from 2 – 4 and 5 – 8 in Gwagwalada Area Council, F.C.T Abuja

Location	Age (Years)	No. Tested	No. Positive	% Prevalence
Tungan maje	2 -4 5 – 8	41 40	0 1	0 2.5
Paiko	2-4 5-8	33 25	0 0	0 0
Gwako and staff quaters	2-4 5-8	46 30	3 4	5 8
Zuba	2-4 5 -8	20 25	0 0	0 0
Kutunku	2-4 5-8	15 25	0 2	0 5.7
Dobi	2-4 5-8	21 19	0 0	0 0
Uniabuja Vet teaching hospital farm	2-4 5-8	3 6	0 0	0 0
Army farms	2-4 5-8	15 20	0 0	0 0
Total		384	10	21.2

$X^2 = 0.765$

d.f= 1

P-value = 0.295

Table 4.2 shows the breed base percentage prevalence of bovine *Brucella* species among cattle in Gwagwalada, cross breed had the highest prevalence of 13.33% while local breed had the lowest prevalence of 5.0%. There was no association between *Brucella abortus* and breed using chi-square.

TABLE 4.2 Breed based Seroprevalence of Bovine Brucellosis in Gwagwalada Area Council F.C.T. Abuja

Location	Breed	No. Tested	No. Positive	% prevalence
Tungan maje	Cross	51	1	1.96
	Local	30	0	0
Paiko	Cross	20	0	0
	Local	43	0	0
Gwako and staff quarters	Cross	70	5	5.14
	Local	40	2	5.0
Zuba	Cross	0	0	0
	Local	15	0	0
Kutunku	Cross	15	2	13.33
	Local	30	0	5.0
Dobi	Cross	0	0	0
	Local	21	0	0
Uniabuja Vet teaching hospital farm	Cross	0	0	0
	Local	12	0	0
Army farms	Cross	22	0	0
	Local	15	0	0
Total		384	10	22.9

X^2 = 0.194
Df = 1
P-value = 0.497

Table 4.3: Shows the sex-based percentage prevalence of bovine brucellosis among cattle in Gwagwalada, females had the highest prevalence rate of 10.8% while males had the lowest prevalence of 4.1%. There was no association between *Brucella* species and sex using chi-square.

TABLE 4.3 Sex-based seroprevalence of Bovine Brucellosis in Gwagwalada Area Council, F.C.T Abuja

Location	Sex	No. Tested	No. positive	% prevalence
Tungan maje	Female	45	1	2.2
	Male	30	0	0
Paiko	Female	30	0	0
	Male	23	0	0
Gwako and staff quarters	Female	37	4	10.8
	Male	73	3	4.1
Zuba	Female	31	0	0
	Male	10	0	0
Kutunku	Female	35	2	5.7
	Male	10	0	0
Dobi	Female	10	0	0
	Male	5	0	0
Uniabuja Vet teaching hospital farm	Female	6	0	0
	Male	4	0	0
Army farms	Female	20	0	0
	Male	15	0	0
Total		384	10	22.9

X^2 = 0.830
Df = 1
P-value = 0.497

IV. DISCUSSION

Bovine brucellosis is considered as one of the most significant bacterial zoonosis affecting the development of the dairy industry in Nigeria. The disease is endemic in many African countries, Asia, Middle East, Central and South America. It is prevalent in areas where effective control programs have not been effected. This study showed an overall

prevalence of bovine brucellosis to be 7.81% using mRBPT, which is higher than the 7(3.5%) reported by (Jajere *et al*., 2016) and 6.0% reported by Cadmus *et al*., (2010). The difference in the seroprevalence could be due to the difference in breeds, test kits sensitivity, seasonal variations, farming system, and the sample size. The higher prevalence rate may have been that preventive measures against the disease is not observed by cattle owners to cure this disease in cattle. The finding from this study revealed that cattle between 5-8 years heard the highest prevalence of 8.0% while 2-4 years heard the lowest of 5.0% prevalence which is lower than the report of Shrivastava *et al*., (2015) who reported 7.4% for 2-4 years, 12.5% for 4-6 and 6 and above 31.91% while Baba *et al*., 2023 reported 21.98% and 23.61% from horses in Kano state Nigeria. Higher prevalence of brucellosis in animals above 4 years might be due to the fact that this is the most suitable age for breeding and also could be that the disease affects sexually matured animals as reported by Cadmus *et al.,* 2006 and Oloffs (1996, 1998). It might also be due to the fact that there is a marked decrease in immune status with the advancement of age. Report by Shrivastava *et al*., (2015) showed that crossed breed was 22.72% while indigenous breed recorded 8.82% which corroborated with the finding from this present study where cross breed heard 13.33% and 5.14% from local breed. The difference may be attributed to region.

Sero-prevalence of brucellosis in female showed 10.8% and male 4.1%. This findings correlates with the report of (Takanouo *et al*., 2022) who reported 19% seroprevalence of brucellosis in females and (Jarere *et al*., 2016) also reported a 3.9 % in female. The high prevalence in female may have arisen due to the fact that an infected single bull can transmit the disease to several cows through mating and via infected semen (Cadmus, 2006). This is because female cows remain the locale of infection, which helps to spread the disease from one animal to another, either through lactation or during mating. Pregnancy and lactation were reported to enhance susceptibility to infection. The growth of virulent strains of *Brucella* organism was reported to be stimulated more in females because of the presence of higher volume of D-erythritol normally found in fetal tissues than in testes and seminal vesicle (Bayemi *et al*., 2009).

CONCLUSION

Bovine brucellosis has a worldwide occurrence and according to the Food and Agriculture Organization (FAO), the World Health Organization (WHO) and the World Organization for Animal Health (OIE), is still one of the most important and wide spread bacterial zoonoses in the world. The current study revealed an 7.81% overall prevalence of bovine brucellosis in Gwagwalada area council of the FCT, Abuja, Nigeria. This study offered data that highlights the need to implement control measures. Many countries have made considerable progress with eradication programs, and some have eradicated the disease. However, brucellosis in Nigeria is still a serious disease facing the veterinary and medical professions. In the present study higher occurrence of brucellosis was found in crossbred cows in comparison to indigenous cows as well as high occurrence in females than males. Livestock producers in Abuja and in many other parts of the countries cannot afford the traditional test and slaughter approach used in developed countries. Therefore, we recommend the need to focus more on intensive approach towards epidemiology and eradication program of brucellosis. Public awareness programs on potential zoonotic transmission of brucellosis, as well as the screening of cattle coming into the FCT. Vaccination programs should be encouraged amongst farmers. More studies on bovine brucellosis in the Area councils of F.C.T should be carried out.

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