

Serological survey for *Brucella* antibodies in one-humped camel (*Camelus dromedarius*) herds in North-Eastern Nigeria

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Abstract

Aim: To determine the *Brucella* antibodies in one-humped camel (*Camelus dromedarius*) herds in Yobe State, North-eastern Nigeria.

Materials and Methods: Blood samples were aseptically collected from four hundred (400) camels comprising 168 males and 232 females from the five agricultural zones of Yobe State. The sera obtained from the blood samples were screened by C-ELISA. In addition, a structured questionnaire was administered to the herdsman to obtain information on pastoralist personal data such as age, educational background, family size, and type of labour employed. Other information includes herd size, herd medical history, and patronage of veterinary services.

Results: 66 (16.5%) of the 400 screened camels were found seropositive for *Brucella*. This was comprised of 26 (6.5%) male and 40 (10.0%) female camels. Out of the 66 seropositive camels, 2 (0.5%) and 64 (16.0%) were young and adult camels, respectively. Geidam agricultural zone of the state had the highest specific sero-prevalence of 24 (6.0%), followed by Gashua 19 (4.75%), Nguru 11 (2.75%), Potiskum 8 (2.0%), and Damaturu 4 (1.0%). There was a significant statistical association between the age of camel and serological reaction to C-ELISA ($P > 0.05$), with the adult camels more significantly associated with *Brucella* infection OR = 7.881 (1.880 – 33.039; $P > 0.05$) than the young camels. There was no significant statistical association ($P > 0.05$) between sexes of camels and positive serological reaction to C-ELISA. Low level of education, low patronage of veterinary services, and lack of vaccination against brucellosis were observed among the herdsman.

Conclusion: A high seroprevalence of brucellosis among the camels of all the agricultural zones of the state indicates that the disease is endemic and camel is one of the animals that perpetuate and sustain the disease.

Keywords: antibody, brucellosis, camel, C-ELISA, odds ratio, seroprevalence.

Introduction

Brucellosis is a zoonotic disease which mainly affect domestic animals (cattle, goats, sheep, camels, pigs, and dogs), but can also affect wild animals. It is caused by bacteria of the genus *Brucella* [1]. It is one of the infectious diseases, which is a major constraint for animal productivity. The disease is manifested by late term abortions, weak calves, stillbirths, infertility, and characterized mainly by placentitis, epididymitis, and orchitis [2]. Animal brucellosis is primarily a disease of ruminants [3]. Brucellosis, the second most important zoonotic disease after Rabies and economically important bacterial disease of animals Worldwide [4], has been reported in most developing countries including Nigeria where its prevalence is up to 13.5% indicating a higher threat to the human and animal health [5]. The infection has been reported in various animal species in different parts of Nigeria [6-13]. However, there is dearth of published information on camel brucellosis in Yobe state, which is one of the semi-arid states in North-eastern Nigeria and one of the

leading livestock producers in the country [14].

The study was conducted to establish the epidemiological pattern of camel brucellosis in camel herds in the state and thereby contributing information to the database of brucellosis in Nigeria.

Materials and Methods

Ethical approval: The experiment was carried out according to the care and use of experimental animals' protocol [13], and was approved by the Faculty of Veterinary Medicine ethics and research committee.

Study area: The study was carried out in herds of camels of the five agricultural zones of Yobe State, Nigeria. The zones are Damaturu, Gashua, Geidam, Potiskum, and Nguru. There are 2-4 local government areas (LGA) in each zone. The state is located in the arid-zone of the North-Eastern part of Nigeria, with a total area of 45,502 square kilometers. The state is dry and hot for most part of the year, except in the southern part of the state which has a milder climate. The arid zone has rather austere climatic condition with a dry season starting from late November to late April with average daily peak temperature especially in April and May of 34.4–37.8 °C. The state is one of the states in northern Nigeria that shared international border with

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Figure-1. Map of Nigeria showing the Yobe State (study area)

Niger Republic which enhances trans-border movement of livestock between the two countries.

Sampling method: Local government areas in each zone serve as sampling frame from where two LGA were selected from each by simple random method. Only herds whose owner consented to our request were used. Questionnaire was administered to get information on pastoralist personal data such as age, educational background, family size and type of labour employed. Other information includes herd size, herd medical history and patronage of veterinary services.

Sample collection: Four hundred (400) camels of one to more than 12 years old from herds located at different local government areas of all the agricultural zones of the state were sampled. Ten ml of blood was collected from each of the animal aseptically from the jugular vein, using hypodermic syringe and needles. The age, sex and location of the animal were recorded as the blood was taken. Samples were kept overnight at 4°C to allow separation of the serum. It was then centrifuged at 3000 g for 10 minutes. The separated serum was collected in a screw capped plastic vial, coded and kept at -20°C up to the time of the test. The experiment was carried out according to the care and use of experimental animals' protocol [15], and was approved by the Faculty of Veterinary Medicine ethics and research committee.

Serological tests: Competitive enzyme linked immunosorbent assay (C-ELISA) was used to screen all the sera as described by Manual of diagnostic tests and vaccines for terrestrial animals [17]. The COMPELISA kit was obtained from Animal Health and Veterinary Laboratories Agency (AHVLA®) New Addlestone Surrey, United Kingdom.

Statistical analysis: Data obtained from the studies were subjected to mean, range, Chi-square analysis and

odds ratio (OR) for comparison and determination of association between the *Brucella* infection and test variables.

Results

A total of four hundred (400) camels comprising of 168 males and 232 females from the five agricultural zones of Yobe state were screened by C-ELISA. Sixty-six (16.5%) of the 400 camel sera were positive for antibodies against *Brucella* spp. This is comprised of 26(6.5%) male and 40 (10.0%) female camels. There was no significant statistical association ($P>0.05$) between sex of camels and positive serological reaction (Table-1). Out of the 66 samples that tested positive for antibodies against *Brucella* organisms, 2(0.5%) and 64 (16.0%) were young and adult camels, respectively. There was a significant statistical association between the ages of camel in Yobe state and positive serological reaction to C-ELISA ($P>0.05$), with the adult camels more significantly associated with *Brucella* infection OR = 7.881 (1.880 – 33.039) than the young camels (Table-2). Four (1.0%) of the 40 camel sera from Damaturu agricultural zone tested positive for antibodies against *Brucella* spp, comprising of 1 (0.25%) male and 3 (0.75%) female camels. There was no significant association between the sexes of camel and positive serological reaction ($P>0.05$). Out of the 60 samples from Potiskum agricultural zone of the state, 8 (2.0%) tested positive, comprising of 2 (0.5%) male and 6 (1.5%) female camels. there was no significant association between the sexes of the camel and positive serological reaction $P>0.05$. Nineteen (4.75%) samples tested positive from 100 camel sera samples collected from Gashua agricultural zone. This comprised of 4 (1.0%) and 15 (3.75%) male and female camels respectively. There was no significant association between sexes of camel in Gashua zone and positive serological reaction ($P >$

Table-1. Sex specific prevalence of *Brucella* antibodies in camel herds in Yobe state

Sex	Number examined	C-ELISA		P value	Odds Ratio (OR)	95% CI on OR	
		No. (%) Positive	Negative			Lower	Upper
Male	168	26(6.5)	142	0.1109	0.8789	0.5125	1.376
Female	232	40(10.0)	192		1.138	0.6634	1.951
Total	400	66(16.5)	334				

Table-2. Age specific prevalence of *Brucella* antibodies in camel herds in Yobe state

Age (years)	Number examined	C-ELISA		P value	Odds Ratio (OR)	95% CI on OR	
		No. (%) Positive	Negative			Lower	Upper
Young (1–3)	68	2(0.50)	66	9.779	0.1269	0.03027	0.5320
Adult (4–12)	332	64(16.00)	268		7.881	1.880	33.039
Total	400	66(16.50)	334				

Table-3. Agricultural zone specific prevalence of *Brucella* antibodies in camel herds in Yobe state

Agricultural zone	Sex	Number examined	C-ELISA		P value	Odds Ratio (OR)	95% CI on OR	
			No. (%) Positive	Negative			Lower	Upper
Damaturu	Male	12	1(0.25)	11	0.05291	0.8181	0.7576	0.07066
	Female	28	3(0.75)	25				
	Total	40	4(1.00)	36				
Potiskum	Male	17	2(0.5)	15	0.05051	0.8222	0.822	0.1468
	Female	43	6(1.5)	37				
	Total	60	8(2.00)	52				
Gashua	Male	25	4(1.00)	21	0.02166	0.8830	0.7619	0.2272
	Female	75	15(3.75)	60				
	Total	100	19(4.75)	81				
Geidam	Male	29	5(1.25)	24	0.02558	0.8729	0.7895	0.2659
	Female	91	19(4.25)	72				
	Total	120	24(6.00)	96				
Nguru	Male	21	2(0.50)	19	0.08175	0.7749	0.3848	0.1156
	Female	59	9(2.25)	50				
	Total	80	11(2.75)	69				

C-ELISA = competitive enzyme linked immunosorbent assay; CI = confidence interval; χ^2 = Chi square; OR = Odds Ratio

0.05). A total of 24 (6.0%) camels from the 120 sampled from Geidam agricultural zone were positive for antibodies against *Brucella* organisms by C-ELISA. Out of this, 5 (1.25%) were male while 19 (4.75%) were female camels. There was no significant association between both sexes of camel sampled from Geidam zone and positive serological reaction ($P > 0.05$). Eleven (2.75%) sera samples collected from Nguru zone tested positive for antibodies against *Brucella* spp. This comprised of 2 (0.5%) male and 9 (2.25%) female camels. There was no significant association between the sexes of camel and positive serological reaction ($P > 0.05$) also in this zone (Table- 3).

The result of the questionnaires administered revealed 10.0% of the herdsmen had Tsangaya (Quranic) education but none had western education. All the respondents practice extensive system of production and reared small ruminants especially sheep alongside camel. The camel herd size ranges from 18 to 95 with 46 as the mean herd size and all the respondents utilize family labour. Although local veterinary service was available only 8% of the respondents patronize the services. All the respondents have observed brucellosis related clinical signs such as abortion in their herds but none of them vaccinate their camel against brucellosis.

Discussion

The overall prevalence of *Brucella* antibodies

among camels in the five agricultural zones of Yobe state was 16.5% by C-ELISA. This was higher than the 8.33% prevalence in camel in the state based on milk ring test [17]. The difference could be because of sensitivity and specificity of C-ELISA compared with milk ring test. The prevalence was also higher than 11.4% in Sokoto, north-eastern Nigeria [7] and 9.4% in the Lake Chad basin of Borno state, north-eastern Nigeria [12]. This could be attributed to location, sample size and serological tests used. The higher and variable seroprevalence obtained in this study could be attributed partly to extensive movement and mingling of the camels with other herds at common grazing and water points; and also the fact that the pastoralists were not vaccinating their herds against brucellosis, non-patronage of veterinary services and herdsmen low level of education. The seroprevalence in this study was however; lower than 25.5% in camels slaughtered at Maiduguri abattoir [18] and 40.5% in Sudan [19]. This could be because C-ELISA used in this study is more specific than RBPT earlier used [18].

The higher prevalence amongst female camels obtained in this study was in consistent with earlier findings [7,12,13] on the distribution of seroprevalence of brucellosis by sex of camel who reported higher prevalence in females than males. Reasons for this could be due to the fact that female animals remained in the breeding herds for a longer period of time than male animals that are being culled from time to time and sold

to meet pastoralists' financial needs. Also the foci of infection remain in females which spread infection from one animal to another as earlier reported [20].

The higher seroprevalence in adult than young camels and the significant association between adults and *Brucella* infection obtained in this study is an agreement with previous reports [19, 21]. The finding could be due to the fact that sexually matured animals are more susceptible to *Brucella* infection while young animals tend to be more resistant and are frequently eliminated as soon as the infection is first observed [22].

Conclusion

In conclusion, the high sero-prevalence of brucellosis in the camel of the agricultural zones of the state indicates that the disease is endemic and camel is one of the animals that perpetuate and sustain this disease. The high seroprevalence recorded in the breeding herds in the state is of economic and public health importance. Economic losses due to abortion, still birth, reduced milk production, and infertility can be control by adopting measures such as compulsory vaccination, movement restriction, quarantine, test and slaughter policy, and hygienic management practices.

Authors' contributions

SGA and AOT: Conception, design, planning, execution and financing of the research, also responsible for collation and analysis of data; preparation of the journal manuscript. NBA and SA: Sample collection, data collation, finance, manuscript vetting and editing. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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