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ORIGINAL ARTICLE

Brucella Infection among Prison Inmates in Borno State, Nigeria

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ABSTRACT

Aim: The study was conducted to determine the seroprevalence of brucellosis among prison inmates in three senatorial zones, Bama, Biu and Maiduguri prisons, in Borno State, Nigeria. A total of 214 Blood samples were collected from January 2014 – July 2014.

Materials and Methods: Blood samples were aseptically collected from two hundred and fourteen (214) prison inmates. The sera obtained from the blood samples were screened for *Brucella* antibodies by Rose Bengal Plate Test (RBPT) and Microtitre Serum Agglutination Test (MSAT).

Results: The overall seroprevalence among the prison inmates tested in all the three senatorial zones were 26(12.1%), and 22(10.2%) for RBPT and MSAT respectively, of which 8(10.8%) and 6(8.1%) were from Bama, 12(14.2%) and 12(14.2%) were from Biu, while 6(10.7) and 4(7.1%) for RBPT and MSAT were from Maiduguri respectively. There was no significant statistical difference (P>0.05) in the seroprevalence based on location among the prison inmates in the state. There was no significant statistical difference (P>0.05) in the seroprevalence based on age of the prison inmates in the state, though the study showed higher seroprevalence among individuals above 40 years followed by those above 20 years and less among individual up to 20 years.

Conclusions: *Brucella* infection was found in all the three senatorial zones in Borno State. There is the need to control the disease in the prisons. Further studies are recommended in all the prisons in Nigeria. The study should involve isolation of the organism and determining their bio-types, in prison inmates and other people in the country.

Keys:

MSAT - Microtitre Serum agglutination Test	(%) - percentage
RBPT - Rose Bengal Plate Test	+ve - positive
No. - Number	-ve - Negative
^{0}C - Degree Celsius	χ^2 - Chi square

INTRODUCTION

Brucellosis is a zoonotic disease of wild and domestic animals in which man is an accidental host[1]. It is one of the common bacterial zoonosis in the world[2]. The disease is predominantly a work related illness in farm and livestock workers, slaughterhouse employees, veterinarians, and laboratory personnel and ranchers who handle infected animals and aborted fetuses or placenta[3]. The risk of contracting brucellosis is comparatively high in areas of endemic infection where people are involved in handling and consuming susceptible dairy animals and their products[4,5]. Brucellosis remains an uncontrolled public health problem worldwide. In many developing countries, the problem is compounded by the absence of national surveillance programmes, diagnostic facilities and reliable data [6].

Human brucellosis is still the most common zoonotic disease worldwide with 500,000 new cases reported annually[7]. The infection can occur through consumption of contaminated, unpasteurized animal products, direct contact with infected animal parts, and through the inhalation of infected aerosolized particles. Brucellosis is an occupational disease in shepherds, abattoir workers, veterinarians, dairy-industry professionals, and personnel in microbiology laboratories [8,9]. Transmission of *B. melitensis* from person-to-person has also been reported in the literature [10,11]. Human brucellosis is a systemic infection that may manifest with a myriad of non-specific symptoms (e.g., fever, sweats, malaise, anorexia, headache, back pain) as well as substantial residual disability. The onset can be insidious or acute, generally beginning within 2 to 4 weeks after inoculation. An "undulant" fever pattern is apparent in patients who are untreated for long periods of time [12]. Osteoarticular disease is the most common complication, followed by the involvement of reproductive system. Endocarditis remains the principal cause of mortality in the course of brucellosis[13].

There are few reports of clinical brucellosis in Nigeria[14]. Much of the published work on human *Brucella* infections are based on sero-survey of occupational high risk groups such as livestock herders, farmers, butchers and other abattoir workers, and veterinarians[15,16,17,18]. These demonstrate how brucellosis has been identified as an endemic and problematic disease in Nigeria. The purpose of this study was to determine seroprevalence of brucellosis among inmates in Nigeria.

METHODOLOGY

Study Area: Borno State is located on latitude 10⁰N and 13⁰E and longitude 12⁰ N and 15⁰ E. The state is located in the North-Eastern part of Nigeria, with a population of 4,151,161 and total area of 69,436 square kilometers; it occupies the greatest part of the Chad Basin. The state has two vegetation zones viz: Sahel in the North with severe desert encroachment covering most of the Chad Basin areas and Sudan Savannah in the South. The State shares boundaries with the Republic of Niger to the North, Chad Republic to the North-East and Cameroon to the East. Within the country, the state shares border with Adamawa to the south, Yobe to the west, Bauchi and Gombe to the South-West[19].

Ethical clearance: The study protocol was peer reviewed and cleared for ethics by the Medical Research Coordinating Committee of University of Maiduguri, Nigeria. Verbal and written consents were also sought from all participants before being involved with the study.

Sample collection: Five milliliters (5ml) of blood sample was aseptically collected from each of the two hundred and fourteen (214) prison inmates, from January 2014 – July 2014. All blood samples were centrifuged at 3000g for 10 minutes. The sera were stored at -20⁰C until tested. The age, sex and location of the inmates were recorded as blood samples were taken.

Serological Test: All serum samples collected were subjected to Rose Bengal Plate Test (RBPT) and Microtitre Serum agglutination Test (MSAT)in order to quantify the antibody. This was done according to the method described by Alton *et al.*[20].Both the RBPT and MSAT antigen were obtained from Veterinary Laboratories Agency (VLA®) New Addlestone, United Kingdom.

Data Analysis: Data obtained from the studies were subjected to Chi square analysis for comparison, and Odd ratio to test association between occurrence of *Brucella* infection and age of inmates as well as location of the prisons within the state.

RESULTS

The results obtained from the study showed that of the 214 inmates screened by RBPT and MSAT, 26 (12.1%) and 22 (10.2%) were positive to *Brucella* infection. This is comprised of 8 (10.8%) and 6 (8.1%) from Bama, 12(14.2%) and 12 (14.2%) from Biu while 6 (10.7%) and 4 (7.1%) from Maiduguri. There was no significant statistical (P>0.05) association between the locations and serological reaction to RBPT and MSAT (Table 1).Table 2 shows the age distribution of *Brucella* antibodies among inmates' serum samples that were tested within the state. The highest seroprevalence of 11.7% and 8.8% was obtained among the age band 41 – 60 years, this followed by 10.1% and 8.4% in the age band 21 – 40 years, while the least 9.6% and 6.4% was obtained in the age band up to 20 years. There was no significant statistical difference (P>0.05) among all the age bands tested.

Table 1: Seroprevalence of brucellosis among prison Inmates in Borno state based on location

Location of prison	Number Examined	RBPT				MSAT			
		+ve (%)	–ve (%)	χ^2	P value	+ve (%)	–ve (%)	χ^2	P value
Bama	74	8(10.8)	66(89.1)	0.5915	0.9640	6(8.1)	68(91.8)	2.437	0.6559
Biu	84	12(14.2)	72(85.7)			12(14.2)	72(85.7)		
Maiduguri	56	6(10.7)	50(89.2)			4(7.1)	52(92.8)		
Total	**214**	**26(12.1)**	**188(87.8)**			**22(10.2)**	**192(89.7)**		

Table 2: Seroprevalence of brucellosis among prison Inmates in Borno state based on Age

Age (Years)	Number Examined	RBPT				MSAT			
		+ve (%)	–ve (%)	χ^2	P value	+ve (%)	–ve (%)	χ^2	P value
Up to 20	62	6(9.6)	56(90.3)	0.1072	0.9986	4(6.4)	58(93.5)	0.8060	0.9376
21 − 40	118	12(10.1)	106(89.8)			10(8.4)	108(91.5)		
41 − 60	34	4(11.7)	30(88.2)			3(8.8)	30(88.2)		
Total	**214**	**22(10.2)**	**192(89.7)**			**17(7.9)**	**196(91.5)**		

DISCUSSION

Brucellosis occurs in domestic animals especially in food animals which is transmitted to human either by direct or indirect contacts such as consumption of contaminated milk and dairy products, close contact with infected animals and their aborted fetus, vaginal discharges. The sero-prevalence of 12.1% and 10.2% obtained in this study is high compare to earlier reports in Nigeria, 9.0% in mixed sheep and cattle rearers, 8.0% in mixed sheep and goat rearers, and 4.0% among each of sheep rearers and non-rearers of animals[21]. But lower than 14.4% obtained in Sokoto[22] and 20.0% observed among cattle handlers in Nigeria[21]. The seroprevalence in the individual prisons revealed 10.8%, 14.2% and 10.7% in Bama, Biu, and Maiduguri prisons. This showed no significant difference to the study made in Sokoto by Junaidu *et al.*[23], except for Biu where the prevalence is higher.

Worldwide reported incidence of human brucellosis in endemic disease areas varies widely, from <0.01 to >200 per 100,000 population[24]. The seroprevalence of 40.0% obtained in Libya[25], and 18.0%, from Uganda[26] were higher than the seroprevalence obtained in this study, this could be due to the fact that inmates are not much exposed to animals. Karabay *et al.*[27] reported seroprevalence of 3.2% from Turkey, while[28] reported seroprevalence of 4.5% from Saudi Arabia respectively which is lower than the seroprevalence reported in this work. This difference in endemicity may be due to the prevalent practices in the population and also the incidence of brucellosis in the community.

The capability of rapidly diagnosing the disease and identifying its causative agent is critical to combat diseases and halt epidemics[29,30]. Recent technological developments have led to the proliferation of new, rapid diagnostic tests that hold promise for the improved management and control of infectious diseases [31]. New technologies such as microfluidics[32] and Lab-on- Chip [33] are examples of promising new technologies that can underpin development of laboratory-free diagnostic devices.

Control of brucellosis requires elimination of infected animals and vaccination of healthy ones in order to reduce the risk for those in regular contact with animals and to have brucellosis-free animal products. Human brucellosis acquired from milk can be prevented, and requires pasteurizing milk and dairy products. Nevertheless, public health education is important in preventing the transmission of brucellosis from animals to humans.

Conflict of interest statement

We declare that we have no conflict of interest.

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