Full Length Research Paper

Seroprevalence of brucellosis among livestock workers at Maiduguri cattle market, Borno State, North Eastern, Nigeria

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A serological survey was conducted to determine the seroprevalence of brucellosis in livestock workers at Maiduguri cattle market, Borno State, Nigeria. A total of 100 serum samples comprising 40 from animal handlers, 25 from livestock keepers, 20 from butchers and 15 from middlemen were tested using Rose Bengal Plate Test (RBPT) antigen for both *Brucella abortus* and *Brucella melitensis*. Seroprevalence rate of 11% was detected for *B. abortus* and 0% for *B. melitensis* antibodies out of the total sampled. The seroprevalence in animal handlers, livestock keepers, butchers and middlemen were found to be 12.5, 16, 10 and 0%, respectively. All persons screened were males. There was no significant difference (p > 0.05) between different categories of workers. It was concluded that brucellosis is prevalent in livestock workers at Maiduguri cattle market in Borno State. There should be education of this category of risk group of people especially as it relates to the use of personal protective equipments (PPEs) ante mortem and post mortem outfit and the consumption of unpasteurized milk and milk products. Government should control the disease with appropriate existing laws or new regulations, public health enlightenment, mass vaccination of animals and the establishments of equipped laboratories for regular screening of humans and animals by well trained personnel.

Key words: Brucellosis, livestock workers, Maiduguri, Nigeria, seroprevalence.

INTRODUCTION

Brucellosis is a contagious bacterial infection of livestock and continues to be of great health concern and economic importance worldwide, especially in Mediterranean countries (Munir et al., 2010). The orga-

nism is intracellular, coccobacilli, Gram-negative bacteria of the genus *Brucella* which consists of ten species ranked according to their host preferences namely, *B. abortus* (cattle), *B. melitensis* (small ruminants and camels), *B. suis* (swine), *B. canis* (dog) which also affect man, *B. ovis* (sheep), *B. neotomae* (desert woodrat), *B. ceti* (cetaceans), *B. pinnipedialis* (pinnipeds) are species isolated from marine mammals and occasionally cause infection in man, *Brucella inopinata* (human breast) (Scholz et al., 2009; Martín-Martín et al., 2011 and Falenski et al., 2011). Human brucellosis is a zoonotic disease with a major impact on public health, even though successful eradication and control programmes for domestic animals have been established in many developed countries around the world (Al Dahouk et al., 2013). More than 500,000 human cases are reported worldwide each year particularly from developing countries (Seleem et al., 2010). Brucellosis is endemic in Nigeria and causes severe economic losses to livestock farmers, which estimated to account for about 46 million Naira (Chukwu, 1987). It is a serious risk to human health and has been documented in different parts of the country especially in ranches, livestock breeding centre and dairy farms in Nigeria (Mohammed et al., 2011; Mai et al., 2012). In Borno State, some evidence of brucellosis in sheep, goats, cattle, camels, and humans has been documented (Brisibe et al., 1993; Adamu et al., 2007; Tijjani et al., 2012; Sadiq et al., 2013 and Adamu et al., 2014). However, the exact status of the disease in workers at cattle market in Maiduguri, Borno State has never been determined despite the fact that this group of people are among the high risk group of contracting the disease (Alballa, 1995; Cadmus et al., 2006). Studies within abattoirs have documented the risk of aerosol transmission. Consumption of unpasteurized dairy products, close contact with infected animals and with contaminated environmental sources could be major risk factors for the spread of *Brucella* infections among humans (Boukary et al., 2010). The present study was therefore conducted to determine the seroprevalence of the disease in this high risk group of workers in Maiduguri, Northeastern Nigeria.

MATERIALS AND METHODS

Study Area

This study was conducted in Borno State which is located on an elevation of about 35 meters above sea level and along Latitude 11°N and Longitude 13°E. The state has land mass area of 75,540 square kilometers and is located in the north-eastern part of Nigeria. The boundaries of the state are the Republic of Niger to the north, Cameroon Republic to the east and to the north-east by Chad Republic. Within the country, its neighboring states are Adamawa to the south, Yobe to the west and Gombe to the southwest. The population of people in the state which is sparsely distributed was put at a total of 4,151,193 people (FGN, 2007) consisting mostly of farmers, animal rearers, fishermen, traders and civil servants. Agriculture and livestock farming are the main stay of the economy employing about 70% of the population (Oguntunde, 1998). The vegetation of the state consists of Sahel Savannah in the north and Sudan Savannah in the south. However, most part of the state generally consists of semi-arid Savannah or sub-desert. The arid zone has rather austere climate conditions with hot dry season from late January to late June, during which average daily peak temperature especially in April and May are 34.4°C to 37.8°C. The rainy season with an average annual rainfall of 46.3 centimeters last from late June to mid-September but can vary. The main relative humidity at room temperature fluctuates between 5% (December to January) and 45% (June to August). The cold north easterly trade wind blowing across the Sahara desert in October to January brings with it, cold and desiccant effect on the environment. The dry season is characterized by complete absence of green pasture. However, towards the Lake Chad area, there is abundance of pasture because of a large water body of the Lake Chad in the area. This brings a lot of nomadic pastoralists both within and outside the country to graze their animals in the area. The soil in the north-central part of the state is largely sands, formed by wind-drift from the desert.

Sample collection

Blood samples were aseptically collected from livestock workers comprising animal handlers, livestock keepers, butchers and middlemen at the Maiduguri cattle market, Borno State. Before the sample collection, "a pilot study was conducted" with individuals and also consultation with their respective leaders were held during which they were informed of the purpose, the significance of the study and were invited to participate. Ethical clearance was also obtained from Borno State Ministry of Health ethical clearance committee. Verbal and written permission was obtained from chairmen of livestock workers, livestock keepers, butchers and abattoir worker. Verbal and informed consent was gotten from all the respondents before the study. Demographic features of each volunteer was also obtained at the time of sample collection. The blood collection was done by qualified health workers from the University of Maiduguri Clinic. For this, five milliliters sterile syringe and needles were used to aseptically collect blood samples from the cephalic veins of volunteers into properly labeled sterile bottles. The samples were kept in an ice-packed cooler before being transported to the laboratory. At the laboratory, the samples collected were centrifuged at 3000 rpm for l0 min and the sera decanted into vials and stored at - 20°C in the freezer until tested.

Sample analysis

The samples were analyzed for evidence of *Brucella* antibodies

Table 1. Seroprevalence of brucellosis in different livestock workers at Maiduguri cattle market, Borno State, Nigeria.

Occupational groups	Number examined	Serological tests			
		RBPT with *B. abortus*		RBPT with *B. melitensis*	
		No. +ve (%)	No. -ve (%)	No. +ve (%)	No. -ve (%)
Animal handlers	40	5(12.5)	35(87.5)	00(00)	40(100)
Livestock keepers	25	4(16.0)	21(841)	00(00)	25(100)
Butchers	20	2(10.0)	18(90)	00(00)	20(100)
Middle men	15	00(0.0)	15(100)	00(00)	15(100)
Total	100	11(11)	89(89)	00(00)	100(100)

*The figure in parenthesis is percentages (%) of the amber positive or negative, No. +ve = Positive, No. -ve = negative, % +ve = percentage positive, % -ve = percentage positive, RBPT = Rose Bengal Plate Test.

using two different types of Rose Bengals Plate Test (RBPT) antigens. The antigens were the standard acidified Rose Bengal stained *B. abortus* and *B. melitensis* antigens prepared, standardized and supplied by the Veterinary Laboratory Agency (VLA) Survey, United Kingdom. The samples and RBPT antigens were removed from the refrigeration condition and left on the table at room temperature for an hour before the test was carried out. The rationale behind thawing of antigens before the test proper for one hour is to aloud the antigen attain room temperature so that it will not affect the test. A drop of the test serum was taken using a clean Pasteur pipette and placed onto test plate beside an equal drop of RBPT antigen using another clean pipette. These were then mixed well using a sterile applicator stick. The mixture was then hand rocked manually for 4 min. The presence of distinct granular agglutinin was recorded as positive result while samples that appeared clear without agglutination granules were recorded negative results. This procedure carried out was as described by Alton et al. (1975).

Data analysis

Prevalence rates of brucellosis in different categories of livestock workers and sex were subjected to Chi-square analysis using GraphPad InStat® to compare the prevalence among the different categories of animal handlers at 0.05 level of significance, where appropriate a computer software Statistical Package for Social Sciences (SPSS) version 20.0 was used (Dhand et al., 2005).

RESULTS

Out of 100 serum samples screened by Rose Bengal Plate Test (RBPT) antigen for both *B. abortus* and *B. melitensis*, 11 (11.0%) were seropositive to *Brucella* infection using *B. abortus* and 0% using *B. melitensis*. This comprised of 5 (12.5%) animal handlers, 4 (16.0%) livestock keepers, 2 (10.0%) butchers and 0% for the middle men, respectively (Table 1). There was no significant statistical difference (P > 0.05) between the various categories of livestock workers screened. The seroprevalence rate of 11.0% was detected in males only

as no female was screened for brucellosis and this could be as a result of mostly animal's handlers in the state are male. Out of 100 serum samples tested using Rose Bengal Plate Test (RBPT) antigens for both *B. abortus* and *B. melitensis*, a seroprevalence rate of 11% was detected for *B. abortus* and 0% for *B. melitensis*. Eleven percent seroprevalence rate was detected in males only as no female was screened since the livestock work is still predominantly a male affair in the state.

The seroprevalence in animal handlers, livestock keepers, butchers and middlemen were found to be 12.5, 16, 10 and 0%, respectively (Table 1). Statistically, there was no significant difference (P > 0.05) between different categories of workers when the data were subjected to Chi-square analysis.

DISCUSSION

Sample collection from livestock workers was not easy as most of the workers assumed that their blood might be used for ritual purposes. Others refused to give their blood because they felt that they do not have sufficient blood to give out.

To minimize the problems of sample collection from this category of people, the livestock workers needed to be diplomatically approached ahead of time using their languages (Kanuri, Shuwa, Gwaza or Hausa) and also to go through their respective leaders. In most times, incentives had to go along with sample collection from this group of people. These reasons account for the only 100 samples obtained from volunteers. There was also the need to educate and enlighten the workers ahead of sample collection and the education continued even during the sample collection. It was equally very important to return to them the results of the findings on their sera, so as to know their test results and seek treatment from the medical hospital. The 11% (11/100)

prevalence rate of livestock workers against brucellosis at Maiduguri cattle Market is higher than the finding of 0% of livestock workers tested at the Akinyele cattle market, Ibadan, Nigeria (Cadmus et al., 2006). The difference is probably due to sample size as only 21 samples were collected from butchers, herdsmen and abattoir workers in the Ibadan study as compared to 100 blood samples collected from animal handlers, livestock keepers, butchers and middlemen at the Maiduguri cattle market in our study. The 11% prevalence rate highlights the occupational hazard posed to this category of workers who handle most time infected animals (Falade, 2002). Most of the livestock workers during screening complained of frequent treatments for malaria without much improvement while some complained of joint pain and general body weakness signs suggestive of brucellosis (CDC, 2005; Muchaal, 2005). The fundamental reasons for the high infection rate recorded among the workers may not be unconnected with the poor and unhealthy practices by the workers. Generally, the livestock workers in this cattle market do not wear any protective clothing, leaving them exposed to infected materials such as blood, urine, virginal discharges, aborted fetuses and placentas from infected animals. These workers are constantly exposed on a daily basis to aerosol and because of possible cuts on their bodies (especially hand and faces), they are at great risk of exposure to the diseases. As a result of little or no access to detailed medical care, those who develop symptoms of fever, joint aches and weakness always associate them with malaria which is an endemic disease in Africa (Cadmus et al., 2006). The seroprevalence was higher in livestock keepers (16%), followed by animal handlers (12.5%) then butchers (10%) and the least were middlemen (0%). The differences in the seroprevalence rates in these different categories of workers might not be unconnected with the differences in duration and constant exposure to infected materials from infected animals. From the study, the workers were infected mainly by *B. abortus* and not *B. melitensis*. The likelihood of the source of infection may be cattle since *B. abortus* infects cattle more than *B. melitensis* which predominantly infects sheep and goats (Radostits et al., 1997).

CONCLUSION AND RECOMMENDATION

Our serological investigation of livestock workers for evidence of brucellosis demonstrates the existence of the disease in people of the area studied and suggests the need to control the disease among this group of workers. The control measures should include among others, public health enlightenment of this group of workers on the danger and the mode of transmission of this disease.

They should be educated on the importance of strictly adhering to hygienic measures and should always wear gloves and protective clothing when handling sick or dead animals and especially at meat inspection. They should be educated on the avoidance of raw dairy foods especially unpasteurized milk, cheese and ice-cream. Attempts should be made by government and private hospitals to encourage routine screening of humans especially those at risk of exposure and those with pyrexia of unknown etiology and for brucellosis free treatment for those found positive.

Conflicts of interest

The authors declare that they have no conflict of interest.

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