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Seroprevalence and Associated Risk Factors of Camel (*Camelus dromedaries*) Brucellosis in and Around Dire Dawa, Ethiopia

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Abstract: A cross-sectional study of brucellosis was conducted from November 2010 to April 2011 to estimate seroprevalence and to assess potential risk factors of camel (*Camelus dromedaries*) in and around Dire Dawa, Ethiopia. Rose Bengal Palte test (RBPT) was used as a screening test to detect presence of *Brucella* antibodies and CFT to confirm those reactors by RBPT. Thirteen of 646 camels (2%) were seroreactive when tested by RBPT, out of which 10 (1.5%) were seropositive by CFT. Higher seroprevalence was observed in female and in adult camels with seroprevalence of 1.7 and 1.8% than seroprevalence of 1.4 and 0.7% observed in male and young camels, respectively. However, there was no ststistically significant difference ($P < 0.05$) in seroprevalence of brucellosis between both groups. Higher seroprevalence of *Brucella* (38.5%) was observed in adult female camels which had history of reproductive problems [abortion, still birth and retained fetal membrane (RFM)] with statistically significant difference ($P < 0.05$) compared to that of adult female camels which had no history of reproductive problems. Of camels which had these reproductive problems, highest seroprevalence (43%) was observed in camelse which had history of abortion. In conclusion, this level of seroprevalence is enough to be a potential hazard for public health in the study area, therefore, the public especially camel producers should be aware of camels as source of brucellosis.

Key words: Brucellosis · Camel Dromedaries · CFT · Dire Dawa · RBPT · Seroprevalence

INTRODUCTION

Even though, there have been notable successes in the control of livestock diseases, some still pose problems. In developing countries, infectious diseases still cause considerable loss of animal life and production [1]. Brucellosis, a bacterial disease caused by members of the genus *Brucella*, is an important zoonosis and a significant cause of reproductive losses in animals. Brucellosis is usually caused by *Brucella abortus* in cattle, *B. melitensis* or *B. ovis* in small ruminants, *B. suis* in pigs and *B. canis* in dogs. Abortions, placentitis, epididymitis and orchitis are the most common consequences, although other syndromes are also reported. The main impact is economic; deaths are rare except in the fetus and neonate. Its economic and public health impact remains of particular concern in developing countries like Ethiopia [2]. The disease can affect almost all domestic species and cross transmission can occur between cattle, sheep, goat, camel and other species [3]. In humans, brucellosis can be a serious, debilitating and sometimes chronic disease that may affect a variety of organs. Most cases are caused by occupational exposure to infected animals or the ingestion of unpasteurized dairy products [2].

In camels, brucellosis is characterized by abortion, non-visible offspring birth in females and orchitis and epididymitis in males [4]. The diseases is also associated with infertility and prolonged calving intervals and has considerable impact on camel production. In camels, it may also cause, chronic inflammation of epididymitis, of the joints, tendon sheath and synovial bursa specially at the carpus [5]. In Ethiopia, brucellosis has been reported in camels [6, 7] and in other animal species by various

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workers [8-13]. Occurrence of brucellosis in different animal species, traditional management system and custom of consumption of raw or uncooked animal products in the country indicate the need of study of brucellosis. Therefore, this study was designed to estimate seroprevalence of brucellosis and to evaluate possible risk factors associated with camel brucellosis.

MATERIALS AND METHODS

Study Area and Study Animals: The study was conducted in and around Dire Dawa, eastern part of Ethiopia. The study area has hot climatic condition with annual minimum and maximum temperature of 18.2°C and 34°C, respectively and annual average rain fall of 676.3 mm. The study animals were camellus dromedarous (one humped camels) which were managed under pastoral production system. There were about 15650 camels in the study area which comprised both sexes of different age groups.

Study Design: It was cross-sectional study conducted on 646 camels from October 2010 to March 2011. Study animals were categorized into different groups based on their sex, age, origin and presence or absence of reproductive problems. Reproductve history was taken for a total of 277 adult female camels. Age determination and history for presence or absence of reproductive problems was obtained from the camels' owners and the attendants. Twelve peasant associations including Adigafelma, Aseliso, Gedenser, Hulahule, Goladeg, Jeldesa, Ayele Gum-Gum, Elehamare, Dire Kalicha, Bishanbehe and Beya-awale were selected for the study. Of the 12 peasant associations Kalicha, Bishanbehe and Beya-awale were taken representative of medium altitude areas while the rest were taken to represent the lowland.

Sample Size Determination and Sampling Procedure: A previous study on prevalence of camel brucellosis in three camel rearing regions of Ethiopia revealed prevalence of 5.7% [14]. Therefore, using 5.7% expected prevalence and 5% absolute precision at 95% confidence level, the sample size was calculated to be 384 according to the formula of sample size determination in random sampling for infinite population described by Thrusfield [1]. However, 646 camels have been included in the study to increase accuracy.

Animals available for sampling were counted and one camel was selected from every 5-10 camels based on feasibility; no animal was selected if a group contains less than five animals. About 10ml of blood was collected from the jugular vein of each selected animal using plain vacutainer tube, labeled and allowed to clot over night in a slant position at room temperature. Questions were asked for for age and history of reproductive problems. In the following day, serum from each blood sample was separately taken for serological examination and stored at -20°C in Dire Dawa Regional Veterinary laboratory until tested for *Brucella* antibodies.

Serological Examination: In the laboratory, all the collected sera were subjected to RBPT for screening of *Brucella* agglutinins according to standard procedures described by Nilson and Dukan [15]. Samples which were positive by the screening test were further tested by CFT for confirmation. CFT was performed according to the standard procedures described by OIE [16].

Data Analysis: Prevalence was calculated as percentage by dividing the number of positive samples for *Brucella* to the total number of samples. Stata 11 was used to check presence of association between explanatory variables (risk factors) and positive seroprevalence. The sex, age, origin and reproductive problems were considered as explanatory variables. Presence of statistical difference between prevalence of *Brucella* was calculated using Fisher's method as the numbers within the categories were too small to be analyzed by chi square test.

RESULTS

Of the total 646 camels (285 male and 361 female), 2% (13 of 646) and 1.5% (10 of 646) were seropositive for *Brucella* antigen by RBPT and CFT, respectively (Table 1). Higher seroprevalence of brucellosis was observed in female (1.7%) and in adult (1.8%) camels than that young camels, respectively. However, there was no statistically significance difference ($P>0.05$) in seroprevalence of brucellosis between the respective categories. Thirteen of 277 (4.7%) adult camels had history of reproductive problems, of which 38.5% were positive for *Brucella* and there was statistically significant difference ($P < 0.05$) between seroprevalence of brucellosis in adult female camels which had history of reproductive problems and which had no history of reproductive problems (Table 1).

Table 1: Seroprevalence of burucellosis between camels of different categories

Risk factors	No. of animal tested	CFT (%)	Fisher's exact
Sex			
Male	285	4 (1.4)	1.00
Female	361	6 (1.7)	
Total	646	10 (1.5)	
Age			
Adult	496	9 (1.8)	
Young	150	1 (0.7)	
Total	646	10 (1.5)	0.467
Adult female camels			
Without reproductive history	264	1 (0.4)	
With reproductive history	13	5 (38.5)	0.000
Total	277	6 (2.2)	

Table 2: Seroprevalence of brucellosis among camels with history of reproductive problems

Reproductive problem	No. of animals: Reproductive history was taken	With history of reproductive problems(%)	Seropositive for *Brucella*(%)
Abortion	277	7 (2.5)	3 (43)
RFM	277	5 (1.8)	1 (20)
Stillbirth	277	1 (0.4)	-
Total	277	13 (4.7)	4 (1.4)

Abortion, retained fetal membrane (RFM) and stillbirth were reproductive problems obtained in the history of the adult female camels with prevalence of 2.5% (7of 277), 1.8% (5 of 277) and 0.4% (1 of 277), respectivey. The highest seroprevalence 43% (3 of 7) was observed in camels which had history of abortion compared to other reproductive problems (Table 2).

DISCUSSION

In this cross-sectional study of camel brucellosis, overall seroprevalence of 1.5% (10 of 646) was observed. This level of seroprevalence of brucellosis in camels observed in current study in Dire Dawa town is in agreement with many previous studies in Ethiopia. Bekele *et al*. [17] reported brucellosis in camels with seroprevalence of 1.8% and 1.7% in his study in Borana and Tigray, respectively. However, it is not in line with the work of Teshome *et al.* [14] who reported camel brucellosis with seroprevalence of 5.7% and 2.8% in Afar and Somali regions of Ethiopia. The difference in seroprevalence between the current study and the previous study might be due to differences in sample size, tests used (CFT), management condition, herd size or due difference in seroprevalence in the two study areas. According to Radiostits *et al*. [4], herd size and management condition determine rate of transmission of *Brucella* infection in different study areas.

Higher seroprevalence of *Brucella* was observed in female (1.7%) camels is in agreement with previous studies of Teshome *et al.*[14] and Tefera [18]. The reason may be related with relaxation of immunity in females associated to lactation, pregnancy and other reproductive stress [19]. According to Radostitis *et al.* [4], physiological and behavioral differences between male and female animals involve in the variation in sex susceptibly for brucellosis. *Brucella* infection is more common in female camels [19] may be associated to erythritol.

As sex hormones and erythrtiol tend to increase in concentration with age and sexual maturity and favor growth and multiplication of *Brucella* organisms [4], higher level of seroprevalence (1.8%) was observed, in agreement with the work of Tefera [18], in adult camels. It is also true that younger animals are more resistant to infection and frequently clear established infection [19].

Higher seroprevalence of *Brucella,* observed in adult female camels which had history of reproductive problems (38.5%) showed statistically significant difference ($P < 0.05$) compared to that of adult female camels which had no history of reproductive problems. This result supports the truth that brucellosis is one cause of reproductive problems like abortion [20]. Of camels with reproductive problems of abortion, RFM and stillbirth, the highest seroprevalence (43%) was observed in camels which had history of abortion compared to other reproductive problems mentioned. This may suggest *Brucella* as cause of abortion in camels.

In conclusion, the study indicated that brucellosis is a potential disease in and around Dire Dawa. Therefore, individuals working with these species of animals should be awre about the risk of camels as source of brucellosis; further detailed study involving different possible risk factors in camels, other animals and humans in wider area is suggested.

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