Short Communication

Seroprevalence of human brucellosis community awareness and practices on its zoonotic importance in Jimma town and Chora Botor district, Ethiopia

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Summary

A cross-sectional study was undertaken in Jimma town and Chora Botor district of Jimma zone to determine sero-prevalence of brucellosis in humans from February to May 2014. A total of 48 blood samples; 24 from Chora botor and 24 from Jimma town were collected. The collected sera samples were screened using Rose Bengal Plate Test (RBPT) and positive reactor were further subjected to complement fixation test (CFT). Statistical analyses were performed using SPSS version 20 software. The overall sero-prevalence of brucellosis in humans was 2.1% and 0.0% by RBPT and CFT, respectively. The majority (97.6%) of the respondents reported to have no awareness on brucellosis. Social habit of consuming raw milk and meat, unsafe handling of placenta, and assisting births were common practices among the community. These practices may predispose people to brucellosis in the study areas. Therefore, collaborative action is needed to exploit through educating communities and creating awareness to prevent and control the disease.

Key words: Brucellosis, Chora Botor, Human, Jimma.

Introduction

Brucellosis remains a major zoonosis worldwide (Corbel, 1997). It is mainly an occupational disease reported in farmers, veterinarians, slaughterhouse workers, animal handlers and meat inspectors (Ajay D. Pathak et al., 2014). Brucellosis is one of the most common zoonotic infections, transmitted to humans through consumption of unpasteurized dairy products or through direct contact with infected animals, placentas or aborted fetuses (Dean et al., 2012). This bacterial disease causes a severely debilitating and disabling illness, with fever, sweating, fatigue, weight loss, headache, and joint pain persisting for weeks to months. Neurological complications, endocarditis and testicular or bone abscess formation can also occur (Corbel, 2006).

Brucellosis is a true zoonosis in that all human cases are infected by animals and,

more specifically, by domestic ruminants as far as *B. abortus* and *B. melitensis* are concerned (Kaoud, 2010). The prevalence of brucellosis among human populations is largely influenced by the prevalence of the disease among domestic animals and local traditions regarding the proximity of animal housing and human habitations and the consumption and processing of milk products (FAO/WHO, 1986).

In Ethiopia, brucellosis in humans have been investigated and reported by different studies. For instance, out of 56 human cases that visited Jimma University's specialized hospital with fever of unknown origin, 3.6% were reported to be positive for *Brucella* antibodies (Tolosa, 2007). In Borana and South Omo pastoral communities, seroprevalence of human brucellosis was documented as 34.9% and 29.4%, respectively (Regassa et al., 2009).

Brucellosis is known to affect human beings who are in contact with animals and their products. Knowledge of potential public health risks as well as economic impact of the diseases is crucial for sustaining both health and economy. There is however, currently lack of a well formulated research to quantify and document the actual prevalence of brucellosis in humans in this area. Therefore, the aim of this study was to determine magnitude of brucellosis in humans and to help human health authorities in their decision for setting priorities for planning and implementation of appropriate control strategies against brucellosis.

Materials and Methods

The study was conducted in Jimma zone, located in Oromia Regional state, southwest Ethiopia. Jimma zone is located about 355 kilometers southwest of Addis Ababa at 7°41'N and 36°10'E. According to 2007 Census conducted by the CSA, the Zone has a total human population of 2,486,155, of whom 1,250,527 are men and 1,235,628 women with an area of 15,568.58 square kilometers (CSA, 2010).

A cross-sectional study was conducted to determine sero-prevalence of brucellosis in humans using serological tests in series (Rose Bengal Plate Test and Complement Fixation Test). A structured questionnaire was also administered by personal interview to collect epidemiological data in Chora Botor district and Jimma town from February 2014 to May 2014.

All people living in Jimma town and Chora Botor district were the source population. The selected participants in the study areas were the study population. Study participants included, peoples of 18 years old and above, resident in the study areas and who have been voluntarily accepted and signed the consent to participate in the study. The sample size (n) for this study was calculated based on the predetermination of: 95% level of confidence, 5% desired level of precision and 0.84 at 20% level for type II error as methods described by Martin *et al*. (Martin, 1987). Which is: $n= [Z\alpha \sqrt{2p(1-p)} + Z\beta \sqrt{p_1(1-p_1)+p_2(1-p_2)}]^2 / (p_2-p_1)^2$, where,

n = sample size for each group, Zα = Z _value for type I error (1.96 at 5% level), Zβ = Z _value for type II error (0.84 at 20% level), P_1= estimate of outcome for one

group, P_2= estimate of outcome for second group and Total Sample size to used is (2n). Previous high prevalence reported was 34.9% (Regassa et al., 2009) and low prevalence 3.6% (Tolosa, 2007). Accordingly, a total sample size of 48 was determined. Study areas and participants were selected through purposive and systematic random sampling method, respectively.

Approximately 5ml of blood were collected from the median cephalic vein of selected humans by using plain vacutainer tubes and left at room temperature overnight to clot for serum separation. Sera samples were collected into cry-vials with plastic pipettes and transported in cold ice box to the National Veterinary institute (NVI), Ethiopia, and stored at –20°C until tested. All serum samples were screened by Rose Bengal Plate Test. The sera that tested positive to the RBPT were further subjected to the CFT for confirmation. A standard *B. abortus* antigen (OIE, 2008) for CFT was used to detect the presence of *Brucella* antibodies in the sera. Antigen used: Veterinary Laboratories Agency (VLA), UK. Standardized *brucella* Ag Batch 16 and Product code PA0066. Sera with a strong reaction more than 75% fixation of the complement (3+) at a dilution of 1:5 and with at least 50% fixation of the complement (2+) at dilutions of 1:10 and 1:20 were classified as positive (+), according to the guidelines of (OIE, 2008).

Structured questionnaire to collect data from the targeted population was administered by personal interview on the following attributes: demography, occupation, contact with animal and animal products (i.e. contact with placenta, aborted fetus, assisting parturition, eating raw meat, consuming raw milk and/or milk products) and awareness on zoonotic importance of brucellosis.

Factors believed to be associated with epidemiology of brucellosis in humans were recorded. Data entry, dataset establishment and storage were performed in Microsoft Excel. Statistical analyses were performed using SPSS version 20 software. The sero-prevalence of brucellosis and practices of participants were determined using descriptive statistics. The study was approved by the Research and Ethics Committee and the letters of clearance were obtained from Makerere University. The data were collected after written informed consent was made with study participants.

Results

Out of the 48 study participants interviewed, the majority (66.7%) were male. The age of participants were 18-30 years (31.3%), 31-40 years (29.2%), 41-50 years (22.9%) and 51 and above years 16.7%. Their educational qualification ranged from no formal education (43.8%) to tertiary level education 4.2% (Table 1).

Forty-eight human individuals were screened using Rose Bengal Plate Test (RBPT) and the positive samples were further subjected to Complement Fixation Test (CFT). The sero-prevalence of 2.1% (n=1) was determined by using RBPT as screening test. However, none of the sample was positive for *brucella* antibody with CFT (Table 2).

Table 1. Demographic characteristic of study participants.

Description	Category	Frequency	Percent (%)
Sex	Male	32	66.7
	Female	16	33.3
Age	18-30	15	31.3
	31-40	14	29.2
	41-50	11	22.9
	>50	8	16.7
Educational level	Illiterate	21	43.8
	Primary	19	39.6
	Secondary	6	12.5
	College/ University	2	4.2

Table 2. Sero-prevalence of human brucellosis in the study area.

Tests	n	Positive reactor	Prevalence (%)
RBPT	48	1	2.1
CFT	1	0	0.0

RBPT=Rose Bengal Plate Test.
CFT= Complement Fixation Test

Table 3. Practices of the study participants in the study area.

Description	Category	n	Frequency (%)
Awareness on brucellosis	Yes	1	2.1
	No	47	97.9
Contact with animals	Yes	47	97.9
	N	1	2.1
Assisting birth	Yes	21	43.8
	No	26	54.2
Using gloves	Yes	2	9
	No	20	91
Contact with retained placenta	Yes	19	39.6
	No	29	60.4
Raw meat consumption	Yes	39	81.2
	No	9	18.8
Raw milk consumption	Yes	40	83.3
	No	8	16.7
Hand washing practices	Yes	40	83.3
	No	8	16.7

This study assessed participants' awareness on the zoonotic importance of brucellosis and practices related to the use of animal products. Accordingly, out of 48 participants interviewed 97.9% were reported to not have awareness on brucellosis. Similarly, 97.9% of respondents were reported to have contacts with different species of domestic animals. Nineteen (39.6%) of respondents said that, they have had contacts with fetal membrane while assisting parturition. Furthermore, 81.2% and 83.3% of the participants were reported to consume raw meat and raw milk, respectively (Table 3).

Discussion

The sero-prevalence of brucellosis in humans was 2.1% and 0.0% using RBPT and CFT, respectively. In different countries, various authors reported the prevalence of brucellosis in human as 4.25% (Ajay D. Pathak et al., 2014), 2.26% (Agasthya et al., 2007), and 4.79% (Mangalgi et al., 2012) by using RBPT. However, the RBPT could reveal unreliable results; because of the possibilities of cross-reaction with other bacterial antigens such as *Salmonella*, *E. coli* and *Yersinia* (Radostits, 1994; Stack and McMilland, 2003). Low sero-prevalence of brucellosis in humans were reported by different studies; 3.3% by Kadri et al., (1998), 0.8% by Handa et al., (2000), 3% by Omer et al., (2002), 2.4% by Tolosa (2004), 3.6% by Tadele et al., (2007), 1.2% by Haileselassie et al., (2011), and 2.15% by Gebawo et al., *(2014)*. On the other hand, high prevalence was also

reported by Yirgu (1991) 12.5%, and Regassa et al., (2009) 34.9% and 29.4% in Abernosa, Borana and Hamar, respectively. As a fact, that the prevalence of human brucellosis is largely influenced by the prevalence of the disease among domestic animals (Weidmann, 1991; Omer et al., 2002).

In the current study, the respondent's awareness on the zoonotic importance of brucellosis was low; as only one person out of 48 was found to have awareness of brucellosis. Forty seven (97.9%) of respondents were reported to have contacts with different species of domestic animals, and 39.6% were reported to have contacts with fetal membrane while assisting parturition. In addition, 91% of respondents were reported to have not been used gloves during assisting animal birth delivery. A similar finding was reported elsewhere by Kebede (2008). However, in the current study, 83.3% reportedly washed their hands at any direct and indirect contact with the animals. In fact, brucellosis is transmitted to humans through consumption of unpasteurized dairy products or through direct contact with infected animals, placentas or aborted fetuses (Radostits, 1994; Corbel, 1997; Tolosa, 2007; Haileselassie, 2011; and Dean, 2012). A report shown that, greatest risk of contracting brucellosis was associated with indirect contact with animals, compared to direct contact with animals (Cooper, 1992).

In the present findings, 81.2% and 83.3% of respondents were reportedly consumed raw meat and milk, respectively. Similar practices of communities have been reported elsewhere (Kassahun et al., 2006; Tesfaye et al., 2011). In addition, eating uncooked meat or meat products was a common practice analyzed in Arusha and Manyara, Tanzania (Mfinanga et al., 2003). Practices of consuming raw meat and unpasteurized milk may predispose peoples to brucellosis (Roberts, 1971). Evidences shown that, the social habit of eating raw meat, raw milk, unsafe handling of aborted fetuses and placenta, assisting parturition, and occupations related to animal contacts have been reported to be some important epidemiological factors for human brucellosis (Mohd, 1989; Cooper, 1992; Mfinanga et al., 2003; Tolosa, 2004; Kassahun et al., 2006; Regassa et al., 2009; Haileselassie 2011; Tesfaye et al., 2011). Brucellosis was also reported as an important cause of travel-associated morbidity (Mfinanga et al., 2003).The reason could be still related to indirect contact with animals. Because many travelers experience new foods, drinks, cultural and exotic food preparations and may be exposed to *brucella* infection particularly when trying to get farm fresh foods.

The overall sero-prevalence of brucellosis in humans was very low. The majority of the participants reported to have no awareness on zoonotic importance of brucellosis. Social habit of consuming raw milk and meat, unsafe handling of placenta, and assisting births were common practices among analyzed population. These practices may predispose peoples to brucellosis in the study areas. Therefore, collaborative activity is needed to take action through educating communities and creating awareness to prevent and control the disease.

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