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A study on seroprevalence of brucellosis in goats and sheep in East Shewa, Ethiopia

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ABSTRACT: A cross sectional study was carried out during February 2013 in order to investigate the seroprevalence of brucellosis in goats and sheep in East Shewa Zone of Oromia Regional State,Ethiopia. The study was conducted in five Peasant Associations (PAs). The study population comprised of small ruminants (goats and sheep) managed under the pastoralist production system. A total of 384 blood sera were collected and screened for *Brucella* antibodies by Rose Bengal plate test (RBPT). A total of 211 (54.9%) goats and 173 (45.05%) were involved in the study. The screening test was conducted in Asella Regional Veterinary laboratory (ARVL) , and n=6 (1.56%) sera samples were found to be positive .The test revealed that 5(2.3%) goats and 1 (0.5%) sheep were found to be positive. Among the total sampled animals, the maximum sero-positivity (2.3%) was observed in goats. The screening test result of this study showed that brucellosis is an endemic and distributed among small ruminants in the study area. The RBPT is useful for screening of goat and sheep sera for antibodies to *B. melitensis*. The test is less sensitive than in cattle, and may not detect some of the infected animals. Complement fixation test (CFT) is often used as a second test for confirmation of the RBPT positive sera. Since the current investigation focused only on the findings of RBPT, the positive results of this screening test needs to be further confirmed by CFT.As brucellosis in a major bacterial anthroponosis, care must be exercised when dealing with the seropositive animals. Moreover, the people in the study area should be educated not to consume raw milk as it can pose risk to many zoonotic infections including brucellosis.

Keywords: Brucellosis, Goats, Prevalence, Public Health, RBTP, Serum, Zoonosis

INTRODUCTION

Small ruminants are important domestic animals in the tropical animal production system. Ethiopia is an agricultural based country and owns huge number of small animals, estimated to be 48.2 million head of sheep and goats (CSA, 2011). Small ruminants are found mainly in the lowland agro-ecology which constitutes 65% of the area, where 25% sheep and close to 100% goats population exists (PACE-Ethiopia,2003).Hence, an increase in small ruminants' production could contribute a lot for the growing human population and enhance export trading. The livestock subsector contributes some 45% of agricultural GDP, 15 – 18% of national GDP and 5 – 17% total exports. Even though, the livestock subsector contributes much to the national economy, its development is hampered by different constraints. Disease is one of the main constraints and the major concern in small ruminant's production .Annul losses due to mortality for sheep ranges from 12 – 14%, and of goats 11-13% (IGADLP,2010).

There are many infectious diseases of animals and several of them have public health significance resulting into high morbidity and mortality (Pal, 2005).These diseases are the major causes of economic loss in livestock production. Among these, brucellosis is a highly infectious disease of humans and wide species of animals; and is important from public health

as well economic point of view (Pal, 2007; Pal *et al.*, 2013). It has continuously been a re-emerging zoonosis causing a serious impact on human health (Pal, 2013). Brucellosis remains one the most common zoonotic diseases with more than 50,000 cases reported annually (Hadush and Pal, 2013). In sheep and goats, brucellosis is mainly caused by *Brucella melitensis*. This organism is a Gram negative, facultative intracellular pathogen, and contains three biovars (1, 2 and 3). All these biovars can cause disease in small ruminants, but their geographic distribution varies (Pal, 2007). This infection causes significant losses from decreased productivity and lost trade in much of the developing world. *Brucella abortus* and *Brucella suis* infections also occur occasionally in small ruminants, but clinical disease seems to be rare. Abortion is typically the first clinical sign of the pregnant females, and orchitis and epididymitis are typical clinical sign of the males. In particular, female animals that have reached sexual maturity are most susceptible to infection (Acha and Szyfres, 2001). In animals, *B. melitensis* is usually transmitted by contact with the placenta, fetus, fetal fluids and vaginal discharges from infected animals. Small ruminants are infectious after either abortion or full-term parturition. Goats usually shed *B. melitensis* in vaginal discharges for at least 2 to 3 months, but shedding usually ends within three weeks in sheep. This organism can also be found in the milk and semen; shedding in milk and semen can be prolonged or lifelong, particularly in goats. Kids and lambs that nurse from infected dams may shed *B. melitensis* in the feces. *B. melitensis* is also an important human pathogen. The true incidence of brucellosis is unknown. In humans, brucellosis is a serious, debilitating and sometimes chronic disease that can affect a variety of organs. Most cases of brucellosis are the result of occupational exposure to infected animals (Pal and Jain, 1986; Pal *et al.*, 2013) but infections can also occur from ingesting contaminated dairy products (Pal, 2007; Hadush and Pal, 2013).

The existence of brucellosis has been confirmed and reported by various workers from many regions and different animal species in Ethiopia (Tekelye, *et al.*, 1990; Yibeltal, 2005; Teshale *et al.*, 2006; Ibrahim *et al.*, 2010; Hirut, 2011; Hadush *et al.*, 2013). The objective of this study was to determine the seroprevalence of brucellosis in small ruminants, and also to create public awareness towards the zoonotic importance of the disease.

MATERIAL AND METHODS

Study area

Fentale is bordered on the southeast by the Arsi Zone, on the southwest by Boset, on the northwest by Amhara Region and on the northeast by the Afar Region. Most parts of this district ranged from 900 to 1000 meters above sea level. A survey of the land in this district showed that 8.2% is arable or cultivable, 7.6% pasture, 28.8% forest, and the remaining 55.4% is considered degraded or otherwise unusable.

In 11 of the 18 kebeles of Fentale, the predominant agricultural practice is pastoralist. Camels, sheep, goats and cattle are the most common livestock in the area. Migration to the border areas of Boset woreda for grazing during normal years is common, but in years of low rainfall herdsman will migrate as far as Negele Arsi. Livestock sales generate the bulk of cash income. The main food sources for households in this livelihood zone are food purchased from the markets, and livestock products such as milk. Another source of income is the sale of firewood and charcoal. The vegetation is primarily acacia trees with the bushes and shrubs common to the lowland portions of Ethiopia. Fruits and vegetables are important cash crops. About 100% of the urban, 22% of rural and 38% of the total population has access to drinking water.

Study animal, study design and sample size determination.

A cross sectional study design was carried out to determine the prevalence of brucellosis in goats and sheep during February 2013. The study animals were selected using simple random sampling method. PAs were selected based on willingness of the owners, accessibility to transportation and density of small ruminants' population. The sample size was calculated on the

basis of 50% expected prevalence of shoats (sheep and goat) brucellosis in the study area with the expected precision at 5% and at 95% confidence interval. The sample size was calculated according to the criterion given by Thursfield (2005). The study subjects included goats and sheep which are reared under pastoralist management system.

Blood Serum Collection

A total of 384 blood sera were collected from jugular vein of shoats using plain vacutainer tubes. The sera samples were left at room temperature overnight to allow clotting for serum separation. Sera collected was transferred into cryogenic vials and stored at -20°C until subjected to the test.

Rose Bengal precipitation Test (RBPT)

Serum of 75 μl was mixed with 25 μl of antigen on an enamel plate to produce a zone approximately of 1 to 2 cm in diameter. The mixture was rocked gently for four minutes at ambient temperature and then observed for agglutination. Any visible reaction was graded as positive and otherwise negative. The test was conducted at Asella Regional Veterinary Laboratory (ARVL), Asella, Ethiopia according to the test procedure recommended by OIE (2004).

The RBT is useful for screening sheep and goat sera for antibodies to *B. melitensis*. The test is less sensitive than in cattle, however, and may not detect some infected animals. CFT is often used as a second test for confirmation of the RBT positive sera (OIE, 2004).

Data Analysis

A standard format was used to collect the information relevant to the epidemiological investigation such as species, breed, sex and age. The seroprevalence was calculated on the basis of RBPT positivity, dividing by total number of tested animals.

RESULTS AND DISCUSSION

The results of this screening test showed that the seroprevalence of brucellosis in small ruminants in selected PAs of Fentale district was 1.56%. Accordingly, 5 (2.33%) goats and 1 (0.5 %) sheep were found positive for brucellosis when tested by RBPT. Maximum sero-positivity was seen in goats as compared to sheep. A total of 211 (54.9%) goats and 173 (45.05%) sheep were involved in the study. Out of the total samples, 350 (91.4%) of them were from the females animals.

The prevalence recorded during this study is almost similar to Tekelye and Kasali (1990), who observed prevalence of 1.5% in sheep and 1.3% in goats in the central highlands of Ethiopia. However, our findings in this study is lower than the results recorded by Yibeltal (2005) in pastoralist areas 16%. The seroprevalence described here is by using RBPT as a screening test. The RBT can be used in all animal species but positive results should be confirmed by a quantitative test. False-negative reactions occur especially in the early stages of acute infection. False negative results are common in sheep, goats and pigs (M.Pal Personal observation). The current brucellosis screening test results showed that brucellosis is endemic infection among shoats across the two PAs of the Fentale district.

Since the RBPT is less sensitive than in cattle and may not detect some infected animals, it is better to use in combination with the complement fixation test (OIE, 2004). Any animal positive to the screening test is subjected to a confirmatory test. But it has to be highly specific, and any positive reaction to the confirmatory test is considered a definitive positive. Accordingly, the positive screened test results needs to be further confirmed by CFT. However, the current investigation is focused only on the results of RBP.

Pastoral animal husbandry and management practices could be the major role for the spread of brucellosis infection in the area. In practice, it is much more difficult to control the movement of animals kept under pastoralist area than that of cattle kept under intensive farm conditions. The owners of herds and flocks may be accustomed to seasonal migrations. There is also a potential for exposure of the disease to the public through consumption of raw milk, milk products, and by contacting

animals during lambing assistance and of aborted materials such as fetus and fetal membranes (Pal, 2007; Hadush and Pal, 2013). Hence, the public awareness should be created in the pheasant associations to decrease the risk of exposure as well in controlling the spread of infection in the animal population. In addition, the veterinarians, public health authorities and other community leaders need to collaborate to control the disease in animals and to manage the risk of human exposure.

CONCLUSION

Among many infectious diseases, brucellosis is an important disease of animals as well as humans. The disease is wide spread and most common in rural areas; and is caused by several species of *Brucella*. RBTP is a simple and low cost test which can be easily conducted in the field without any laboratory for the screening of animals for brucellosis. However, the confirmation is done by CFT which is expensive, tedious and requires good laboratory facilities. The presence of brucellosis in goats and sheep is significant as the infected animals can act as reservoir of infection and may transmit the infection to human beings by several routes. The goal in the application of hygienic methods to the control of brucellosis is reduction of exposure of susceptible animals to those that are infected, or to their discharges and tissues. However, steps can be taken to reduce the impact of the disease by educating the population in the nature of the disease and its mode of transmission. Further studies on the transmission dynamics, risk factors, isolation of bacterium from clinical samples and application of ELISA and PCR techniques may be rewarding as brucellosis is one of the major infectious diseases in Ethiopia.

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