JIVS JOURNAL OF ISTANBUL VETERINARY SCIENCES

Sero-prevalence and associated risk factors of bovine brucellosis in selected districts of Benadir Region, Somalia

Research Article

Volume: 4, Issue: 2
August 2020
Pages: 57-63

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ABSTRACT

A cross-sectional sero-prevalence study using random sampling was conducted from June to November 2019 in the selected districts of the Benadir Region of Somalia (Karaan District) and (Deyniile District) to determine the seroprevalence of bovine brucellosis and assess the potential risk factors. In this study, a total of 395 animals aged from 7 months and above were screened for Brucella antibodies using the Rose Bengal plate test, and positive sera were confirmed by complement fixation test. Four sera samples out of the 395 (0.7%) reacted positively for the Rose Bengal plate test and one of them reacted positively for the complement fixation test (0.2%). In the present result of this study, the prevalence in female and male and age were not significantly related to the seroprevalence of brucellosis ($P>0.05$). But there is a significant relationship of seropositivity of brucellosis with a record of abortion ($P<0.05$).The current cross-sectional study of bovine brucellosis in the Benadir region of Somalia showed is very low. There is a need to institute control measures of brucellosis through vaccination education on control to the public and conducting serosurveys and those animals testing positive culled.

Article History

Received: 24.06.2020
Accepted: 17.08.2020
Available online: 18.08.2020

Keywords: bovine brucellosis; Benadir Region; seroprevalence.

DOI: https://doi.org/10.30704/http-www-jivs-net.757196

To cite this article: Mohamud, A. I., Mohamed, Y. A. & Mohamed, M.I. (2020). Sero-prevalence and associated risk factors of bovine brucellosis in selected districts of Benadir Region, Somalia. *Journal of Istanbul Veterinary Sciences. 4*(2), 57-63, **Abbreviated Title:** *J Ist Vet Sci*

Introduction

Somalis are one of the most livestock production populations and they contribute greatly to the family in cash profits (Nega et al., 2009). Sheep and goats, camels, and dairy cattle are the domesticated animals kept in Somalia. And they kept under agro-pastoralist (in southern and western regions) or pastoralist production system (central and north regions) (Ombui et al., 2014). Brucellosis is approved as one of the ignored tropical zoonotic diseases with a serious global public health importance caused by the genus Brucella (WHO, 2006 and OIE, 2018) and affects humans and animals (Corbel, 1997). Bovine Brucellosis is primarily a reproductive disease in a female is characterized by abortion in the very last trimester and epididymitis and orchitis with common infertility in male animals (David et al., 2001).

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https://dergipark.org.tr/tr/pub/http-www-jivs-net

Brucellosis can transmit by direct or indirect contact with diseased animals. The Brucella organism is most commonly acquired by ingestion, skin contamination and genital inoculation, Respiratory route, intrauterine and venereal transmissions are other possibilities of the organism (Walker, 1999) and (Corbel,2006). Brucellosis can also cause a huge economic loss in farm animals due to abortion, sterility, dead offspring and the birth of weak, increased calving interval, and drop off or the decrease in milk yield (Rahman, 2019).

Brucellosis is the second most important zoonotic disease after rabies as ranked by the WHO, OIE and FAO cause an estimated half-million human cases yearly in the world (Schelling et al., 2003 and Pappas et al., 2006). The disease affects almost wild animals, domestic animals, as well as humans (Ghanem et al., 2009).

Husbandry system and environmental factors, herd size, type of breed of animal (dairy or beef), characteristics of the animal, management practices, and biology of the disease are Risk factors associated with brucellosis. Abortion of the cows is the main important source of risk for the spread of the infection (Ebrahim et al., 2016). The different livestock share water, pasture, and housing which increases direct contact between animals hence facilitating transmission of brucellosis. The lack of vaccination and immunization in the pastoral community is also a major factor that perpetuates brucellosis transmission and outbreaks in rural areas (Kabagambe et al., 2001).

Brucellosis is endemic in many countries in Africa (Cadmus et al., 2006, Tijjani et al., 2009 and kaltungo et al., 2013).

In Somalia, the prevalence of brucellosis estimates ranged from 2.8% to 5.6% (Flade and Hussein, 1979). Sero-prevalence of Bovine Brucellosis in Mogadishu is reported by 10% (Afrah et al., 2020), in serosurvey of Brucellosis in Kismayo, the prevalence estimates ranged from 7.2% in sheep and 5.3% in goats (Andreani et al., 1982). The prevalence reported in Jijjiga Zone of Somalia regional state estimated 1.38% (Geresu et al., 2016; Gumi et al., 2013).

The specific economic losses of Somalia related to the diseases include loss of milk, sterilized infertility and, cost of vaccine and droplet value of animals culled because of the disease (Bale et al., 1991). The level and effects of brucellosis in Somalia remains unidentified but the problem is likely to be great particular because of the large number of livestock and pastoral production practices.

For screening or confirming of brucellosis serological tests are used (Navarro et al., 2004). Indirect Enzyme-Linked Immunosorbent Assay (I-ELISA), Standard Agglutination Test (STAT), and Rose Bangle Plate Test (RBPT) are mostly used serological tests for the diagnosis of brucellosis in animals. (Rahman et al., 2014).

The objective of this study is to determine sero-prevalence and associated risk factors of bovine brucellosis in the Benadir Region.

Materials and Methods

Study area and period: The study was conducted in the Benadir region which lies among latitude 2.046934 and longitude 45.318161. The normal yearly temperature ranges between 28.7˚C - 37˚C. Benadir region is the capital city it has the largest population across Somalia and it is probable to have about 2.3 million people and covers an area of around 96,878 km (Wikipedia, 2018). The study was conducted from June to November 2019 at two Districts were Karaan and Deyniile which was located in Benadir Region. The criteria of selected herds purposively for the study because it is a huge population of Bovine and we were selected the suspected animals in herds respectively.

Study design: The cross-sectional study was conducted to determine the seroprevalence of Bovine Brucellosis by selecting two Districts of the Benadir Region.

Study population: A total of 395 indigenous breeds of cattle of different ages and sexes reared under the semi-intensive management system was sampled. An open system was used to determine the seroprevalence of Brucellosis.

Sample size determination: For sample size determination expected prevalence of 50% and the level of confidence of 95% was used using the formula of Thrusfield (Thrusfield, 2005).

The sample size used in the study was 395

indigenous breeds of cattle. N=1.962 pq/d2 where, N=sample size; p=expected prevalence; q=1-p; d=standard error (Thrusfield, 2005).

Blood sample collection: Whole blood samples from 395 indigenous breeds of Cattle, samples were collected from 5 ml of blood by jugular venipuncture of each animal using 10 ml syringe and 21G needle following proper restraint and allowed to clot overnight at room temperature. Serum was separated from clotted blood by transferring to other tubes and transported immediately to the Kasmo University laboratory for processing.

Rose Bengal plate test (RBPT): The presence of Brucella antibodies in serum samples were determined by the Bengal test (Alton et al., 1988). For a short time, enough antigen, test sera, Negative and positive manage sera for a day's testing was removed from the refrigerator and kept back at the room temperature for 90 minutes previous to the test; 30 µl of RBPT antigen and 30 µl of test serum was put beside on plate, and then combine thoroughly. (Concentrated suspension serological analysis, equal volumes 30 of *B. abortus* biotype 1, Instituto de Salud Tropical Universidad de Navrra, Spain) were mixed and rotated on a glass plate for four minutes. If agglutination was observed after 4 minutes, samples were considered positive, otherwise, they were considered negative for brucellosis.

Complement fixation test (CFT): Complement fixation test was used to all sera tested positive by Rose Bengal Plate Test (RBPT) for more confirmation *B. abortus* antigen for CFT was used to mark the presence of anti-Brucella antibody in the sera like RBPT. The test was prepared according to the standard method mentioned by OIE (OIE, 2004).

Statistical analysis: The entire data collected was entered into a Microsoft Excel spreadsheet and coded appropriately. The coded data were replaced into SPSS version 19 software. For data analysis, descriptive statistics were used but to test the association of the hazard factors with the disease chi-square test were used and the association was considered if P-value is less than 0.05.

Results

The general prevalence of the current finding was 0.2% with the rates of 0.2% in Karaan and 0.7% in Deyniile districts in Benadir Region of Somalia using the RBPT test while during the confirmation of the sera-positive animals using CFT it was 0% in Karaan and 0.2% in Deyniile with no statistical significance variation between these two Districts (P>0.05) as indicated in Table 1.

The prevalence of brucellosis in female and male was 1%, 0.0% when tested using RBPT while the CFT test indicated that it was 0.2% and 0% in female and male respectively. But there was no statistical variation in the rate of the disease between male and female (P>0.05) as indicated in Table 2.

Age grouping prevalence of brucellosis disease indicated that is was upper in those cattle, it is age ranged from 7 months to 5 years old compared to the rest of the age groups with no statistical variation between age groups (P>0.05) as indicated in Table 3.

The prevalence of brucellosis was associated with their history of abortion on those examined animals (P<0.05) as indicated in Table 4.

Discussion

During this study, we used the RBPT screening test because of it's fastest, easy, and susceptible (97.9%), and allows processing lots of samples per day (PAHO/WHO, 2001). Those RBPT sera test positives were retested using the CFT test having a specificity of 100% (Dohoo et al., 1986). İn order to maximize the specificity of the tests. Animals were considered as positive if it was positive by both RBPT and CFT.

The overall prevalence of study findings was 0.2%, this indicated that only a limited number of dairy cows were affected by the disease, but this doesn't mean that the disease is insignificant as it is a very serious disease responsible for reproduction failure of the dairy industry in the area and its zoonosis important.

The overall prevalence of the current finding was lowered compared to the study conducted Afrah who reported a prevalence of 10% in Mogadishu, Somalia, Similarly, the prevalence

Table 1: The prevalence of bovine brucellosis in Karaan and Deyniile districts

Districts	Number of examined animals	RBPT Positive	CFT positive	*P*-value
Karaaan	162	1 (0.2%)	0 (0%)	
Deyniile	233	3 (0.7%)	1 (0.2%)	0.52

Table 2: Prevalence of bovine brucellosis in female and male.

Sex	Number of examined animals	RBPT Positive	CFT positive	*P*-value
Female	297	5 (1%)	1 (0.2%)	
Male	233	0 (0%)	0 (0%)	0.251

Table 3: Prevalence of bovine brucellosis in different age group

Sex	Number of examined animals	RBPT Positive	CFT positive	*P*-value
7 month-5 years	282	4(1%)	1(0.2%)	
6 year-9 years	113	0(0%)	0(0%)	0.229

Table 4: Association of brucellosis with abortion

Sex	Number of examined animals	RBPT Positive	CFT positive	*P*-value
Aborted	87	2(0.5%)	1(0.2%)	
Non aborted	308	2(0.5%)	0(0%)	0.042

reported in Jijjiga Zone of Somalia regional state 1.38% (Geresu et al., 2016 and Gumi et al., 2013), relatively higher seroprevalence was reported in other African countries. İn central Ethiopia 11.0% (Megersa, et al., 2011), in Uganda 3.3% (Magona et al., 2009), in Sudan 24.5% (Angara et al., 2004), in Tanzania 5.3 % (Swai and Schoonman, 2010), in Algeria 31.5% (Aggad and Boukraa, 2006).

The reasons for the low seroprevalence of our study of Bovine Brucellosis might be attributable to well hygienic practices in the study area and use of maternity pen and separation of cows for the period of parturition, cleaning and disinfection actions, the killing of diseased animals, depending on their own farms for replacing supply and farm owners understanding of disease in these intensive farms.

The prevalence of the disease in male was zero compared to female having a prevalence of 0.25%. In accord with the present result, Tesfay and Yayeh reported that only female cattle were well-thought-out as positive reactors (Tesfaye 2003; Yahyeh, 2003). This was as well explained by Radostits et al. who stated evidently that sex has been one of the risk factors causing susceptibility of cattle to Brucella abortus infection (Radostits et al., 2000). Age-wise produce of the current finding as well determined that the rate of the disease in this study was 0.2% in those cattle its age ranging from seven months to five years old. In line with the recent finding recorded that the superiority (97.87%) of sero-reactors notice were in animals above two years of age in both the extensive and intensive management systems (Kassahun

et al., 2007). Additionally, Radostits et al. explained that effective of cattle to Brucella abortus disease is helpful by the age of the individual animal (Radostits et al., 2000).

Further confirmed that while younger animals tend to be additional resistant to infection and often clear infections, a latent infection does happen (Walker, 1999). In the present finding, there was a statistical association of the history of abortion and the presence of infection in those animals (P<0.05). (Radostits et al., 2000). Also showed that in extremely vulnerable unvaccinated pregnant cattle, Abortion after the late months of pregnancy is an important characteristic of the infection.

The study suggested warranting immediate preventive measures in these areas. To avoid spreading out of brucellosis disease, it is essential to pay attention to aborting animals and supplies associated with abortion. Further study for isolation, identification, and typing of *Brucella spp.* epidemiological relatedness among animals or between animals and humans in Somalia is recommended.

Conclusion

The current cross-sectional study of Bovine brucellosis in the Benadir region of Somalia showed is very low, At the same time, the low prevalence of the disease was observed in different sex of animals and age groups of cattle. Though it's seroprevalence is low, it can still be a potential risk for both susceptible animals and humans. and perhaps in other areas of Somalia where nomadic pastoralism is practiced. There is a need for an institute to control measures of brucellosis through vaccination, education on control to the public, and conducting serosurveys and those animals testing positive culled.

Acknowledgments

We would like to appreciate Kasmo University, Mogadishu, Somalia for their overall guidance during the research activity. For providing the necessary facilities and support throughout the investigation.

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