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Bovine Brucellosis: Serological Survey in Guto-Gida District, East Wollega Zone, Ethiopia

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Abstract: Brucellosis is an infectious bacterial zoonotic disease caused by member of genus *Brucella.* The disease affects both animals and human being resulting in a serious economic loss in animal production sector and deterioration of public health. This cross-sectional study was carried out to determine the seroprevalence and associated risk factors of bovine brucellosis in Guto-Gida district in East Wollega zone from November 2010 to March 2011. A total of 406 blood samples were collected from cattle of above 6 months of age and sera were initially screened with Rose Bengal Plate Test (RBPT) and those samples found positive by RBPT were further tested by Complement Fixation Test (CFT) for confirmation. Out of 406 sera 12 (2.96%) were positive using RBPT and the overall seroprevalence of bovine brucellosis documented was 1.97% based on CFT result. The study showed no statistically significant difference ($P > 0.05$) in seroprevalence among the age groups and sexes considered. Although the seroprevalence in crossbred cattle (3.64%) was higher than local breed (1.71%), there was no statistically significant difference ($P > 0.05$) between the breeds. To deal with diseases like brucellosis, the public in general and high risk groups in particular should be made aware of the zoonotic and economic importance of brucellosis through veterinary extension education.

Key words: Bovine Brucellosis · RBPT · CFT · Seroprevalence · Ethiopia

INTRODUCTION

Zoonoses are diseases that can be transmitted from wild and domestic animals to humans and are public health threats worldwide [1]. Their impact on health and socioeconomic state are increasingly being felt by many countries and most particularly, although not exclusively, by developing countries [2]. At the individual health level, zoonotic diseases are a concern for all who live or work with animals [3].

Brucellosis is an infectious bacterial zoonotic disease caused by member of genus *Brucella.* The disease is primary reproductive disease clinically characterized by abortion in the last trimester and retained placenta in the female whereas orchitis and epididymitis with frequent sterility occur in male [4]. The means of transmission in both female and male are through ingestion and direct or indirect contact with excretion of the organisms in uterine discharge and milk of infected animals [5, 6]. Brucellosis is found worldwide, but it is well controlled in most developed countries. Clinical disease is still common in Middle East, Asia, Africa, South and Central America, the Mediterranean Basin and Caribbean regions. Eradication of *Brucella abortus* from domesticated herd is reported to be nearly complete in the U.S. [7].

In Ethiopia there is no documented information on how and when brucellosis was introduced and established. However, in the last two decades several serological surveys have showed that bovine brucellosis is an endemic and wide spread disease in the country [8]. For instance, prevalence of 18.4% around Addis Ababa [9], 2.4% in Jimma zone [10], 11.6% in Sidama region [11], 4.2% in south east Ethiopia [12], 2.9% in Central Oromia [13], 11.2% in east Showa zone [14], 4.9% in Tigray region [15], 7.61% in Arsi region [16] and 1.11% in Addis Ababa and Sululta abattoir [17] were documented in different parts of Ethiopia. In view of the growing live animal export business in the country, information on the situation of diseases like brucellosis is of great importance. Moreover, no investigation has been done on the presence and risk factors of bovine brucellosis in the present study area. Therefore, the objective of this study was to provide

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evidence on the prevalence of bovine brucellosis in Guto-Gida District, East Wollega Zone, Ethiopia and associated risk factors (age, sex and breed).

MATERIALS AND METHODS

Study Animals: Indigenous breeds of cattle kept under extensive husbandry and cross-breeds (Zebu with Holstein Friesian) in the selected sites of Guto-Gida district were the study subjects in the period from November 2010 to March 2011.

Study Design: A cross sectional study was carried out both on indigenous and cross-bred cattle using serological tests RBPT and CFT. Individual cattle for this study were selected randomly using lottery method. Sample size for serum collection was determined using the formula given by Thrusfield [18]. Accordingly, using expected prevalence of 50% at 95% confidence interval and 5% desired absolute precision a sample size of 384 cattle which were above 6 months of age were aimed to be sampled. However, a total of 406 cattle were sampled in order to increase the precision.

Blood Sample Collection: About 10ml of blood was collected from jugular vein of each selected cattle in to plain vacutainer tube and allowed to clot in a slant position at room temperature and the serum was decanted in to a labeled vial and stored at -20°C until tested [19].

Serological Test Procedures

Rose Bengal Plate Test (RBPT): RBPT was performed in Jimma School of Veterinary Medicine on all serum samples collected as per the procedure described in Alton *et al.* [19] and OIE Manual, [20].

Complement Fixation Test (CFT): Serum samples found positive were further tested by CFT at National Veterinary Institute (NVI), Debre Zeit Ethiopia, according to the protocol described in OIE Manual, [20].

Data Analysis: Data collected during the study period were stored in the Microsoft Excel spread sheet program and analyzed using STATA 8.0 version soft ware program. The seroprevalence was calculated by dividing the number of test positive cattle by the total number of cattle tested. Chi square test was utilized to measure the association between the disease and risk factors such as sex, age and breed. A p-value of less than 0.05 was considered for statistically significant difference.

RESULTS

Seroprevalence: Out of 406 sera tested, 12 (2.96%) and 8 (1.97%) samples were found to be positive by RBPT and CFT, respectively. Therefore, the overall seroprevalence of bovine brucellosis in the study area was 1.97 %.

Potential Risk Factors (Age, Sex and Breed): Comparison was made on the seroprevalence of brucellosis in male and female animals to observe the effect of sex in the abundance of the disease, the result of the current study showed that seropositivity was higher in female animals than in male animals (Table 1). However the observed difference was not statically significant ($P > 0.05$).

The prevalence of bovine brucellosis in different age groups is summarized in Table 2. According to the result of the present study, zero prevalence was recorded in animals with <2 years of age. However, there was no statistically significant variation between the age groups ($P > 0.05$).

The present study attempted to identify the existence of any association between the seroprevalence of brucellosis and breeds. Thus, the result showed that the seroprevalence of bovine brucellosis in local and crossbred animal was 1.71% and 3.64%, respectively (Table 3). Although seropositivity was higher in the cross breeds, the difference in prevalence of brucellosis between the two breeds was not statistically significant ($P > 0.05$).

DISCUSSION

The present study revealed the overall prevalence of bovine brucellosis as 1.97% in the Guto-Gida district. This over all prevalence is closely in agreement with the finding of Sheferaw [21] with 2.1% in Shoa region and Asmare [22] with prevalence of 1.92% in Sidama zone. On the contrary, it is by far much lower than the previous reports of Rashid [23] with 38.7% in cattle owned by institute of agriculture research farm, Gebremariam [24] with 18.4% in the dairy farms of around Addis Ababa, Shiferaw [25] with 12.34% in and around Bahir Dar and Molla [16] who reported 7.62% in Arsi region. Other investigators, for instance Tadesse [26] in north Gonder, Tolosa [10] in Jimma zone, Lidia [27] in central highland and Degefa [28] in Arsi zone of oromiya regional state reported 0.14, 0.77, 0.45% and 0.05%, respectively that indicates lower overall prevalence when compared to our finding. Generally, the occurrence of brucellosis is

Table 1: Seroprevalence of bovine brucellosis by sex in Guto-Gida District

Sex	Number tested	RBPT positive (%)	CFT positive (%)	95% CI for CFT
Male	151	2(1.32)	1(0.66)	0.016-3.63
Female	255	10(3.92)	7(2.75)	1.11-5.570
Total	406	12(2.96)	8(1.97)	1.54-5.120

$\chi^2 = 2.13$, $P > 0.05$

Table 2: Seroprevalence of bovine brucellosis by age in Guto-Gida District

Age	Number tested	RBPT positive (%)	CFT positive (%)	95% CI for CFT
≤2 years	970	0	0	-
>2 years	309	12(3.88)	8(2.59)	1.11-5.04
Total	406	12(2.96)	8(1.97)	1.54-5.12

$\chi^2 = 2.5618$, $P > 0.05$

Table 3: Seroprevalence of bovine brucellosis by breed in Guto-Gida District

Age	Number tested	RBPT positive (%)	CFT positive (%)	95% CI for CFT
Local	351	10(2.85)	6(1.71)	0.63-6.240
Cross-bred	550	2(3.64)	2(3.64)	4.40-12.52
Total	406	12(2.96)	8(1.97)	1.54-5.120

$\chi^2 = 0.914$, $P > 0.05$

described to cover large area of the country and rates of infection are reported to vary from one region to another even within the region [4, 29, 30]. Furthermore, the reports of FAO/ WHO [29] stated that the level of brucellosis infection tends to be relatively high in intensive farm than extensive farm.

Sex has been one of the risk factors affecting susceptibility of cattle to *Brucella abortus* infection [29]. In the present study, prevalence of the disease based on sex was 2.75% in female and 0.66% in male. This finding is in agreement with the work done by Asfaw *et al*. [31] around Addis Ababa, Tolosa *et al*. [32] in Jimma zone, Gebretsadik *et al*. [8] in Tigray region and Desalegn [33] in Asella dairy farm, who reported higher prevalence in female than male. The lower prevalence of male reactors in this study could be due to smaller number of males tested as compared to female and it was also reported that the serological response of male animal to *Brucella* infection is limited [34]. In addition, it has also been reported that infected male animals are usually found to show low antibody titers [35]. Furthermore, female cattle are more susceptible to *Brucella* organism in gravid uterus of pregnant animals than in testis due to the presence of erythritol in female reproductive tract which stimulates the growth of the organism [36].

Age is supposed to have some association with occurrence of brucellosis, because sexual maturity is very important for the rapid multiplication of *Brucella* organism [34, 36]. In this study, all infected animals were adult and this finding is in agreement with the report of Lidia [27] in central highland of Ethiopia and Nuraddis *et al.* [37] in selected site of Jimma zone, who reported only older age category reactors. In addition, the absence of statistically significant difference between the two age categories is in agreement with previous findings of Mussie [38] in Bahir Dar, Ethiopia and Omer *et al*. [39] in Eritrea. According to some authors [32, 40, 12, 41] susceptibility to brucellosis is reported to increase as the animals approach to the breeding age. It has been also reported that susceptibility of cattle to *Brucella* infection is influenced by the age of individual animal. Thus, sexually mature and pregnant cattle are more susceptible to infection with *Brucella* organism than sexually immature animal of either sex [41]. On the other hand, younger animal tend to be more resistant to infection and frequently clear infections although latent infection could occur [4].

There is still controversy among different authors on the issue of breed susceptibility to brucellosis. In this study, the seroprevalence was found to be higher in cross-bred animals (3.64%) than indigenous ones (1.7%). Nevertheless, this difference was not statically significant which is in agreement with the report of Lidia [27] in central highland of Ethiopia. On the contrary, Jergefa *et al*. [13] in their study found that breed of cattle has significant effect on the serological prevalence of brucellosis and is higher in cross-bred than in indigenous ones. The reason reported by the same researcher is the compounded effect of management systems in cross-bred

and also the farmers who owned cross-bred tend to follow intensive management. Therefore, further investigation using reliable tools like molecular technique is needed in order to know the exact epidemiological distribution of brucellosis in Guto-Gida district and to set plan for control and prevention of the disease accordingly. The public in general and high risk groups in particular should be made aware of the zoonotic and economic importance of brucellosis through veterinary extension education and possible means like media.

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