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Low Prevalence of Bovine Tuberculosis in Two Major Towns of Ethiopia: at High Risk of Spread of the Disease

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Abstract

After a report of the disturbing high prevalence of bovine tuberculosis in Addis Ababa and its environs, the capital of Ethiopia, there was a concern that the disease might have been distributed to other major towns via animal movements. A cross-sectional study was conducted from October 2014 to April 2015 in two selected major towns of Ethiopia namely Hawassa and Adama to assess the extent of distribution and association of risk factors. A total of 34 farms comprising 565 (270 - Hawassa and 295 - Adama) cattle were subjected to the comparative intra-dermal tuberculin test. Data on risk factors were collected in a pretested questionnaire. Seven cows (2.6 %) of Hawassa and five (1.7%) from Adama were found to be reactors. The herd level (at least one reactor) prevalence was 22.5% and 6.7%, in that order. The prevalence of the disease with the origin of the cows was high for those from Shashamene (n=5, 27.8%), and Addis Ababa (n=6, 25% compared to the study areas (0% to 3.6%) showing the introduction of the disease from prevalent areas. Among the risk factors age (≥ 7 years), herd size (>30), body condition score (thin), and origin (prevalent areas) of the cattle were found to be significant, associated with the disease positivity ($p<0.05$). Among 29 individuals interviewed about the habit of raw milk and meat consumption, 24.1 % (n=7) replied yes and only 27.5 % (n=8) of them know bovine tuberculosis signifying the public health importance of the disease in the study areas. The chance of the spread of bovine tuberculosis in Ethiopia from prevalent areas to low or free areas could be high and test service could be counterproductive as farmers are likely to sell their cows after knowledge of their status.

Keywords: Bovine tuberculosis; Prevalence; Comparative Intradermal Tuberculin Test; Ethiopia

1. Introduction

Bovine Tuberculosis (BTB) is a chronic bacterial disease of animals and humans caused by *Mycobacterium bovis*. BTB is considered by the world organization for animal health (WOAH) to be the important zoonotic disease of major socio-economic and public health importance with an impact of international trade of live animal and product. The introduction of exotic and cross-breed cattle into the central highlands of Ethiopia has created a favourable condition for the spread of BTB, leaving cattle, cattle owners, and

consumers of raw cattle products at risk for infection from *M. bovis* (Amine *et al.,* 2003).

The reported prevalence of BTB in Ethiopia ranges from 3.4% in small holder production system up to 50% in intensive dairy productions (Shitaye *et al.,* 2007; Regassa *et al*., 2007; Tigre *et al.,* 2011). An extensive study was conducted by Firdessa and his colleagues (2012)to estimate the prevalence of BTB in intensive dairy farms in Addis Ababa, capital city of Ethiopia and surrounding cities within 50km radius. And in large farms i.e. having greater than 50 animals, a herd prevalence (at least one reactor in the herd) of 100% was found in most of these farms and the lowest was 67% with an overall herd prevalence of 90.5%. After this worrying finding, there was a fear that the disease might have spread to other regions of the country through the purchased heifers as Addis Ababa is the main supplier and through other means including animal movements.

This study was therefore conducted to estimate the extent of spread and prevalence of bovine tuberculosis in two major towns of Ethiopia namely Hawassa and Adama towns, to evaluate the association of selected risk factors and assess farmer's awareness about bovine tuberculosis.

2. Materials and Methods

2.1 Study Area

The study areas were Hawassa and Adama, amongthe major towns of Ethiopia. Hawassa is located in the northern part of Southern Nation's Nationalities and Peoples Regional State (SNNPR) about 275km away from Addis Ababa, capital of Ethiopia. Adama is located 95 km South East of Addis Ababa.

2.2 Study Farms

The farms were selected based on convenience and willingness. Thirty-four farms having a herd size of 5 and above cattle; 15 from Hawassa and 19 from Adama comprising a total of 565 (270 - Hawassa and 295 - Adama) cattle were selected. Calves below 6 months of age were excluded from this study. All these farms had kept crossbreds; only four local breed animals were found and tested. Among the 565cattle tested, 29 were males.

2.3 Study Design

The study was cross-sectional and carried out from October 2014 to April 2015using comparative intradermal tuberculin test (CIDT). The study towns were selected based on population size and convenience. Data on risk factors including age, body condition, and the origin of the animal and herd size were collected using a pretested questionnaire having closed and open ended questions. Furthermore, data related to raw milk and meat consumption habits, knowledge of bovine tuberculosis and /or tuberculosis including its transmission and the presence of cattle coughing within the last six months was collected. Age was categorized into <1, 1- 3, 4 - 6, 7- 9 and>10 years. Similarly herd size was classified as 5-10, 11-30 and >30 cattle. The body condition was scored according to Neary and Yager (2002).

2.4 Comparative Intradermal tuberculin test (CIDT)

CIDT was performed and interpreted following the standard procedure of WOAH (2009). Briefly the animal's skin was shaved at two sites on one side of the neck 12cm apart and one above the other. Before injection, a fold of skin at each of the intended injection sites and within the clipped area must be taken between the forefinger and thumb and accurately measured to the nearest millimetre using callipers. One side is injected aliquot of 0.1 millilitre (ml) of 2000 international unit (IU) per ml of bovine purified protein derivatives (PPD). Similarly, an equivalent dose of avian purified protein derivative was injected into the other site. After 72 hours, the thickness of the skin at the injection sites was measured again and recorded. When reactions were observed at both sites, the difference between the two reaction sizes was considered. Thus, the animals were classed as tuberculin positive when the increase in

skin thickness at the bovine site of injection was greater than 4 mm to the reaction shown at the site of the avian injection. If the change in skin thickness was between 1 mm and 4 mm or below and equal to 1 mm, the animal was classified as doubtful or negative, respectively.

2.5 Data analysis

All data recorded was entered to Microsoft excel coded and checked and then subjected for analysis using STATA V. 11.The association of risk factors with positivity was analysed using the Chi-square (X^2) test and a P-value of <0.05 was taken as statistically significant.

3. Results

3.1 Prevalence

Seven cattle out of 270 (2.6%) of Hawassa town and five of 295 (1.7%) of Adama were found reactors for CIDT (Table 1). The prevalence of bovine tuberculosis by risk factors was high for age groups>10,herd size of above 30, cattle purchased from Shashamene (27.8%) and Addis Ababa (25%) and cattle with thin body condition and the association was statistically significant and more affected ($p<0.05$) (Table 1). The number of local breeds and male cattle were small in number and were not used for statistical analysis.

Table 1: Prevalence of bovine tuberculosis by study site and area of purchase or origin of dairy cattle

Factors	Category	No of animal tested	No. of positive animal	Prevalence	X^2	P-value
Study area	Hawassa	270	7	2.59%	267.3	0.025
	Adama	295	5	1.69%		
Area of purchase (origin)it	Shashamene	18	5	16.7%	92.8	0.348
	Adama	72	0	0%		
	Hawassa	28	1	3.6%		
	Debre zeit	11	0	0%		
	Addis Ababa	24	6	25%		
	Borena	6	0	0%		
	Holeta	3	0	0%		
	Un known	64	0	0%		
	Born at home	339	0	0%		

Table 2: Prevalence of bovine tuberculosis by risk factors

	Category	No of animal tested	No of positive animal	Prevalence	X^2	P-value
BCS	L-2	47	9	19.1%	26.49	0.328
	L-3	230	2	0.9%		
	L-4	243	1	0.4%		
	L-5	45	0	0%		
Age	<1	43	0	0%	101.2	0.282
	1-3	173	0	0%		
	4-6	259	3	1.2%		
	7-9	72	7	9.7%		
	>10	18	2	11.1%		
Sex	Female	536	10	1.8%	1.53	0.464
	Male	29	2	6.8%		

Breed	Cross	561	12	2.1%	3.8	0.150
	Local	4	0	0%		
Herd size	≤10	79	1	1.3%	22.7%	0.185
	11-30	238	2	0.8%		
	>30	248	9	3.6%		

3.2 Questionnaire Survey

Twenty nine farm workers were interviewed and seven of them (24.1%) were having a habit of raw milk and meat consumption and only 27.5 %(n=8) of them have knowledge about bovine tuberculosis. Fifteen (51.7%) of the respondents mentioned the presence of cattle with chronic cough in the farm.

4. Discussion

The prevalence of bovine tuberculosis in Hawassa (2.7%) and Adama (1.7%) was low compared to previous studies elsewhere in Ethiopia (Ameni *et al.*, 2003; Elias *et al*., 2008; Firdessa et al., 2012, Zeweld *et al*., 2013; Romha *et al*., 2013). As expected in pastoral and transhumance systems where there is no confinement of cattle, the prevalence could be lower or comparable to the present study (Inangolet *et al*., 2008 and Gumi *et al*., 2012). The interesting finding in this study was the prevalence of BTB was associated with the origin of the animals; being high in those coming from prevalent areas including Addis Ababa. From experience we learned that if farmers know their cattle status for BTB, usually they sale the animal to another farmers in other towns of the country. Only a few farmers were reached agreement (buyer and seller) for testing. Previous studies and occasional farm testing in Addis Ababa revealed that the prevalence of BTB is alarming. In some farms it was found above 85 % (Tafesse, 2013 unpublished). In the present study cattle with high prevalence were originated from Addis Ababaand Shashamene and from the authors experience in the field these animals might have been sold after knowledge of their status. Therefore, the tuberculin test service without accompanying culling and compensation in Ethiopia is becoming questionable and counterproductive.

In the present study, the proportion of reactors increased with age. One of the main individual risk factors identified by numerous studies is the age of animals. The duration of exposure increases with age; older animals are more likely to have been exposed than younger ones, as shown by studies (Cleaveland *et al*., 2007; Inangolet *et al*., 2008; Munyeme *et al*., 2009). Animals might get infected at a young age, but only expresses the disease clinically when they are adults (Griffin *et al*., 1996) may be due to weakening immunity (O'Reilly and Deborn, 1995). The body condition was also significantly associated with the occurrence of bovine tuberculosis and agreed with the findings of Ameni *et al*. (2007) but Assegid *et al*. (2000) reported no significant difference. Both findings seem right. Cattle in good physical condition are immunocompetent and their reaction to tuberculin test can be greater unlike those with poor physical condition. However, tuberculosis being a wasting disease, most reactors may be in poor body condition. Herd size was found as a significant factor in our finding. When the numbers of animals in a herd increase, thechance oftransmission of the bacillus is also promoted (Radostits *et al.*, 1994)**.**

The questionnaire survey has provided information regarding the knowledge and practices of the farm workers about bovine tuberculosis and its zoonotic importance. A high number of respondents had no detailed and accurate knowledge about bovine tuberculosis in relation to zoonosis.

This low awareness may result a limiting factor in the implementation of control and prevention strategies of the disease in the country. So, capacitating the farm workers will increase the implementation of control and prevention strategies.

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