Prevalence of bovine tuberculosis in dairy cattle and the associated risk factors in Oromia, Ethiopia

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Abstract
A cross-sectional study was conducted in February 2013 by using Comparative Intra dermal Tuberculin Test (CIDT) in order to determine the prevalence bovine TB and the associated risk factors in Tiyo, Agarfa districts and in Shashemene town of Oromia National Regional State. The study subjects included were crossbred dairy animals, kept under intensive management systems. A standard questionnaire formats was used to collect information relevant to the age, body condition and the herd size of the animals. Five hundred forty two dairy animals were included in the study. The individual prevalence of BTB was 4.24% and 20.66% at ≥4 mm and ≥2mm cut off value respectively. The herd level prevalence of was found to be 48.9% (95% CI: 34%-63%). The questionnaires survey results of this study indicated that, more than 85.1% of the households were consuming raw milk, whereas 14.8% were consuming heat-treated milk. 74.4% of the respondents were aware, that the transmission of bovine TB through consumption of raw milk, milk products and raw meat. The present study revealed that the overall low prevalence of bovine TB in the study area. Education and raising awareness of the animal owners about the health risks of contacting with infected animals, consumption habits of raw meat, unpasteurized milk, and milk products are very imperative. Moreover, appropriate diagnosis of the disease and provision of useful information for use by public health and agricultural officials is important in the control practices of bovine tuberculosis. This approach is highly appreciated and is a key to tackling zoonotic tuberculosis for the future.

Introduction
Bovine Tuberculosis (BTB) was widespread in many European countries and is a public health concern in some developing countries [1]. It is a chronic bacterial disease of animals, wildlife and humans and is caused by Mycobacterium bovis (M. bovis), which belongs to a group of mycobacteria known as Mycobacterium tuberculosis complex (MTBC) [2-4]. M. bovis has one of the broadest host ranges of all known pathogens and has been diagnosed worldwide [5].

Bovine tuberculosis is usually characterized by formation of nodular granulomas known as tubercles and they are most frequently observed in several tissues, even though they are frequently seen in lymph nodes at head and neck, lung, intestines, liver and pleural cavity. Extreme emaciation and acute respiratory distress may occur during the terminal stages of the disease [6]. The Rates of M. bovis infection is higher among closely confined animals than animals in extensive farming systems [7]. This disease is one of the seven most neglected endemic diseases in the world, particularly in developing countries [8] and is a significant zoonosis that can spread to humans through aerosols, by the consumption of unpasteurized milk and dairy products and through meat from infected cows [7,9]. Veterinarians, farmers, and abattoir workers were most considered at the risk of this disease. The disease induces high animal morbidity and mortality that eventually reduces the financial capital and increases production costs [10]. As an OIE List B disease, it is one of the significant diseases, which affect the international trade of animals and animal products between countries [11].

Bovine Tb is widespread in many countries. During 2015 to 2016, 179 countries and territories reported their status concerning bovine TB to OIE. Of these, more than half reported the presence of the disease in livestock and wildlife, demonstrating its wide geographical spread. In 2016, there were almost 1.7million deaths from tuberculosis and
The study result revealed that the CIDT prevalence of 4.02% and 20.66% at ≥4mm and ≥2mm cut off value respectively. The herd level prevalence was 48.9% (Table 1). The result of this study revealed that, there is no statistically significant association between the tuberculin test positivity and the assessed risk factors such as towns, age, herd size and body condition (Table 2).

### Table 1: The individual animal and herd level prevalence of tuberculin reactors.

| Variable  | Negative | Positive | Prevalence at ≥4mm cut off | Prevalence at ≥2mm cut off |
|-----------|----------|----------|----------------------------|---------------------------|
| Individual animal | 542 | 23 | 4.24% | - |
| Individual animal | 453 | 118 | - | 20.66% |
| Herd | 47 | 23 | 48.9% | - |

| Variable | Catagories | No tested | Positive | Prevalence | $X^2$ | P-value |
|-----------|------------|-----------|----------|------------|------|---------|
| Town      | Tiyo       | 243       | 9        | 3.7%       |      |         |
|           | Agarfa     | 88        | 1        | 1.1%       | 3.166| 0.205   |
|           | Shashemene | 211       | 13       | 6.16%      |      |         |
| Total     | Female     | 542       | 23       | 42.4%      |      |         |
| Age (Years) | < 2   | 150       | 5        | 3.33%      |      |         |
|           | 2-5       | 365       | 17       | 4.65%      | 0.278| 0.870   |
|           | >5        | 27        | 1        | 3.7%       |      |         |
| Herd size | <7        | 111       | 5        | 4.5%       | 0.155| 0.925   |
|           | 8-15      | 190       | 8        | 4.21%      |      |         |
|           | >16       | 241       | 10       | 4.14%      |      |         |
| BCS       | Thin       | 101       | 2        | 1.98%      | 1.517| 0.468   |
|           | Medium     | 387       | 18       | 4.65%      |      |         |
|           | Good       | 54        | 3        | 5.5%       |      |         |

### Discussions

The study result revealed that the CIDT prevalence of 4.02% and 20.66% at ≥4mm and ≥2mm cut off value at individual animal level respectively and the herd level CIDT prevalence...
was 48.9%. This result is higher than the prevalence of 1% at the cutoff off value ≥4mm and 4.02% at the cut off value ≥2 in Ambo and Toko districts in Ethiopia [26]. The higher prevalence of tuberculin test positivity of 13.9% and 15.8% was also reported in Tigray and Arsi respectively [27,18].

In the present study, the highest prevalence was recorded in Shashemene town, which is 6.16% when compared to Tiyolo 3.7% and Agarfa 1.1% districts. The highest prevalence of tuberculin positive reactivity was 4.65% in age group between 2–5 years as compared to the younger and older age group. The prevalence of small and medium herd size is similar, which is 4.25% and 4.21%, as compared to the large herd size, which is 4.14%. The animals with good body condition score have the highest prevalence 5.5% of tuberculin positive reactivity (Table 2).

The current study revealed the herd level CIDT prevalence was 48.9%. The result of the current study revealed that, there is no statistically significant associations between the tuberculin test positivity and the assessed risk factors such as towns, age, herd size and body condition (P>0.05).

The questionnaires result of this study indicated that, more than 85.1% of the households consumed raw milk, while 14.8% were consumed heat- treated milk. 74.4% of the respondents were aware that the bovine TB could be transmitted through consumption of raw milk, milk products and raw meat. The public health importance of M. bovis infection was reported mainly by consumption of infected milks [28–32]. Bovine Tuberculosis (BTB) is a public health concern in some developing countries and results in trade barriers, as well as posing a risk to food safety and human health [12].

Conclusions

The present study revealed overall low prevalence of bovine TB in the study area. In detail, information on molecular characteristics of M. bovis, strain affecting the cattle population in Ethiopia, is limited. Thus, it is suggested that, the isolation, identification and molecular diagnosis of different strains of M. bovis need to be further investigated in the study area in a way of multidisciplinary approach. Education and raising awareness of the animal owners about the health risks of contacting with infected animals, consumption habits of raw meat, unpasteurized milk, and milk products is very imperative.

Moreover, appropriated diagnosis of the disease and provision of useful information for use by public health and agricultural officials is important in the control practices of bovine tuberculosis. This approach is highly appreciated and is a key to tackling zoonotic tuberculosis for the future.

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