

# Prevalence of Bovine Tuberculosis in and Around Nekemte Town Western Oromia, Ethiopia

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## Abstract

The study conducted from January to June, 2014 with aim of determining prevalence of bovine tuberculosis and its associated risk factors in and around Nekemte town of western Oromia, Ethiopia. Bovine tuberculosis is a globally distributed chronic disease of animals and humans can be affected by the consumption of raw milk which is a serious public health concern. This study revealed that herd (26.6%) and individual (13.7%) prevalence of tuberculosis in study area among 128 herd sizes and 394 individual dairy cattle tested using Comparative Intradermal Tuberculin Test (CIDT). Herd prevalence of bovine tuberculosis insignificantly associated ( $P > 0.05$ ) with herd size and animals greater or equal to six were 2.3 times more likely to be infected (odds ratio OD= 2.32, (95% CI= 1.01, 5.33) with bovine tuberculosis. Individual prevalence of bovine tuberculosis was significantly associated ( $P < 0.05$ ) with the different age categories of animals but insignificantly associated ( $P > 0.05$ ) the other variables and female cattle affected about four times than male. Therefore, routine control measures should be undertaken regularly.

**Keywords:** Bovine tuberculosis; Dairy cattle; Prevalence; Herd size; Comparative Intradermal Tuberculin test; Nekemte

## Introduction

Bovine tuberculosis is a disease that characterized by progressive development granulomatous in tissues and organs of vertebrate animals and humans that caused by *Mycobacterium bovis* [2,12,21]. It is extensively distributed throughout the world which cause impact on income gain from animal production and result in zoonotic importance in humans [28]. Hence, Bovine tuberculosis potentially threatens African cattle and humans as closely 85% and 82% respectively [7]. Human tuberculosis that estimated 10 to 15% are caused by *Mycobacterium bovis* which is still common in developing countries because of pasteurization of milk is not routinely carried out [8].

In Tropics countries to increase demand for milk and milk products introduction of high-grade dairy cows is a quick and suitable option when compared to dairying indigenous cattle solely [13,27]. For this reason, Channel Island breeds and Friesians were imported in the countries after Second World War. Increments of milk yield were not enough by introduction of high grade dairy cows. So, improved feeding and intensive management

conditions are mandatory [1]. However, Tuberculosis becomes a serious problem in cattle after European breeds used for the intensive dairy industry [11,18,24]. In Ethiopia situation bovine tuberculosis is the most prevalent disease of cattle and humans. Many reports indicated that prevalence of bovine tuberculosis ranges from 0.8% to 50% minimum value in extensive farming and maximum value in intensive farming [14,26,29]. Even though, there is a paucity of epidemiological information on bovine tuberculosis in and around Nekemte town. Therefore, the objective of this study is to determine prevalence of bovine tuberculosis and its associated risk factors in and around Nekemte town western Ethiopia.

## Methods and Materials

### Study area

The study was undertaken from January to June, 2014 in and around Nekemte town of dairy farms which is geographically located at latitude and longitude of 905'N 36033'E, an elevation of 2,088 meters above sea level and 335 km westward far from capital city Addis Ababa (Figure 1).

### Study animals and Sampling

The study was conducted on all breeds of cattle kept for purpose dairy which varies in age, sex, breed, body condition and management. Convenient sampling method was employed to the study area and all the animals in the farms were tested. A total of 394 dairy cattle and 128 herd sizes were tested by Comparative Intradermal Tuberculin Test.

### Comparative Intradermal Tuberculin Test

The Cattle skin was shaved at two sites (12 cm apart) on the right-hand side of the mid-neck area in adult cattle but in young cattle both side of the neck was shaved for injection with PPD. The skin thickness was measured with calipers before the tuberculin was injected. Aliquots of 0.1 ml of 2,500 international units (IU) per milliliter (ml) of bovine Purified Protein Derivative (PPD) (Veterinary Laboratories Agency, Addle stone, United Kingdom), and 0.1 ml of 2,500 IU/ml of avian PPD (Veterinary Laboratories Agency, Addle stone) were injected into the dermis at these sites. After 72 hours, the thickness of the skin at the injection sites

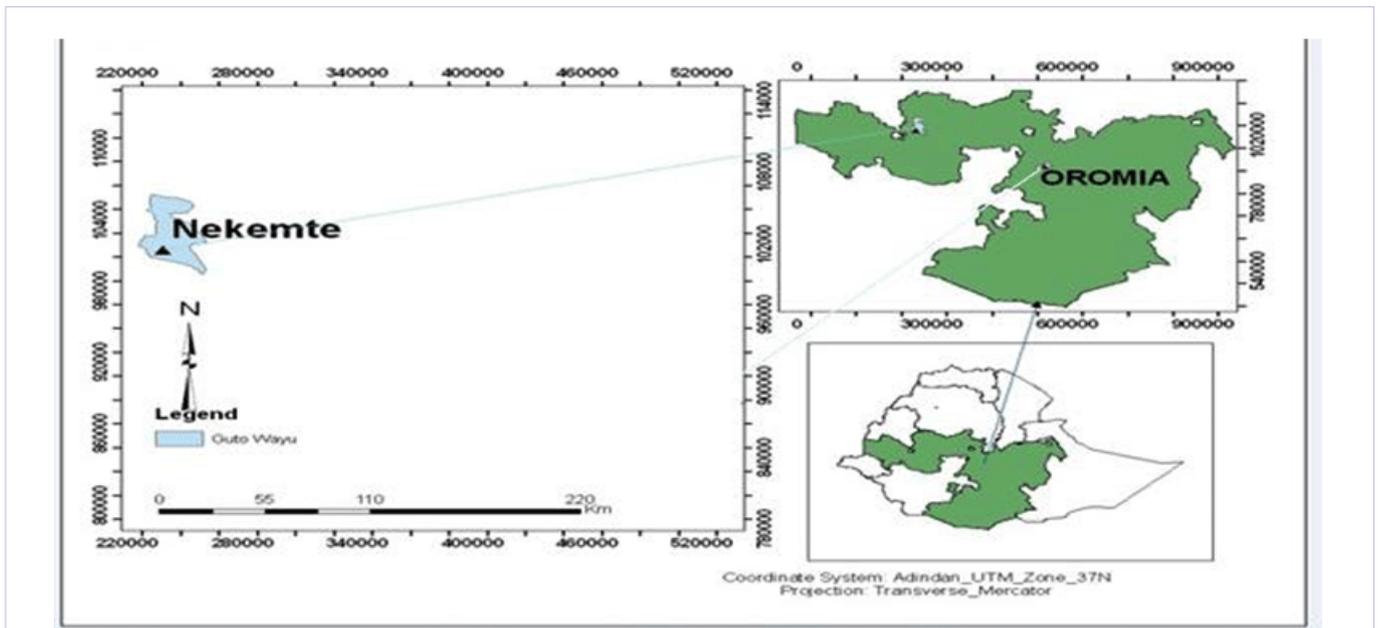


Figure 1: Source (NMSA, 2013)

was measured, using calipers. The results were interpreted in accordance with the recommendations of the World Organization for Animal Health (OIE) [19,20,21]. Shortly, when the change in skin thickness was greater at the avian PPD injection site, the animal was considered positive for mycobacterium species other than the mammalian type (*M. tuberculosis* and *M. bovis*). However, when an increase in thickness was observed at both sites, the difference in thickness was considered. Thus, if the increase in thickness at the injection site for bovine PPD (B) was greater than that at the avian PPD site (A), and if B minus A was less than 2 mm, the animal was classified as negative for bovine TB. If B minus A was between 2 mm and 4 mm, or above 4 mm, the animal was classified as either suspect, or positive, respectively.

**Data analysis**

The collected data was entered into Microsoft Excel spread sheet and analyzed by using SPSS version 20. Relationships between test result and potential predictor variables were assessed using chi-square and multivariate logistic regression

model. P-values of less than 0.05 were considered statistically significant.

**Results**

**Herd Prevalence**

The overall herd prevalence of dairy cattle 26.6% was recorded in and around Nekemte town using comparative intra dermal tuberculin test. Prevalence of bovine tuberculosis insignificantly associated ( $P > 0.05$ ) with herd size. Animals greater or equal to six were 2.3 times more likely to be infected (odds ratio  $OR = 2.32$ ,  $95\% CI = 1.01, 5.33$ ) with bovine tuberculosis (Table 1).

**Characteristics at the animal level**

Prevalence of bovine tuberculosis at individual animal was 13.7% by Comparative Intradermal Tuberculin test. Prevalence of bovine tuberculosis was significantly associated ( $P < 0.05$ ) with the different age categories of animals but the rest variables were insignificantly associated ( $P > 0.05$ ) (Table 2).

**Table 1:** Effect of herd size on the prevalence bovine tuberculosis

Herd size	Number of herds tested	Number (%) of herds tested positive	X <sup>2</sup> -value	P-value	Odds ratio (95% Confidence Interval)
≤ 2 Animals	10	2(5.9%)	4.276a	0.118	1
3-5 Animals	62	12(35.3%)			2.22(0.43 - 11.49)
≥6 Animals	56	20(58.8%)			2.32(1.01 - 5.33)
<b>Total</b>	128	34(26.6%)			

**Table 2:** Associated risk factors effects on prevalence of bovine Tuberculosis of small scale dairy cattle in and around Nekemte town.

Variables	Categories	Number of animals	Prevalence	Adjusted odds ratio (95% Confidence Interval)	X2	P-value
Sex	Male	92	10(2.5%)	1		
	Female	302	44(11.2%)	0.83(0.37 – 1.87)	0.816a	0.366
	Total	394	54(13.7%)			
Age	≤1	76	0(0%)	1		
	3-Jan	142	24(6.1%)	Very large (0-very large)		
	6-Mar	134	24(6.1%)	1.19 ( 0.43 – 3.29)	15.312a	0.002
	>6	42	6(1.5%)	1.11 ( 0.41 – 2.98)		
	Total	394	54(13.7%)			
BCS	Good	84	14(3.6%)	1		
	Medium	244	32(8.1%)	1.14(0.43 – 3.02)	0.835a	0.659
	Poor	66	8(2.0%)	1.03(0.44 – 2.44)		
	Total	394	54(13.7%)			
Breed	Local(Zebu)	18	0(0%)	1		
	Cross	376	54(13.7%)	Very large (0-very large)	2.996a	0.083
	<b>Total</b>	<b>394</b>	<b>54(13.7%)</b>			

## Discussion

The current study in and around Nekemte town revealed that the herd prevalence of bovine tuberculosis was 26.6%. This finding is almost two times lower than herd prevalence of tuberculosis (42.6%) in Wuchale-Jida district [3]. This could be due to herd size of dairy farms when herd size increased it predispose to higher tuberculosis infection. However, herd prevalence of tuberculosis of this study was higher than studies undertaken in Adama (15%), Bishoftu (5.5%) and Mekelle (20%) respectively [4,25,31].

Prevalence of bovine tuberculosis at animal level in the recent finding was 13.7%. In agreement with the previous studies in Wolaita soddo (14.2%) and Asmara (14.5%) studied by Ameni et al., 2001 and Omer et al., 2001 respectively [6,22]. However, higher in prevalence than studies conducted in Adama (11%) and Hawassa (11.6%) [4,26]. On other hand, the current prevalence of individual animal was lower than studies undertaken in Addis Ababa city 34.1% and 23.7% by [23]. Hence, studies on bovine tuberculosis in Addis Ababa city conducted on Holstein breeds, intensive production system and large herd sizes which favor transmission of bovine tuberculosis in the herd [4,5,9].

Regarding to sex of dairy cattle in present study female cattle affected about four times than male by bovine tuberculosis which is in line with the previous finding of Inangolet et al. 2008 [16]. Such susceptibility raised from the management and purpose of dairy cattle like cows confined in bran and kept for long period for production which creates stress on animals and these enhance transmission of bovine tuberculosis among dairy cows [10].

In present study local breeds non-infected when cross breeds infected with the prevalence of 13.7%. This study agrees with

previous findings [14,17,26]. This could be genetically improved dairy cattle more prone to diseases due to easily suffer poor management and malnutrition. Similar to Zeru et al. 2014 report recent finding pointed medium body condition score dairy cattle suffer more infection than good body condition score [31]. Infectivity of infection increases as deficiency of nutrition values such as proteins, minerals and vitamins raises in the diet [15].

## Conclusion and Recommendation

In Ethiopia bovine tuberculosis still constitutes a public health hazard. Hence, the current study in and around Nekemte town indicates that higher prevalence of tuberculosis in both herd and individual levels. Risk factors female, cross breeds and medium body condition score harbor more infection of tuberculosis in this study. This occurs with small herd sizes which is alarming sign of tuberculosis that herd size is the predisposing factor of bovine tuberculosis. Therefore, routine awareness creation and control measures should be undertaken in the study area.

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