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Research Article

Cross Sectional Study on Bovine Tuberculosis at Ghmbi Municipal Abattoir

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ABSTRACT

Across sectional study to determine the prevalence of bovine tuberculosis at Ghmbi municipal abattoir was carried out on 400 heads of cattle from October 2008 to April 2009. Post mortem examination was used as a tool to establish the prevalence and culture and Ziehl-Neelsen staining to characterize *Mycobacterium*. Tuberculous lesion was observed in a total of 31 animals and this give an overall prevalence of 7.75 %. The tubercle lesion was detected in 21 (67.7%) mediastinal, 4 (12.9%) tracheobronchial, 3 (9.67%) mesenteric and 1 (3.2%) hepatic lymph nodes and 2 (6.45%) lung tissues. The highest detection rate was recorded in mediastinal and the lowest in hepatic lymph node. In this study a total of 2 lung tissues and 29 lymph node samples were collected and cultured to isolate *Mycobacterium*, of these 4 (12.90%) samples were found positive for *Mycobacterium*. The risk factors such as sex, age, and body condition were assessed in relation to the occurrence of bovine tuberculosis and found significantly ($p < 0.05$) associated with the occurrence of this disease. In conclusion, the present study shows the potential risk of the disease for both animals and human beings live in the study area, and being female, old and medium body condition animal is more risk to be infected with bovine tuberculosis.

Keywords: *Mycobacterium*; Bovine tuberculosis; Prevalence; Post mortem; Slaughter house

INTRODUCTION

Even though, Ethiopia has a huge livestock population, it doesn't benefit much from this source due to its low productivity. The major biological and socio-economic factors attributing to the low productivity includes: the low genetic potential and performance, poor nutrition in quality and quantity, traditional way of husbandry systems and inadequate skilled man power and among others environmental stressors, internal and external parasites and prevalent contagious disease like brucellosis and tuberculosis [1].

Bovine tuberculosis (BTB) is a chronic infectious disease of animals characterized by the formation of granulomatous lesions in tissues and organs, more significantly in the lungs, lymph nodes and intestine. The etiological agents of mammalian tuberculosis, classified as members of *Mycobacterium tuberculosis* complex, are *Mycobacterium tuberculosis* (*M. tuberculosis*), *Mycobacterium bovis* (*M. bovis*) and *Mycobacterium avium* (*M. avium*). However, *M. bovis* is the most universal pathogen among *Mycobacterium* and affects many vertebrate animals of all age groups including man, although, cattle, goats, and pigs are found to be most susceptible, while sheep and horses are showing a high natural resistance [2].

In industrialized countries BTB is controlled by test and slaughter and pasteurization of milk, and, and therefore the humans and animal infectious is minimized. In developing countries, however, such as in 60% of the Africa, 47% of the Asia and 38% of the Latin America and Caribbean countries sporadic occurrences of bovine tuberculosis still exist. Approximately 85% of the cattle and 82% of the human population of Africa live in areas where BTB is either partly controlled or not controlled at all [3].

Currently, the BTB in humans is becoming increasingly important in developing countries, as human s and animals are sharing the same micro environment and water holes, especially during droughts and the dry season, thereby potentially promoting the transmission of *M. bovis* infection in humans and that of local cattle populations highlights the potential threat of this disease for humans, most notably in developing countries where drinking raw milk is a common practice in rural areas in particular. On the other hand in countries like Ethiopia consuming raw meat is a welcome tradition, meat is also remaining to be another area of concern. In developing countries social discrimination based on tuberculosis status is more a matter of sigma than of appropriate public health precautions and it remains as powerful as that of HIV/AIDS, which further complicates the process of investigation by patients hiding their tuberculosis status [4].

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BTB has major economic impact, associated with reduction of productive efficiency and carcass/organs/condemnation in abattoirs mostly in developing countries [2]. In Ethiopia, bovine tuberculosis is considered as prevalent disease in animal population; however, there is limited information on tuberculosis status in different region of the countries [5]. Therefore, the objectives of this study were:

- To determine the prevalence of bovine tuberculosis at Ghimbi municipal abattoir.
- To asses risk factors which increases the susceptibility of cattle to tuberculosis.

MATERIALS AND METHODS

Study area

The study was conducted at Ghimbi town and its surrounding which is found in Western Wollega zone of Oromia Regional State, 441km from Addis Ababa. The temperature of the area ranges from 22.5-27°C, and the area receives an average annual rain fall of 600-1200ml. The human population of Ghimbi is 68,899 of which 35,711 are males while 33,188 are females. The total area coverage of the woreda is 113,818 hectares with arable land 54,202 hectares, grazing area 3252 hectares, and village 2803 hectares, forest 16000 hectares, marshy land 12,929 hectares and others 23,633 hectares. The animal population of the area is 563,419 of which 532,099 are cattle, 12,080 goats, 16240 sheep and 3000 equines [6]. The feed source for the livestock is mainly grazing while some farmers feed their stock with crop residues. The production system is manly mixed crop livestock, where smallholder farmers raise majority of animals at subsistence level. The major problems in animal production and health in their order of importance are poor management, animal diseases and shortage of veterinary drugs, which impairs service provision to the animals by professionals. The animal health coverage of the area is about 14%. The major diseases in the study area are internal parasites, bacterial diseases, external parasites, haemoparasites and viral diseases.

Study subjects

Animals which came to slaughter house from Ghimbi and its surrounding were the study animals. During the study a total of 400 heads of cattle were inspected for post mortem lesions in Ghimbi slaughter house. In this slaughterhouse, on average 1440 heads of cattle are slaughtered annually and five animals daily.

Study design

A cross-sectional study was carried out at Ghimbi slaughterhouse from October, 2008 to April, 2009 to determine the prevalence of bovine tuberculosis. On each sampling day, usually four days in a week, all the animals, which came to the slaughter house, were inspected for tuberculous lesion after ante mortem examination and body condition scoring carried out. Mediastinal, tracheobronchial, hepatic, mesenteric lymph nodes and lung tissue samples were aseptically collected from each slaughtered animal suspected for tuberculosis. The samples were then transported in ice box packed with ice to the AHRI laboratory. All samples were processed and analyzed separately.

Body condition scoring and age determination

The body condition of each of the study animals was scored using guideline established by Nicholson in Butter Worth [7]. Accordingly, on the basis of observation of anatomical parts such as vertebral column, ribs, spines, tip of the tail and et. the study animals were classified as lean, medium and fat. The age of the study animals also was determined according to Daraje et al. [8]

Post mortem examination

Detailed examination of mediastinal, bronchial, retropharyngeal, mandibular, hepatic and mesenteric lymph nodes, lung and other tissues were done by visualization, palpation and dissection of the tissues for tubercle lesions.

Tissues/Organs collection and transportation

Suspected tissues from 31 cattle were further processed for isolation of *Mycobacterium*. The lymph nodes and others tissue specimens were cut in to a thickness of about 2mm using sterile surgical blades. Then cut surfaces were examined for presence of abscess, cheesy masses and tuberculosis [9]. Tissue specimens for culture collected in sterile universal bottle in 5 ml of 0.9% saline solution and were transported to the AHRI laboratory by maintaining the cold chain in the ice box.

Isolation and identification of *Mycobacterium*

In the laboratory the specimens were sectioned using sterile blades and then homogenized with a mortar and pestle. The homogenate was decontaminated by adding an equal volume of 4% NaOH by centrifugation at 3000 rpm for 15 minutes. The supernatant was discarded and the sediment was neutralized by 1% HCl using red phenol as an indicator. Neutralization was achieved when the color of the solution is changed from purple to yellow. Then, 0.1ml of suspension from each sample was spread in to a slant of Lowenstein-Jensen media. Double slants were used, one enriched with sodium pyruvate and other enriched with glycerol. Cultures were inoculated aerobically at 37°C for about 5 to 8 weeks with weekly observation for growth of colonies. Whenever the colonies were seen, sub culturing and Ziehl-Neelsen staining was done to confirm the presence of acid fast bacilli.

Data analysis

The prevalence of bovine tuberculosis is defined as the number of animals that are tuberculous lesion positive per the number of animals inspected for post mortem lesions and was expressed as percentage. The data was fed in to Microsoft Excel 2003 for analysis and the variation between different factors was analyzed using Chi square test to the occurrence of BTB in cattle. A p-value < 0.05 was considered to be statistically significant.

RESULTS

A cross-sectional study on BTB was undertaken at Ghimbi municipal abattoir between October 2008 and 2009. The objectives of study were to determine the prevalence of bovine tuberculosis and asses risk factors which increase the susceptibility of cattle to tuberculosis.

Prevalence of Bovine Tuberculosis

A total of 400 cattle were examined for the presence of tuberculosis lesion in their body tissues and lymph nodes. Tuberculous lesion was observed in a total of 31 animals and this give an overall prevalence of 7.75%. The tubercle lesion was detected in 21 (67.7%) mediastinal, 4 (12.9%) trachiobronchial,3 (9.67%) mesenteric and 1 (3.2%) hepatic lymph nodes and 2 (6.45%) lung tissues. The highest detection rate was recorded in mediastinal and the lowest in hepatic lymph node.

In this study a total 2 lung tissues and 29 lymph node sample were collected and cultured to isolate *Mycobacterium*, of these 4 (12.90%) samples were found positive for *Mycobacterium*.

Risk factor

Sex: BTB was observed from 5 (62.5%) female and 26 (6.6%) male animals. There was a significant (p=0.005) statistical difference in BTB prevalence between male and female cattle (Table 1).

Age: In this study the animals were grouped in to two age category of 4-8 years 5 cattle (1.4%) and from age category of above 8 years 26 cattle (70.27%) were found positive for BTB. Statistical analysis showed the presence of significant (p=000) association between different age groups and the occurrence of BTB (Table 2).

Body condition: All the cattle slaughtered at Ghimbi municipal abattoir during the study period were categorized in to medium and good body condition score classes and high prevalence of BTB were observed in medium body condition category. Significant (P=0006) difference was observed in the occurrence of BTB between the two body condition score categories (Table 3).

DISCUSSION

The present study reported 7.75 % prevalence of BTB at Ghimbi slaughterhouse. This result coincides with that of Getachew, who reported a prevalence of 7.9 % in the same slaughterhouse [9]. The current prevalence was found lower when compared to the 12.5% and 14.8% prevalence reported at Butajira and Jinka municipal abattoirs respectively [8,10]. This might be due to the consideration of non-tubercle lesions as tubercle during post mortem examination; this is witnessed by their low culture prevalence. In other hand the present finding was little bit higher than that of 5.2 % prevalence in Adama Municipal Abattoir and Addis Ababa abattoir [11,12].

The present culture positive prevalence at the area is 12.90 %. This result is higher than that of 6% culture positive prevalence reported by Getachew [9]. This might be due to the failure of previous work to identify tubercle lesions accurately and collect sample from appropriate sites.

Table 1: Association of sex with Bovine Tuberculosis.

Sex	Number of animals examined	Result		Prevalence
		positive	Negative	
Male	392	26	366	6.60%
Female	8	5	3	62.50%
Total	400	31	369	7.75%

Table 2: Association between different age groups with bovine tuberculosis.

Age groups	Number of animals examined	Result		Prevalence
		Positive	Negative	
4-8 years	363	5	358	1.40%
>8 years	37	26	11	70.27%
Total	400	31	369	7.75%

Table 3: Association between different classes of body condition score with bovine tuberculosis.

Body condition score	Number of animals examined	Result		Prevalence
		Positive	Negative	
Medium	133	19	114	14.28%
Good	267	12	255	4.50%
Total	400	31	369	7.75%

Highly significant difference (p=0.000) was observed in the occurrence of bovine tuberculosis between categories. The finding confirmed that the occurrence of the diseases increased with increasing age. The possible reasons for this could be waning of protective capability to the diseases in aging animals [13], the increase in the probability to encounter *M. bovis* with longer period of time and the slow progression of the disease to detectable level [14]. This finding is in agreement with previous reports by Shitaye et al. and Radostitis et al. [12,14], which indicates aged animals are more prone to the disease than young animals.

Significant difference (p=0.005) was also observed in bovine tuberculosis occurrence between sex categories. Female animals were more affected by the disease when compared to male animals. This might be attributed to immune suppression due to stress factor (Pregnancy, parturition, lactation) and the long term existence of female cows in the farm for reproductive purpose, which increases the probability to be infected with the disease. This finding supports the work of Radostitis et al. [14], which witnessed that female tuberculosis than male animals.

In the present study statistically significant (0.0006) difference in the occurrence of bovine tuberculosis was reported between different classes of body condition score. The disease was more prevalent in medium body condition score category. This might be due to the wastage nature of the disease. The present result coincides with the previous finding of Radostitis et al., which indicates that animal with good body condition score have relatively good immunological responses to the infectious agent than animal with medium scores [2].

The current study reported that 87% of TB lesion were found in lung and associated lymph nodes. This TB lesion distribution is similar with previous report of 90% TB lessons occurrence in the respiratory system [15]. The present study therefore, coincides and extends the earlier findings that, inhalation is almost invariably the portal of entry in housed cattle and even in those at pasture, it is considered to be the principal mode of transmission [2]. Furthermore, such findings suggest that focus should be given on lung and associated lymph nodes during post mortem examination.

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