

# Prevalence of Bovine Cysticercosis of Slaughtered Cattle in Dale Wabera District Municipal Abattoir, Western Ethiopia

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## Abstract

A cross-sectional study to determine the prevalence of bovine cysticercosis in cattle slaughtered at Dale Wabera municipal abattoir was conducted from June to October, 2016. A total of 384 randomly selected male cattle were examined during antemortem and postmortem inspections and a total prevalence of bovine cysticercosis was recorded as 25 (6.5%). The prevalence rates of *Taenia saginata* cysticercosis were 2.1%, 2.6% and 1.8%, respectively, in animals with poor, medium and good body conditions. The distributions of the cysts in cattle of highland and lowland areas were calculated and found to be 2.9% and 3.6%, respectively. The prevalence of *C. bovis* was also assessed based on different age groups of the cattle and it was found as 4.2% and 2.3% for cattle less than five years and for equal to or greater than five years respectively. There is no statistically significant difference ( $P>0.05$ ) in the prevalence of cysticercosis between the different groups of origins, age and body conditions of the study animals. However, the differences in distribution of the cysts in different internal organs/tissues of the animals were statistically significant ( $P<0.05$ ). The triceps muscles, masseter muscles, tongue, heart muscles and liver were the main predilection sites of the cysts in decreasing order as it was in triceps muscles (3.4%), masseter muscles (1.6%), tongue (0.7%), heart muscles (0.5%) and liver (0.2%). To conclude, the current study revealed the presence of high prevalence of *T. saginata* metacestodes in the major edible organs/tissues of the slaughtered cattle. Therefore, sufficient emphasis should be given to this problem by awareness creation for people not to consume raw meat and to use latrine to decrease the contamination of grazing areas. Additionally, it is important to do further study so as to improve health, quality and quantity of beef that may satisfy the domestic requirements of the country.

## Introduction

Among the diseases that cause serious problems, parasitism represents a major impact on livestock production in the tropics [1]. From the parasitic diseases, metacestode in domestic ruminants inflicts enormous economic damage due to the condemnation of affected muscles of the organs and lowering of meat and milk production. *Cysticercus bovis* is the larval stage (cysticercoids, metacestode) of *Taenia saginata*, a human tapeworm parasite that has cattle, buffaloes and various wild ruminants as intermediate hosts. Eggs of *Taenia saginata* pass in the stool of an infected person into the ground (grasses) and cattle become infected by ingestion of feed-stuff containing ova passed from infected human. A wide variety of tape worms (cestodes) occur in domestic animals presence of these hosts is of public health and economic significance. The tape worm problem is more serious in tropics because the consumption of under cooked or raw meat is common [2].

The clinical effect of cysticercosis on infected animals is generally not significant but it is economically important as it causes carcass condemnation arising from heavy infestation with the cysticerci of *T. saginata* as well as the cost of inspecting meat, the necessity to freeze or boil infected meat and losses may also occur from restriction of live animal and animal products [3]. In African continent an annual loss was reported to be USD 1.8 billion under an overall infestation rate of 7%. In South America, where an overall infestation rate was estimated at 2%, caused an annual loss of USD 428 million [4,5]. It is also more important with regard to high economic losses due to the condemnation of heavily infected carcasses in Ethiopia [6].

In Ethiopia, *Taenia* infection is very common as raw beef is customarily consumed by most high land inhabitants and cattle raised on free range become infected through contamination of grazing areas with human stool [7]. Based on abattoir survey, the prevalence reports of bovine cysticercosis in Ethiopia showed variable results with localities. Relatively lower prevalence of 3.1% in central Ethiopia [8], 4.9% in Gondar [9] 3.6% and 7.5% in Addis Ababa [10,11] were reported respectively, while higher prevalences of 17.5% in East Shoa [12], 21% in Nekemte [13], and 26.25% in Hawassa were found [14]. However, countrywide study on prevalence of bovine cysticercosis is still very limited.

In foreign trade, although the country is ideally placed to export live animals to the big markets of the Middle East and substantial markets of North and West Africa, export earning is relatively low. This is mainly due to the presence of a number of unimproved animal health problems, among

which, *Taenia saginata/Cysticercus bovis* remains a major public and animal health problem [15] and sufficient emphasis must be given to increase the foreign export revenue. Thus, the current study was carried out with the aim to determine the prevalence of *Cysticercus bovis* at Dale Wabera district municipal abattoir, Western Ethiopia.

## Materials and Methods

### Study area

The present study was carried out from June to October, 2016 in the municipal abattoir of Dale Wabera district of Kellem Wollega Zone, Oromia Regional State, Western Ethiopia. Dale Wabera district is located at 600 km west of Addis Ababa between 08025' to 08058' N and 034033' to 035028' S. The climate alternates with long summer rain (June-September) and short rainy season and winter dry season (October- February) with mean annual rainfall of 1200-1800 mm. The mean annual temperature is 25°C and the altitude ranges from 1200-2200 meters above sea level [16].

### Sampling method and sample size determination

By using simple random sampling method and by considering 50% expected prevalence and 5% accepted error at 95% confidence interval, the sample size was calculated according to Thrusfield [17], using the formula:  $N = 1.96^2 * P_{exp} (1 - P_{exp}) / d^2$ ; where, N=required sample size;  $P_{exp}$ =expected prevalence; d=desired absolute precision.  $N = 1.96^2 * P_{exp} (1 - P_{exp}) / d^2$ ;  $N = 1.96^2 * 0.5 (1 - 0.5) / (0.05)^2 = 384$  sample cattle were considered for the study.

### Study design and study animals

A cross-sectional study was carried out to assess the prevalence of cysticercosis in cattle slaughtered at Dale Wabera district municipal abattoir. A total of 384 indigenous zebu cattle slaughtered during the study period were included in the study.

### Data collection procedure

During antemortem inspection, related risk factors such as sex, breed, age, origin and body condition of the animals were recorded before slaughtering. The body condition of the animals was ranked as poor, medium and good depending on [18]. Origin of the slaughtered animals was recorded as lowland (if an animal was from areas of less than 1500 m above sea level) and as highland (if an animal was from areas of greater than 1500 m above sea level). Estimation of age was carried out by examination of the teeth eruption using the approach forwarded by De Lahunta and Habel [19]. Age was recorded as <5 years and >5 years old.

All the animals were identified on the basis of enumerated marks on their body surface using ink, and this marking was transferred to the major internal organs and tissues during postmortem inspection [20]. During postmortem inspection, palpation of the organs/tissues followed by incision to examine for the presence of any cyst of *C. bovis*, according to the guideline of Ministry of Agriculture [21]. For masseter muscle, deep linear incision were made parallel to the mandible; the heart was incised from base to apex to open the pericardium and incisions also were made in the cardiac muscle for detail examination. Deep, adjacent and parallel incisions were made above the point elbow in the shoulder muscle. Examination of the kidney, liver, spleen and the lung was also conducted accordingly and results for the presence of any cyst of *C. bovis* were recorded.

### Data management and analysis

Data obtained from antemortem and postmortem findings were entered into and analyzed using SPSS version 20 software. Cysticercosis prevalence was calculated as percentage by dividing the number of infected animals to the total number of animals examined. Pearson chi-square ( $\chi^2$ ) test was employed to assess the existence of association between the results (prevalence of the cysts) and the different factors like age groups, body conditions, origin of animals, and organs/tissues affected. A statistically significant association between variables was said to exist if the calculated  $P < 0.05$ .

## Results

### Prevalence of bovine cysticercosis

Among the 384 male zebu cattle examined 25 (6.5%) of the cattle were found to be positive for *C. bovis*. There was no statistically significant difference ( $P > 0.05$ ) in the prevalence of cysticercosis between the two origins of animals, two age groups and between the three groups of body conditions of the study animals (Table 1). Analysis of the active abattoir survey showed that there was a significant variation ( $P < 0.05$ ) with regard to the anatomical distribution of the cysts of cysticercosis in the inspected organs and tissues. As indicated in table 2, maximum intensity of infection was observed in triceps muscle followed by masseter muscle, tongue, heart muscles and liver.

## Discussion

Taeniasis/Cysticercosis occurs most commonly in the environments characterized by poor sanitation, primitive livestock husbandry practice and inadequate meat inspection and control. Bovine cysticercosis usually does not cause much morbidity or mortality among cattle, but it does cause serious economic problems in the endemic areas due to the condemnation of meat or down grading of carcasses [22,23] contributing to constraint in food security and safety. The results of the present study also reflect specially the zoonotic importance of this disease, which is in agreement with the above statements.

In the current study, prevalence of bovine cysticercosis was 6.5%, which is greater than the findings of Tolosa et al. [24], Gomol et al. [25] and Nuraddis and Frew [10] in Jimma municipal abattoir with prevalence of 2.93%, 3.6% and 3.6% respectively, of Bedelu et al. [6] in Zeway municipal abattoir (3%), of Tembo [8] in Central Ethiopia (3.2%) and of Teka [26], in which the prevalence was 2.2-3.2% but lower than the findings of Kebede et al. [27], Nigatu [11] in Addis Ababa abattoir (7.5%), Abuna et al. [14] in Hawassa abattoir (26.25%), Kebede [28] in North West Ethiopia (18.49%), Hailu [12] in East Shoa (17.5%). The different prevalences reported in these studies might be due to several factors of which husbandry systems, hygiene differences and eating habits are among the most important. In addition, diagnosis of bovine cysticercosis by meat inspection underestimates the true prevalence, especially when infection is light [29]. The higher prevalence of cysticercosis in developing countries is associated with poor sanitary infrastructure, low awareness and improper disposal of sewage, which also pertains to Ethiopia, where the widespread habit of eating raw meat is an additional important risk factor [24].

**Table 1:** Influence of some risk factors for the prevalence of bovine cysticercosis.

Factors	Groups	No of Animal Examined	No of Positive Animals (%)	P-Value
Origin	Highland	171	11 (2.9)	0.270
	Low land	213	14 (3.6)	
	Total	384	25 (6.5)	
Age	<5 years	262	16 (4.2)	0.301
	>5 years	122	9 (2.3)	
	Total	384	25 (6.5)	
Body condition	Poor	60	8 (2.1)	0.072
	Medium	174	10 (2.6)	
	Good	150	7 (1.8)	
	Total	384	25 (6.5)	

**Table 2:** Distribution of the cysts of bovine cysticercosis in different organs and tissues.

Organ/tissue inspected	Number of positive organs/tissue (%)	P-value
Triceps muscle	13 (3.4%)	0.001
Masseter muscle	6 (1.6%)	
Tongue	3 (0.7%)	
Heart muscles	2 (0.5%)	
Liver	1 (0.2%)	
Lung	0 (0%)	
Spleen	0 (0%)	
Kidney	0 (0%)	
Total	25 (6.5%)	

In this study, there is no association ( $P>0.05$ ) between, age, origin, body condition (Table 1) and the prevalence of cysticercosis and in the case of age and origin, this agrees with the reports of [6,8,12] and in the case of origin this was also agrees with [31]. One possible explanation for insignificance of variation might be due to the fact that most of the animals slaughtered in this abattoir were adult and have similar husbandry systems (the same type of livestock management) [14] and also the sample size is a factor for its insignificance [10].

Regarding the anatomical distribution of the cysts in different organs/tissues of cattle, many researchers come up with different results. The masseter muscles, tongue, heart muscles, triceps muscles and thigh muscles among others were the preferred organs (predilection sites) for the cysts of bovine cysticercosis in various endemic areas [30]. Fufa [31] and Nuraddis and Frew [10] reported triceps as being frequently affected by the cyst, which agree with the finding of the current study having 3.5% which is higher than the value indicated as 1.9% by [10]. This is also in agreement with the finding Belayneh [32] in Debre Zeit, Tolosa et al. [24] and Gomol et al. [25] in Jimma municipal abattoir and Jemal and Haileleul [33] at Kombolcha Elfora meat factory, but it is not in line with Fufa [31]. Next to triceps muscle, the highest number of cysts was found in the masseter muscle, tongue, heart muscle and liver in decreasing order (Table 2). The high proportion of cysts in the triceps muscle could probably due to the blood kinetics in the animal affect the distribution of oncospheres and the predilection site during meat inspection [10].

## Conclusion and Recommendations

*Taenia saginata* is a public health economically important cestode parasite prevalent in Ethiopia. High prevalence rate is associated with raw and under cooked beef consumption, presence of backyard slaughtering practices, indiscriminate defecation, low level of public awareness and poor waste disposal. Therefore, sufficient emphasis should be given to this problem by awareness creation for people not to consume raw meat and to use latrine to decrease the contamination of grazing areas and also by doing further studies so as to improve health, quality and quantity of beef that may satisfy the domestic requirements of the country.

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