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Prevalence of *Cysticercus bovis* at Dessie Municipal Abattoir, North East Ethiopia

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ABSTRACT

A cross-sectional study was carried out from November 2015 to April 2016 on bovine cysticercosis at Dessie Municipal Abattoir with the objectives of estimating the prevalence of *Cysticercus bovis* (*C bovis*) and assessing some of the associated risk factors. The study animals were selected by using simple random sampling method from the cattle slaughtered in the Abattoir. Ante-mortem and post-mortem examination of 384 cattle were done during the study period. The cattle were examined for the presence of *C. bovis* following the routine meat inspection procedures. The overall prevalence of *C. bovis* was 6.8% (26/384). There was no statistically significant difference ($p>0.05$) in occurrence of the disease between sex, breed and age of the animal where as statically significant ($p<0.05$) difference was observed in body condition of slaughtered animals. Higher prevalence was recorded in animals with poor body condition than in animals with medium and good body condition. The total number of cysts encountered during the study was 43. The anatomical distribution of the cysts in organs/muscles affected were 13(30.23%) in tongue, 8(18.60%) in shoulder, 6(13.95%) in masseter, 2(4.65%) in heart, and 2(4.65%) in liver. No cyst was found in kidney and diaphragm. The current finding clearly indicated that relatively high prevalence of *C. bovis* was found distributed throughout the organs of slaughtered cattle. As a result, emphasis should be given to prevention and control of the parasite so as to reduce the impacts of this disease in animals and humans.

Keywords: Abattoir, Cattle, *Cysticercus bovis*, Dessie, Prevalence.

INTRODUCTION

Ethiopia has large number of livestock population in Africa with an estimated 56,706,389 cattle, about 29,332,382 sheep and 29,112,963 goats (CSA, 2015). Ethiopia has great potential for increased livestock production, both for local use and export. Cattle play significant contribution in Ethiopian economy as source of meat, milk, drought power, income and foreign exchange. However, livestock production including cattle production was constrained by inadequate nutrition, disease, lack of support services and inadequate information on how to improve animal breeding, marketing and processing. Thus, the country is not utilizing this huge potential and an improvement in this sector is not as it should be (Abebe, 1995).

Taenia saginata (*T. saginata*)/taeniasis/ bovine cysticercosis is one of the major parasitic diseases, transmitted by eating raw or undercooked meat infected with cyst stage of these parasites. It does not only lead to economic loses, but also adversely affect the public health (Dorny et al., 2009). *T. saginata* is a cosmopolitan parasitic disease found in industrialized countries as well as in developing countries. It is also more common in populations or age groups that consume raw or undercooked beef (Murrell, 2005). In Eastern African countries like Ethiopia up to 70% of the population reports to have been infected with a tapeworm (Kebede et al., 2009), while in developed western countries much lower prevalence (0.01% to 10%) were recorded (Dorny et al., 2009). Similarly, bovine cysticercosis is highly prevalent in developing countries like Ethiopia. The prevalence of bovine cysticercosis in Ethiopia reported so far varies from relatively lower prevalence of 3.1% in central Ethiopia (Tembo, 2001) to as high as 26.2% at Hawassa (Abunna et al., 2008) whereas in Europe it ranges from 0.007% to 6.8% (Dorny et al., 2009). Differences in geographical isolates of the parasite and in the breed and age of cattle have been suggested as possible factors affecting the distribution of *C. bovis* (Tembo, 2001). Economic losses due to bovine cysticercosis are associated

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with total condemnation of carcasses with generalized infestation and downgrading of carcasses which are subjected to refrigeration, in addition to the cost of refrigeration and extra handling and transport (Kebede et al., 2009).

The treatment cost for human and costs of manufacturing of drugs have significant contribution in estimation of economic losses (Cabaret et al., 2002). There are works done in other parts of the country but there is no published or accessible data on the occurrence of *C. bovis* around Dessie area. Therefore, the objectives of this study were to estimate the prevalence of *C. bovis* in cattle slaughtered at Dessie Municipal Abattoir and to assess some of the associated risk factors.

MATERIALS AND METHODS

Study area and population:

The study was conducted from November 2015 to April 2016 in Dessie Municipal Abattoir. Dessie is located North East Ethiopia at a distance of 400km from Addis Ababa, at 11º 08' North latitude and 39º 38' East longitudes and has an elevation of 2600m above sea level. The mean minimum and maximum temperature of the area are 12.37°C and 26.27°C, respectively. The livestock population of the area comprises 18,724 cattle, 22,248 sheep, 2,572 goats, 1,879 horses, 833 mules, 3,362 donkeys, and 37,557 heads of chickens (DFEDB, 2015).

Study design:

A cross sectional study was conducted from November, 2015 to April, 2016 to estimate the prevalence of bovine cysticercosis in Dessie Municipal Abattoir, North East Ethiopia.

Study animals:

The study animals were local and cross breeds of cattle presented for slaughter from Dessie and its surrounding areas mainly from Kutaber, Hayk, Kombolcha, and Kemissie to Dessie Municipal Abattoir. From those animals which were daily brought to the Municipal Abattoir, study animals were randomly selected and inspected for *C. bovis* after slaughtered.

Sampling and sample size determination:

Simple random sampling method was employed for selecting animals from cattle slaughtered in Dessie Municipal Abattoir during the study period. To calculate the total sample size, the following parameters were used: 95% confidence interval, 5% desired level of precision and 50% expected prevalence of bovine cysticercosis among cattle in the study area since there was no previous work in the study area, and the formula given by Thrusfield (2005) was used.

$$n=\frac{1.96^2 P_{exp}(1-P_{exp})}{d^2}$$

Where n= required sample size
P_{exp}= expected prevalence (50%)
d= desired absolute precision (0.05)

Accordingly, $n = 1.96^2 * 0.5 (1- 0.50)/0.0025 = 384$ cattle were sampled.

Ante-mortem examination:

Ante-mortem examination was conducted by visiting the abattoir two days a week mainly Tuesday and Thursday but also other days except Wednesday and Friday since on these days few animals are slaughtered. A total of 384 cattle were examined for the presence of disease or abnormality before they are slaughtered. The age, sex, breeds, and body condition of each animal were assessed and recorded in data recording book prepared for this purpose. The body condition score of the animals were ranked as poor, medium, and good according to Nicolson & Butterworth (1986). Age of the animals was determined by dentition formula and categorized into three age groups (< 5, 5-10 and > 10 years) according to the method described by De Lahunta & Habel (1986).

Post-mortem examination:

A total of 384 cattle were selected from cattle presented for slaughter at Dessie Municipal Abattoir and examined for the presence of *C. bovis* following the routine meat inspection procedures. The post mortem inspection was carried out according to the guideline by Ministry of Agriculture (MoA, 1972). The post mortem examination for detecting *C. bovis* was conducted generally through visualization, palpation and two longitudinal ventral incision of the tongue from the tip of the root, one deep incision into the triceps muscles of both sides of the shoulder, deep incision into external and internal muscles of the masseter parallel to the plane of the jaw, longitudinal incision of the heart from base to apex, three parallel incisions into the long axes of the neck muscles on both sides as well as one extensive incisions on the diaphragm; visual examination, palpation and incision of liver and kidneys. Findings were registered according to the organs inspected.

Data management and analysis:

Given Collected data was entered into Microsoft excel and summarized by descriptive statistical methods like percentage and proportion. Then data was also analyzed by using version 20 of SPSS software. The results of this study were considered statistically significant when $p<0.05$.

RESULTS

Out of the total 384 examined cattle, 26 (6.8%) were found to be positive for *C. bovis* at postmortem inspection. There was no statistically significant difference (p>0.05) between sex, breed and age of animals in prevalence of *C. bovis*, but there was statistically significant difference (p<0.05) between body condition groups of animals (Table 1). The abattoir survey analysis clearly indicated that there was statistically significant variation with regard to the anatomical distribution of *C. bovis* in the inspected organs of the slaughtered animals. Total number of cysts encountered in this study were 43 and the level of infection was one cyst 13(50%), two cysts 11(42%), and four cysts 2(7.7%). The anatomical distribution of the cysts in organs/muscles affected were 13(30.23%) in tongue, 8(18.60%) in shoulder, 6(13.95%) in masseter, 2(4.65%) in heart, and 2(4.65%) in liver. No cyst was found in kidney and diaphragm.

Table 1: Prevalence of *C. bovis* by age, sex, breed and body condition of the animal.

Variables		No. of inspected	No. infested (%)	χ^2	*p-value*
Age	**Young**	4	0 (0)		
	Adult	377	26 (6.9)	0.518	0.772
	Old	3	0 (0)		
	Total	**384**	**26 (6.8)**		
Sex	**Female**	2	0 (0)	0.146	0.702
	Male	382	26 (6.8)		
	Total	**384**	**26(6.8)**		
Breed	**Local**	382	26 (6.8)	0.146	0.702
	Cross	2	0 (0)		
	Total	**384**	**26 (6.8)**		
Body condition	**Poor**	44	7 (15.9)	8.821	0.012
	Medium	280	13 (4.6)		
	Good	60	6 (10.0)		
	Total	**384**	**26 (6.8)**		

DISCUSSION

Bovine cysticercosis is an infection of bovine caused by the larval stage, *C. bovis*, of the human intestinal cestode, *T. saginata*. This parasite is universally distributed in developing as well as in developed countries. Meat inspection remains the corner stone for the control of *T. saginata* (Dorny & Praet, 2007).

In the present study the prevalence of *C. bovis* in cattle slaughtered in Dessie Municipal Abattoir was 6.8%. This result is higher than the findings of Tolosa et al. (2009) 2.93%, Ibrahim & Zerihun (2012) 3.6%, Megersa et al. **(**2010) 4.4%, Nuraddis & Frew (2012) 3.6%, Dawit et al. (2012) 2.59%, Tembo (2001) 3.11%, and Teka (1997) 2.2% from different Abattoirs of Ethiopia. There are also reports which are lower than the present study result from other countries which include 1.05% by Dutra et al. (2012) from Brazil, 3% by Garedaghi et al. (2011) from Iraq, 1.6% by Basem et al. (2009) from Egypt, 1.08% by Abuseir et al. (2006) from Germany, 0.2% by Dzoma (2011) from South Africa, 0.25% by Khaniki (2010) from Iran and 2.67% by Rabi'u & Jegede (2010) from Nigeria.

On the other hand, the present finding is lower than the findings of Abunna et al. (2007) 26.25%, Kebede (2008) 18.49%, Hailu (2005) 17.5%, Mesfin & Nuradddis (2012) 22.9%, Hailemariam et al. (2014) 92.7%, and Belachew & Ibrahim **(**2012) 22.9% from different parts of Ethiopia. Prevalence rate of 13.4% and 72.2% reported by Qadeer (2008) and Ikpeze et al. (2008) respectively from Nigeria are also higher than the present study result. These variations in prevalence may be due to difference in personal and environmental hygiene, variation in the method and quality of meat inspection, management of animals, experience and carefulness of the meat inspectors. The other major factor contributing for higher prevalence of cysticercosis is the habit or custom of eating undercooked or raw beef by the people in the areas where the studies have been carried out. This is because the prevalence of bovine cysticercosis in cattle is highly correlated with the prevalence of taeniasis in human being in the same area since humans with taeniasis are source of infection for cattle.

The result of this study indicates the prevalence of *C. bovis* infestation within body condition of the animal was 4.6% (13/280) in medium body condition, 10% (6/60) in good body condition and 15.9% (7/44) poor body condition. This result reveals statistically significant association between *C. bovis* infestation and body condition of animals (p <0.05).

With regard to rate of infestation and age, there is no association between *C. bovis* infection and age of animals (p>0.05). This result is in agreement with report of Ibrahim & Zerihun (2012) in

Ethiopia. But this result is in contrary with the finding of Basem et al. (2009) in Ethiopia. This might be due to age dependent immunity of an animal that had an important role in fighting against infestation and re-infestation by *C. bovis*. In addition to this, re-stimulation of animal's immunity following continuous invasion and development of a strong immunity which did not allow further development of more cysticerci from invading infestation may contribute (Wanzala et al., 2003).

The prevalence of *C. bovis* infestation related to breed of animals was 6.8% (26/382) in local, while no *C. bovis* was found in cross breed cattle. However, there was no statistically significant association between *C. bovis* infection and breed of animals (p>0.05). This result is in agreement with the report of (Belachew & Ibrahim, 2012). There was no significant association between *C. bovis* infestation and sex of animals. This result is in agreement with the report of Belachew & Ibrahim (2012) in Ethiopia, Garedaghi et al. (2011) in Iran and Dzoma et al. (2011) in Nigeria. But this finding is not in line with study carried out in Ethiopia where Ibrahim & Zerihun (2012) and Nuraddis & Frew (2012) have reported statistically significant difference between sexes of slaughtered animals in infestation rate with *C. bovis.* This might be due to the fact that few numbers of females were included in this study.

According to the current study, the cysts were found on tongue, shoulder muscle, masseter, heart, and liver in decreasing order of frequency of occurrence of *C. bovis*. Predilection sites are heart, tongue, masseters and diaphragm, presumably because they receive the greatest blood circulation. Nonetheless, cysts may be found in any muscle of the body OIE (2008). This result is in line with the report of Getachew (1990), Tolosa et al. (2009) and Jemal & Haileleul (2011).

In conclusion, although the prevalence found in the current study is relatively not high (6.8%), the significance of the disease on the health of the public and its economic importance should not be under estimated.

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