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Prevalence of Tania Saginata Cysticercosis in Cattle Slaughtered in Addis Ababa Municipal Abattoir, Ethiopia

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Abstract: Bovine cysticercosis is an infection of cattle caused by the larval stage, *Cysticercus bovis*, of the human intestinal cestode, *Taenia saginata*. It is an infection of public health significance as eating of raw or undercooked beef results taeniasis in human population and an important cause of economic loss mainly due to condemnation, refrigeration and downgrading of infected carcasses. A cross sectional study was conducted during October 2010 to march 2011 to estimate the prevalence of bovine cysticercosis in cattle slaughtered at Addis Ababa municipal abattoir with the objectives of determining the prevalence of Taenia saginata cysticercosis, cyst viability and cyst distribution in different body tissues. The abattoir survey was carried out by routine inspection of carcasses and viability test methods. Post mortem examination of 535 slaughtered cattle were examined from randomly selected animals of which 19 (3.6%) were infected with T. saginata metacestodes. Of the total of 24 Cysticercus bovis collected during the inspection, 11 (46%) were found to be alive while others (54.0%) were degenerative cysts. The tongue, masseter muscles, heart muscles, triceps muscles, diaphragm and liver were the main predilection sites of the cysts. Anatomical distribution of the cyst showed that highest proportions of C. bovis cyst were observed in triceps muscle 10 (1.9%), followed by tongue 5 (0.95%), masseter muscle 4 (0.7%), heart 2 (0.4%), diaphragm 2 (0.4%) and liver 1 (0.2%). Out of 477 male cattle, examined, 14 (2.9%) had cysts of bovine cysticercosis while 5 (8.6%) of the 58 investigated female animals were infected. The prevalence varied significantly between sex ($P<0.05$), but not varied between, age groups and breed of the animals. The proportion of viable cysts in the inspection sites was triceps muscles (70%), masseter (50%), diaphragm (0%), heart (50%), tongue (20%) and liver (0%). The current study suggests that high prevalence of T. saginata metacestodes throughout the edible organs and therefore sufficient emphasis should be given to this problem so as to improve health, quality and quantity of beef that may satisfy the domestic requirements of the counry.

Key words: Addis Ababa · Bovine Cysticercosis · Cattle · Prevalence · Viability Test

INTRODUCTION

Bovine cysticercosis refers to the infection of cattle with metacestodes of the human tapeworm [1]. The adult Taenia infection in man is referred to as Taeniasis and that due to the larval stage cysticercosis [2]. Bovine cysticercosis is found worldwide, but most often in developing countries, where unhygienic conditions are coupled with poor cattle management practices and lack or absence of meat inspection [3].

Cysticecosis was significantly more prevalent in feedlots and in traditional farming systems than in dairy farms. It is suggested that the continuous contact between man and animal and the use of causal workers in feedlots may be factors that are conducive to *Taenia saginata* transmission [4].

In East African countries prevalence rates of 30 to 80% have been noted [5]. In many developing countries, this disease constitutes a serious but sometimes less recognized public health problem [6].

In Ethiopia, the prevalence of *T. saginata/C. bovis* has been reported by a number of individuals. Florova [7] reported a prevalence of 100% which is the highest in Africa and also in the world. In some parts of Ethiopia, due to the habit of eating raw beef dishes such as *kourt* and *kitffo* that are served in raw or undercooked are the source of *T. saginata* infection in man [8]. Tembo, [5], reported prevalence of 89.41% in different agro-climatical zones of the country and she associated this high prevalence with the habit and/or culture of eating raw or undercooked beef. The prevalence of *C. bovis* in cattle reported by different individuals was 3.2% in different

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agro-climatic zones of the country [5], 2.2-3.2% in Addis Ababa Abattoir [8], 19.4% in Bahir Dar [9], 13.85% in Debre Zeit [10] and 9.67% in Gondar [11]. Among 1,042,390 slaughtered cattle in different abattoirs of the country 1,308 whole carcass, 32, 630 portions, 30,656 heart, 21,917 heads, 7,462 tongues, 2,798 livers, 348 lungs, 26 spleens and 21 kidneys have been condemned [12].

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 [13] and sufficient emphasis must be given to increase the foreign export revenue. Thus, the current study was carried out to indicate the prevalence of *C. bovis* at Addis Ababa Abattoir and to determine the distribution of cysts in organs and tissues of infected animals.

MATERIALS AND METHODS

Study Area: The study was conducted at Addis Ababa Municipal Abattoir, in the capital city of Ethiopia. Addis Ababa lies in the central highlands of Ethiopia at an altitude of 2500 meters above sea level; the average annual temperature and rainfall are 21°C and 1800mm, respectively. The relative humidity varies from 70 to 80% during the rainy season and from 40 to 50% during the dry season [14]. Addis Ababa and its peri-urban areas have 62,166 bovine, 22,647 ovine, 7,531 equine, 5,597 caprine and 330,000 avian species. Daily, the abattoir supplies cattle, sheep, goat and swine meat and its edible organ to the consumers in Addis Ababa city. An average of 153,000 cattle, 39,000 sheep, 3,200 goats and 750 pigs are slaughtered annually.

Study Population: The study population consists of cattle at different age, sex and breed categories in the study area.

Study Design: A cross sectional study was carried to determine the prevalence of bovine cysticercosis. The study was based on routine meat inspection on randomly selected cattle slaughtered at the abattoir. The randomly selected animals for routine meat inspection were given an identification numbers. This is to avoid the unnecessary mixing with organs during inspection. Visual inspection of all exposed surface was made in all active organs. They are shoulder muscles, hearts, masseters (cheek muscle), diaphragms, tongues and livers. This is followed by incision of all those organs to be examined for Cysticercosis bovis cysts. The incision procedure for each organ is for shoulder muscle three deep adjacent and parallel transverse incisions were made above the elbow joint, for masseter, two deep linear incisions were made parallel to the mandible from its upper muscular insertion. The tongue was incised longitudinally from apex to root on the lower surface (and also examined by palpation). The heart was split from base to apex and further incisions made into the muscle. The other organs were also examined based on the standard methods of the meat inspection and the findings were recorded. Positive samples were transported to parasitology labaratory in sholla after placing in normal solution.

The viability of cysts was done by placing the cyst containing organ part carefully removed from the carcass and transfers into a petridish containing organ part carefully removed from the carcass and transfers into a petridish containing normal solution and incubated at 37°C. One drop of the cyst fluid was added to the glass slide and add equal amount (one drop) of 0.1% eosin solution to the glass slide and cover with cover slide and examine under microscope. If the cyst viable the scolex evaginates after the incubation period. At the same time the scolex was checked whether it is *T.saginata* or other metacestodes based on the size of cysticercus and absence of hooks on the rostulum of the evaginated cyst. Evagination took place within 1-2 hours. Then the microscopic examination of the cysts pressed between two glass slides showed thin bladder wall and the scolex with four suckers but no rostellum or hooks [15].

Data Analysis: Statistical analysis was done using SPSS version 16. Chi-square (X^2) test was used to determine the variation in infection, prevalence between sexes, ages and breeds. Statistical significance was set at $P < 0.05$ to determine whether there are significant differences between the parameters measured between the groups.

RESULTS

Prevalence of Bovine Cysticercosis: Among 535 animals inspected, 19 (3.6%) animals were found to be positive for C. bovis. There is no statistically significant difference ($P>0.05$) in the prevalence of cysticercosis between the age groups as well as between breeds. Analysis of the active abattoir survey proved that there is statistically significant difference between sex groups ($P<0.05$) (Table 1).

Table 1: Influence of some risk factors on prevalence of bovine cysticercosis

Factors	Group	No of inspected animals	No of infested animals	Prevalence (%)	X^2	P-value
Age	<5years	221	8	3.6	0.006	0.937
	=5years	314	11	3.5		
	Total	535	19	3.6		
Breed	Local	491	18	3.6	0.227	0.634
	Cross	44	1	2.3		
	Total	535	19			
Sex	male	477	14	2.9	4.9	0.027
	female	58	5	8.6		
	Total	535	19			

Table 2: Anatomical distribution and viability of cysts among inspected organs

Organ/tissue inspected	No.	No. of live/Viable cysts (%)	No. of died cysts (%)	Total (%)
Triceps muscle	535	7 (70%)	3 (30%)	10 (1.9%)
Tongue	535	1 (20%)	4 (80%)	5 (0.9%)
Masseter muscle	535	2 (50%)	2 (50%)	4 (0.75%)
Heart	535	1 (50%)	1 (50%)	2 (0.4%)
Diaphragm	535	0	2 (100%)	2 (0.4%)
Liver	535	0	1 (100%)	1 (0.2%)
Total	3210	11 (46%)	13 (54%)	24

Analysis of the active abattoir survey showed that there was a significant variation with regard to the anatomical distribution of Cysticercus cysts in the inspected organs. As indicated in Table 2, the maximum intensity of infection was observed in triceps muscle followed by tongue, masseter muscle, heart, diaphragm and liver. A total of 24 cysts were detected from 19 cysticercosis positive animals during the inspection. Of the total of 24 cysts 11 (46%) were found to be live (viable), 13 (54%) were degenerative cysts (Table 2).

DISCUSSION

In the current study, prevalence of bovine cysticercosis was 3.6%, which is comparable to finding of Tolosa *et al.* [16] and Gomol *et al.* [17] in Jimma municipal abattoir with prevalence of 2.93 % and 3.6%, respectively, of Tembo [5] in central Ethiopia (3.2%) and of Tekka [8], in which the prevalence was 2.2 - 3.2% but lower than the recent findings of Kebede *et al.* [18], Nigatu [19] in Addis Ababa abattoir (7.5%), Abuna *et al*. [20] in Hawassa abattoir (26.25%), Kebede [21] in North West Ethiopia (18.49%), Hailu [22] in east Shoa (17.5%). The above difference in prevalence of bovine cysticercosis might be due to the fact that most of the animals slaughtered in the abattoir were brought from fattening systems flourishing in and around Addis Ababa in which animals from such farms are less exposed for eggs of C. bovis as they graze on relatively clean pasture. The other reason is hygiene and eating habits differences and in addition to this postmortem inspection is less sensitive when the infection is at initial stage.

In current study there is no statistically significant difference (P>005) between age group and breed. It concurs with earlier observation of Hailu [22] and Tembo [5] and not in agreement with report of Gomol *et al.* [17] and Jemal and Haileleul [23]. The possible explanation for this might be that any breeds of animal and age group have close susceptibility to Taenia saginata. Animals brought to the abattoir are in the same age group that means nearly adult and also the sample size is a factor for its insignificancy.

In present study there is statistically significant difference (P<0.05) between both sexes. This is in contrary with report of Gomol *et al.* [17], Kebede *et al.* [18], Jemal and Haileleul [23] and of Garedaghi *et al.* [24]. The possible reason is that, the sample size of female cattle is not comparable to that of male cattle slaughtered at Addis Ababa municipal abattoir.

According to the current study, the most frequently affected organ with the highest number of cysts was the triceps muscle. This is in agreement with the finding of Belayneh [10] in Debre Zeit, Tolosa *et al.* [16] and Gomol *et al.* [17] in Jimma municipal abattoir and Jemal and Haileleul [23] at Kombolcha Elfora meat factory, but it is not in line with Abunna [20]. Next to triceps muscle, the highest number of cysts was found in the tongue, masseter, heart muscle, diaphragm and liver in decreasing order. 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.

The proportion of viable cysts in the inspection sites was triceps muscles (70%), masseter (50%), diaphragm (0%), heart (50%), tongue (20%) and liver (0%) which is in agreement with the report of Abunna [20] and Jemal and Haileleul [23].

CONCLUSION

The prevalence of Taenia saginata cysticercosis is associated with undercooked beef consumption, poor waste disposal, poor sludge and sewage treatment system, low level of public awareness and presence of backyard (village) slaughtering practices, which also pertains to Ethiopia, where the widespread habit of eating raw meat. The study suggests that emphasis be given to this problem so as to improve health, quality and quantity of beef.

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