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Cysticercosis bovis in Eastern Tigray, Northern Ethiopia

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ABSTRACT: Taeniasis is an important worldwide food borne parasitic disease. A cross sectional study was conducted on 540 bovine species from October 2012 to March 2013 to determine prevalence and associated risk factors of cysticercosis at Adigrat Municipal Abattoir. The overall prevalence of cysticercosis was 5.73% (29). Infection prevalence of cysticercosis was significantly associated with age, body condition and breed of cattle ($P < 0.05$). Infection rate of cysticercosis with respect to age group showed that higher prevalence was in cattle 5 and above years (8.47%) than below 5 years (2.96%) ($\chi2= 7.949$, $p = 0.003$) and infection rate with respect to body condition revealed the highest prevalence (13.5%) was in poor followed by medium and good body condition scores 4.6 and 1.66%, respectively ($\chi2= 23.1$, $p = 0.000$). Related to breed of cattle highest prevalence (6.31%) was in Holstine – Fresian followed by local (5.2%) and barka breeds (4.91%) ($\chi2= 0.211$, $p = 0.036$). However, no significant variation was observed with related to sex of cattle ($p > 0.05$). Heart (35.56%) was the most infected organ by large number of cysts followed by tongue (23.3 %), masseter muscle (14.4 %), tricept muscle (10 %), liver (8.8 %) and tight muscle (7.7%), respectively. In conclusion, results obtained from this study confirm that cysticercosis is a health problem in cattle in the study area. Therefore, it is necessary to establish appropriate strategy for prevention and controls.

KEYWORDS: Adigrat abattoir, Prevalence, Cattle, *Cysticercosis bovis,* Risk factors.

1 INTRODUCTION

Bovine cysticercosis is disease name given to the condition caused by the zoonotic tapeworm *Tania saginata (T.saginata)* [1]. The larval stage of *T. saginata* occurs in musculature of cattle while the adult stage occurs in intestine of man causing taeniasis. The life cycle of the parasite, *T. saginata* involves humans and cattle the final and intermediate hosts, respectively [2]. An infected animal releases gravid segments that are shed by the adult fall to ground and release eggs on the ground. Eggs are immediately infective when passed. Animals acquire infection from ingestion of segments and eggs contaminating herbage or in faeces commonly herbivores while grazing. Most incidents in cattle arise as a result of direct exposure to proglottids shed from farm workers, but there have been some reports of large scale outbreaks resulting from sewage-contaminated feed or forage [3]. 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 cysticercosis 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 [4]. In Ethiopian cysticercosis was identified as a major health problem and production losses in domestic ruminants. Several studies have been conducted on the epidemiological distribution of bovine cysticercosis in different parts of Ethiopia [5, 6 7]. However, the prevalence of bovine cysticercosis with respect to host related risk factors is limited in Adigrat. Therefore, this study was undertaken to determine prevalence and associated risk factors of cysticercosis in cattle slaughtered at Adigrat municipal abattoir.

2 MATERIALS AND METHODS

2.1 STUDY AREA

The study was conducted from October 2012 to March 2013 in Eastern zone of Tigray, called Adigrat abattoir. The wereda has different agro-ecological areas namely sub moist dry, sub moist cool and sub dega. The annual rain fall ranges from 400-

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600mm and the minimum and maximum temperature ranges from 6-21.8 ^{0}c with an altitude of 2000-3000 meter above sea level. In the study area the maximum rain fall occurs from mid June up to September and between March and May but the minimum rain fall occurs from April to May. The farming system is mixed farming system; crop cultivation and animal husbandry similar to that of most Ethiopian husbandry system [8].

2.2 STUDY ANIMAL

The study was conducted on 540 cattle slaughtered in Adigrat Municipal Abattoir which originates from neighboring localities and various grazing areas of the region. All the cattle breeds presented for slaughter were selected for the study by random sampling method. Most of the cattle's were local breeds, while some are barka and holstine –fresian breeds.

2.3 SAMPLE SIZE

The required sample size was calculated according to [9].

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where, "n" is required sample size, "z" is standard value, "p" is expected prevalence and "d" is desired absolute precision. At 95% confidence interval z =1.96 and d = 5%. Since no previous study was carried in the study area and the expected prevalence value was considered to be 50%. Accordingly, it was 384. However, to increase the level of accuracy of determining the prevalence the sample size was increased to 540.

2.4 STUDY METHODOLOGY

2.4.1 ANTE-MORTEM EXAMINATION

Three days visit per week was made for ante mortem and postmortem examination of slaughtered cattle. Age, breed, sex and body condition of each study animals was recorded on prepared format paper. Body scoring of the cattle was made based on the guideline provide by [10]. Each scoring were given number from 1(L-, very lean) to 9 (F+, very fat) and finally included under three body condition scores poor, medium and good. Age determination was carried by means of their dentition as described by [11].

2.4.2 POST MORTEM EXAMINATION

After the cattle slaughtered, careful examination on the carcass of individual cattle was made through palpation of the organs followed by incision to examine for the presence *Cysticercus* cysts following the methods described by ministry of agriculture[12] as follows; the surface and substance of tongue was examined visually, following by longitudinal incision of the under surface. Each the masseter muscles (both left and right) was incised make cuts parallel to the jaw bone from the lower jaw. The pericardium and heart were examined visually and followed by incision lengthwise the left ventricle and intraventicular septum so exposing for examination of C. *bovis*. The muscles of diaphragm were examined visually and by making incision. Examination of kidney, liver, and the lung was also conducted accordingly. Cysts observed in theses organs were carefully dissected and numbers of cysts in each organ was recorded for each animal.

2.5 STATISTICAL ANALYSIS

Data were coded and stored in to Microsoft excel and analyzed by using SPSS version 20. The prevalence was calculated as the number of positive samples divided by the total number of examined samples. Chi-square ($\chi 2$) test was used to assess the association between the prevalence of C*. bovis* and host related risk factors such as sex, age, breed and body score of the animals. P value < 0.05 was considered as significant.

3 RESULTS

3.1 PREVALENCE OF CYSTICERCOSIS

The survey considered in this study reported that a total of 540 cattle were slaughtered in Adigrat municipal abattoir during the study period from October 2012 to March 2013. From the total examined cattle, 5.73% (29) were found to be infected with cysticercosis. Infection prevalence of cysticercosis was significantly associated with age, body condition and

breed of cattle. Infection rate of cysticercosis with respect to age group showed that higher prevalence was in cattle above 5 years (8.47%) than below 5 years (2.96%) ($\chi2$= 7.949, p = 0.003) and infection rate with respect to body condition revealed that the highest prevalence (13.5%) was in poor followed by medium and good body condition scores 4.6 and 1.66%, respectively ($\chi2$= 23.1, p = 0.000). Related to breed of the cattle the highest prevalence (6.31%) was in Holstine –Fresian followed by local (5.2%) and barka breeds (4.91%) ($\chi2$= 0.211, p = 0.036). However, no significant variation was observed with related to sex of cattle (p > 0.05) (Table 1).

Table 1. Prevalence of C. bovis and related risk factors

Category	No of examined	Prevalence (%)	$\chi2$	p
Age				
< 5 years	304	9 (2.96)	7.949	0.003
> 5 years	236	20(8.47)		
Sex				
Male	525	28(5.338)	0.51	0.378
Female	15	1(6.6)		
Body Score				
Poor	126	17(13.5)	23.1	0.000
Medium	174	8(4.6)		
Good	240	4(1.66)		
Breed				
Barka	61	3(4.91)	0.211	0.036
Holstine- Fresian	95	6(6.31)		
Local zebu	384	20(5.2)		

Heart (3.51%) was the most frequently infected organ followed by tongue (2.6%), masseter muscle (1.85%), tricept muscles (1.66%), liver (1.3%) and tight muscles (0.92%), respectively (Table 2). Anatomical distribution cysts in different organs revealed that the highest number of cysts were found from heart (35.56%) followed by tongue (23.3%), masseter (14.4%), tricept muscles (10%), liver (8.8%) and tight muscles (7.7%) (Table 2). No cyst was recorded from the lung and diaphragm.

Table 2. Distribution of C. bovis cyst in inspected organs

Infected organ	No of positive (%)	Total cyst count (%)
Masseter	10 (1.85)	13(14.4)
Tight muscles	5 (0.92)	7(7.7)
Liver	7 (1.3)	8(8.8)
Tongue	14 (2.6)	21(23.3)
Triceps	9 (1.66)	9(10)
Heart	19 (3.51)	32(35.56)
Lung	-	-
Diaphragm	-	-
Total	64(11.85)	90(100)

4 DISCUSSION

The present study revealed that the overall prevalence of cysticercosis in cattle slaughtered at Adigrat municipal abattoir was 5.73%, which is comparable to the prevalence of 4.4% reported from Jimma[5], 7.5% from Addis Abeba[13], 8.2% from Tigray region[14], 6.7% from Kombolcha Abattoir[15]. However, it was higher than the reported prevalence of 3% in Zeway [16], 3.6% in Addis Abeba [17], 2.98% in Nekemte [6], and 2.93% in Jimma abattoir [18].

The prevalence of cysticercosis bovis in this study was relatively lower as compared with previous reports from different abattoirs of Ethiopia, such as 11.3% from Wolaita Soddo[19], 22.9% from Hawassa municipal abattoir [20], 26.25% from Southern Ethiopia [21] and from other countries 16% from Upper Egypt [22] and 72.2% from Nigeria [23]. The variation of prevalence in different study sites may be due to variations in personal and environmental hygiene, religion, culture and feeding habits of the population and their production systems [5]. The difference in prevalence rate could also attributed

due to the limitation of conventional method of meat inspection which is less sensitive to pick all animals that are infected with *T. saginata* metacestodes. Observations indicated that except for dead and degenerated cysts which form white and fibrotic lesions viable cysts pass to human consumption without being detected due to carless meat inspection as described [24].

In this study, animal greater than five years of age were highly infected. This finding is in agreement with the report of [25]. But, it was inconsistent with other works who found no significance variation in different age group of cattle [6, 17]**.** The increase in prevalence of cysticercosis with age may be explained due to the long cumulative exposure time of the animals to the different sources of infection with eggs of *T.saginata*. Animals with poor body condition were highly infected with *C. bovis* than those with medium and good body condition scores. As [6] explained it is easier to detect cysts from emaciated carcass and organs as compared to well conditioned animals.

The result of this study showed that the highest prevalence was found in Holstine – Fresian breed cattle. [3] reported roughage feed components such hay and crop by-products which purchased from unknown locations may serves as source of *T. saginata* eggs as they contaminate with human waste during harvesting and collection time. This lower prevalence of cysticercosis in local breeds could be explained that, locally adapted breeds are more resistant to parasitic diseases infections as described by [27]. This result was inconsistent with finding of [13] from Addis Ababa abattoir and [24] from Iran, who reported high prevalence of cysticercosis in local breeds. This may be associated with management system where local breeds have greater chance to contaminated pasture with human excreta.

Prevalence of *C. bovis* in this study was not affected by sex of the animals. This is in agreement with previous reports [13, 15, 16, 24]. This could be associated with similar management given to both male and females cattle. In communal system both sexes were grazing on the same pastures and thus exposed to similar challenge with *T. saginata* eggs. In the study, female cattle examined for cysticercosis were small in number which makes difficulty to correlate prevalence with the sex of animals. However, according to [17, 26] males were highly infected than females. This may be related to management system of longer exposure of male outdoor, while females are kept in door at the beginning of lactation and breeding.

In this study heart (3.51%) was the most frequently infected organ. This result is in agreement with other study conducted by [22, 26]. However, [5, 28] reported that tongue was the most infected organ. In the present study, highest number of cysts was found from heart (35.56%) followed by tongue (23.3%) and masseter muscles (14.4%). In the present study small number of cysts was in tight muscles (7.7%). This could be due to the practical limitation of meat inspection, as deep incision lower marketability of the owners don't allow multiple incision of the carcass. The variation in the predilection seats may be also attributed to management practices of the animals like using the cattle in the daily agricultural activities which influence the distribution of the cysticerci [26]. In Ethiopia bush defecation, habit of eating raw beef (kitfo, Kourte, Gored-Gored) and village slaughter might have contributed much for the increase in prevalence of cysticercosis in cattle.

5 CONCLUSION AND RECOMMENDATION

The study demonstrated that cysticercosis is a major health problem in cattle of the study area. Appropriate control strategies should be design to reduce the transmission and educational awareness of the society on avoiding consumption of raw meat and proper use of latrine with improved standard of human hygiene were recommended.

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REFERENCES

[1] O. Oladele, "Bovine cysticercosis: Preliminary observations on the immuno histochemical detection of *T. saginata* antigens in lymph nodes of an experimentally infected calf," *Canada Veterniary Journal, vol*. 45, pp. 852 – 855, 2004.

[2] W. Lees, J. Nightingale, D. Brown, B. Scandrett, and A. Gajadhar, "Outbreak of *Cysticercosis bovis* (*T. saginata*) in feedlot cattle in Alberta, *Canada.*" *Veterinary Journal*, vol. 43, pp. 227–228, 2012.

[3] F. Flütsch, D. Heinzmann, A. Mathis, H. Hertzberg, R. Stephan, and P. Deplazes, " Case-control study to identify risk factors for bovine cysticercosis on farms in Switzerland," *Parasitology,* vol. 135, no. 5, pp. 641-646, 2008.

[4] E. Soulsby, Helmiths, Arthropods and Protozoa of Domestic Animals, 7th Edition, London, Bailliere Tindal, 1982

[5] B. Megersa, E. Tesfaye, A. Regassa, R. Abebe, and F. Abunna, "Bovine cysticercosis in Cattle Slaughtered at Jimma Municipal Abattoir, South western Ethiopia: Prevalence, Cyst viability and Its Socio-economic importance," *Veterinary World*, vol, 3 no. 6 pp. 257-262, 2010.

[6] F. Abunna, A. Dasta, R. Alemayehu, M. Bekele, and E. Debela, "Major Metacestodes in cattle slaughtered at Nekemte Municipal Abattoir, Western Ethiopia: Prevalence, Cyst Viability, Organ Distribution and Socio Economic Implications," *Biomirror,* vol. 2, no. 10, pp. 1-7, 2011.

[7] A. Fekadu, E. Legesse, and D. Tesfaye, "The Cause, Rate and Economic Implication of Organ Condemnation of Cattle Slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopia,"*Global Veterinaria,* vol. 9, no. 4, pp. 396-400, 2012.

[8] GBOANR, Ganta afeshum bureau of agriculture and natural resource.1999

[9] M. Thrusfield, Veterinary Epidemiology, 2nd Edition, Oxford, Black Well Science tropics, 2005.

[10] M. Nicholson, and M Butterworth, "A guide to condition scoring of zebu cattle," International Livestock Center for Africa, Addis Ababa, Ethiopia.1986

[11] W. Kelly, "Age determination by Teeth," In: Veterinary Clinical Diagnosis, 2nd Edition, Bailliere Tindall, London: 1975

[12] MOA, "Meat Inspection Regulations," Legal Notice No-428. Negarit Gazeta. Addis Ababa, Ethiopia.1972

[13] N. Kebede, G. Tilahun, and A. Hailu, "Current status of bovine cysticercosis of slaughtered Cattle in Addis Ababa Abattoir, Ethiopia," *Tropical Animal Health Production*, vol. 41, pp. 291–294, 2009.

[14] A. Kumar, and B. Gebretsadik, "Occurrence of cysticercosis in cattle of parts of Tigray region of Ethiopia," Journal *Haryana Veterinarian*, vol. 47, pp. 88-90, 2008.

[15] J. Endris, and H. Negussie, "Bovine Cysticercosis: Prevalence, Cyst Viability and Distribution in Cattle Slaughtered at Kombolcha Elfora Meat Factory, Ethiopia," *American- Eurasian Journal of Agriculture & Environmental Science*, vol. 11, no. 2, pp. 173- 176, 2011.

[16] H. Bedu, K. Tafess, B. Shelima, D. Woldeyohannes, and B. Amare, "Bovine Cysticercosis in Cattle Slaughtered at Zeway Municipal Abattoir: Prevalence and its Public Health Importance," *Journal of Veterinary Science and Technology*, vol. 2, no. 108, pp. 2157- 7579, 2011.

[17] N. Ibrahim, and F. Zerihun, "Prevalence of *Tania Saginata* Cysticercosis in Cattle Slaughtered in Addis Ababa Municipal Abattoir, Ethiopia," *Global Veterinarian,* vol. 8, no. 5, pp. 467-471, 2012.

[18] T. Tolosa, W. Tigre, G. Teka, and P. Dorny, "Prevalence of bovine cysticercosis and hydatidosis in Jimma municipal abattoir, Southwest Ethiopia," *Onderstepoort Journal of Veterinary Research, vol.* 76, pp. 323 –326, 2009.

[19] A. Regassa, F. Abunna, A. Mulugeta, and B. Megersa, "Major Metacestodes in cattle slaughtered at Wolaita Soddo Municipal abattoir, Southern Ethiopia: Prevalence, cyst viability, organ distribution and socioeconomic implications," *Tropical Animal Health Production*, vol. 41, pp. 1495–1502, 2009.

[20] M. Belachew, and N. Ibrahim, "Prevalence of Cysticercosis Bovis in Hawassa Municipal Abattoir and its Public Health Implication," *American-Eurasian Journal of Scientific Research*, vol. 7, no. 6, pp. 238-245, 2012.

[21] F. Abunna, G. Tilahun, K. Bersissa, B. Megersa, and A. Regassa, "Bovine Cysticercosis in Awassa, Southern Ethiopia: Prevalence, risk factors and cyst viability," *Zoonoses and Public Health*, vol. 55, no. 2, pp. 82-8, 2008.

[22] R. Basem, S. Amal, A. Asmaa, I. Hussein, and M. Arafa, "Occurrence of *Cysticercosis* in cattle and buffaloes and *T. saginata* in man in Assiut Governance of Egypt, " Veterinary *World*, vol. 2, no. 5, pp. 173-176, 2009.

[23] O. Ikpeze, O. Eneanya, I. Christine, and W. Ekechukwu, "Significance of meat inspection in the estimation of economic loss due to bovine cysticercosis," *Animal Research International*, vol. 5, no. 3, pp. 896 – 899, 2008.

[24] Y. Garedaghi, A. Rezaii Saber, and M. Saberie Khosroshahi, "Prevalence of Bovine Cysticercosis of Slaughtered Cattle in Meshkinshahr Abattoir," Iran Journal *of Animal and Veterinary Advances*, vol. 11, no. 6, pp. 785-788, 2012.

[25] P. Usip, I. Isaac, E. Amadi, E. Utah, and U. Akpaudo, "The occurrence of cysticercosis in cattle and taeniasis in man in Uyo, capital city of Akwa Ibom State, Nigeria, " *Nigerian journal of agriculture, food and environment,* vol. 7, no. 2, pp. 47-51, 2011

[26] M. Qadeer "*Prevalence* of bovine cysticercosis in Jos Abattoir, Nigeria," *Animal Research International*, vol. 5, no. 1, pp. 777 – 779, 2008.

[27] J. Gracey, D. Collins, and R. Huey, Meat Hygiene, 3rd Edition, W.B. Saunders Company Ltd. 1999

[28] D. Tesfaye, T. Sadado, and *T*. Demissie, "*Public* Health and Economic Significance of Bovine Cysticercosis in Wolaita Soddo, Southern Ethiopia, " *Global Veterinarian*, vol. 9, no. 5, pp. 557-563, 2012.