

Survey on the Epidemiological Distribution of Bovine Cysticercosis in Ghimbi Municipal Abattoir West Wellega Zone of Oromia Regional State of Ethiopia

DVM THESIS

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ABSTRACT

A cross-sectional survey to determine the prevalence and distribution of cysticercosis of cattle was conducted at Ghimbi municipal abattoir in west wellega zone of oromia regional state of Ethiopia from October 2008 to Feb 2009. A total of 400 cattle were examined as part of routine meat inspection methods slaughtered at Ghimbi municipal abattoir which were brought from in and around Ghimbi (Ghimbi, Billa, yubdo and Haru). 18(4.5%) cattle were found to be infected and the cyst were distributed in muscle of triceps 16(21.1%), maceter 15(19.73%), tongue 10(13.2%), diaphragm 6(7.89%), and visceral organs like heart ,21(27.6%), liver 3(3.94%), kidney 3(3.94%), and lung 3(3.26%) in order of infection rates .The result of meat inspection revealed that the prevalence varied between the origin of animal, which was highest in Ghimbi(3.5%) followed by Billa(0.75%) and Haru(0.25%) none in Yubdo but not significant ($p > 0.05$). The detection of *Cysticercus bovis* in the different parts of the examined body significantly higher in the carcass compared to visceral organs except the heart ($p < 0.05$). Therefore attention should be given for awareness creation for the peoples not to consume raw meat and to use toilets to decrease the contamination of grazing areas.

Key words: Cysticercosis, visceral organs, prevalence, slaughter house, Ghimbi

1. INTRODUCTION

Ethiopia has large number of livestock .However; its productivity remains low due to prevalent disease, malnutrition, and management constraints. Parasitism represents a major setback to the development of the sub-sector. However, data on epidemiology, economic loss, and relative hierarchy of individual parasitic infections are hardly available. Understanding these contexts yield paramount importance to determine the type and scope of control intervention to be envisaged (Jobre et al., 1996).

Among the parasites of livestock bovine cysticercosis is a disease that affects the muscle of cattle. It is caused by larvae of the human tapeworm. Its life cycle entirely depends on the link between man and cattle. Thus, any break in this links can result in the total elimination of the parasite (Urquhart et al., 1996). Bovine cysticercosis is also known as beef measles caused by the larval stage of *Taenia saginata* which is a zoonotic parasitic disease. It is prevalent in most countries of the world (Fralova et al., 1982, Smyth, 1994, Urquhart et al., 1996). Financial losses can be considerable when a large numbers of animals are affected ,such as in feedlot. Most incidents arise as a result of direct exposure to proglottids shed from farm workers. There are also some reports of large scale outbreaks resulting from sewage contaminated feed or forage (Wayne, 2002). Hence, cysticercosis is an important public health and economic problem because of its consequence on human nutrition and economy of some countries (Wanzala et al.,, 2003).

Globally, carriers of bovine taeniasis are 77 million and about 40% of them live in Africa. In relation to developed countries even if the disease has a very low prevalence, the problem with removal and treatment facilities in their sewage system plays role in the distribution of eggs (Fralova et al., 1982),since it is shown that the eggs can survive in sewage (Arundel and Adolph,1980).

The larvae of *T. saginata* still cause significant problems in many parts of the world. In Ethiopia the adult parasite in human and cyst in cattle population is widespread but differs from region to region. The prevalence of *T.saginata* in human population indicated 64.2% in Hawasa (Fufa, 2006), 75.9% in East showa (Hailu, 2005) and 89.41% in Addis Ababa (Tembo, 2001). Bovine cysticercosis prevalence in abattoir survey varied from region to region in cattle population. In Gondar the ranges was from 4.9% (Dawit,2004) to 9.7%(Amsalu,1989),19.5% in Bahir Dar(Mulgeta ,1997),21% in Nekemte(Ahmed,1990),17.5% in East shoa(Hailu,2005),13.8% in Debre Zeit (Getachew,1990) and 24.8% in local and 52.38% in cross breed cattle in Hawassa(Fufa,2006). The parasite proved to be controlled by routine meat inspection,

restriction of raw or under cooked beef meat consumption, utilization of latrine, treating Infected humans and public awareness about the life cycles and control measures. However, nothing is known, no information recording the dynamics of the prevalence of *C.bovis* in and around Ghimbi. Therefore, this research study is initiated to provide information's on bovine cysticercosis.

Specific objectives of the study were:

- ❖ To determine the prevalence of bovine cysticercosis in cattle originated from different localities for slaughter at Ghimbi municipal abattoir.
- ❖ To determine the cyst prevalence and distribution in different cattle body tissues with in infected animals.

2. MATERIALS AND METHODS

2.1 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 0C, and the area receives an average annual rainfall of 600-1200ml. The human population of Ghombi 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, 1620 sheep's and 3000 equines (Ghimbi Agricultural and Rural Development Office, 2007). The feed source for livestock is mainly grazing while some farmers feed their stock with crop residues. The production system is mainly mixed crop-livestock, where small holder 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 the 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, haemo parasites and viral diseases.

2.2 Study population

The study population for the present study was those animals brought to slaughter house in

Ghimbi municipal abattoirs during the study period. More than 1680 animals of different age and sex groups were brought for slaughtering purposes and the majority of them were males and almost all are adult in age groups. The sources of animals for slaughter were included from Ghimbi and its surrounding areas.

2.3 Study Design and Sample size Determination

A cross-sectional study was conducted between October 2008 to Feb 2009 to determine the prevalence rate and distribution of bovine cysticercosis by using post-mortem examination of different organ and carcass of individual slaughtered animals. Sample size estimation was calculated using the formula $N = 1.96^2 \times p \exp (1 - p \exp) / d^2$ (Thrusfield, 1995).

Where N=required sample size

P exp=expected prevalence

d²= desired absolute precision In the current study, we used 95% as confidence interval with absolute precision of 0.05. To get maximum sample size, the expected prevalence was estimated at 50%. Thus $N = 1.96^2 \times 0.5 (1 -$

$0.5) / 0.05^2 = 384$.

Therefore, at least 384 cattle were to be sampled with random sampling technique and in our study we have examined about 400 animals.

2.3.1. Active abattoir survey

About 400 animals were examined for this study of which adult 378 adult male and 22 adult female indigenous cattle which was provided for slaughter from different localities and markets in their vicinity such as Ghimbi, Billa, Haru and Yubdo.

Ante Mortem Inspection (AMI)

AMI was conducted on individual animals while the animals were entering in to the lairage. Both sides of the animals were inspected at rest and in motion moreover the general behavior of the animals. If there is signs of diseases and abnormalities of any type were observed it was recorded in the data collection sheets. History of individual animal was taken by recording origin of animal, age and sex. Then a separated number was given to each animal so that its carcass is identified after slaughtering.

Post Mortem Inspection (PMI)

During meat inspection liver, lung, kidney, tongue and carcass was thoroughly examined by

visual inspection, palpation, and making systemic incisions where necessary for the presence of cysts, adult parasites, and other abnormalities found. For the detailed examination of the organs and tissues we have followed the protocol developed by the ministry of agriculture of Ethiopia (1972) and the meat control act of Kenya (MOA,1972)for meat inspection used for routine inspection of the carcasses in the abattoir.

To detect cysts in macetor muscle two deep linear incisions were made parallel to the mandible from its upper muscular insertion. The tongue (also examined by palpation) was incised lengthwise on the lower surface from base to root, while the heart was split from base to apex and further incisions made in to the muscle. Three deep, adjacent and parallel transverse incisions were made above the point of elbow in the triceps muscle. One extensive incision in to the freshly part of the diaphragm, visual examination, palpation and incision of the kidney, liver and lung.

2.4 Data Analysis

The data collected in the municipal abattoir were entered into a computer on Microsoft Excel spread sheet. Statistical analysis was done using SPSS 15.0 and STATA 7 versions. Categorical variable (area, sex, and predication site) were expressed in percentage. The prevalence proportion was calculated as the number of animals detected positive by inspection and incision, divided by the total number of animals examined during study period. For all analysis p- value less than 0.05 was taken as significant.

3. RESULT

The prevalence of bovine cysticercosis in cattle slaughtered at Ghimbi municipal abattoir was found to be 4.5 %(18/400)during the study period. The prevalence of cysticercosis in different areas from where brought to the abattoir house is summarized in table 2. The highest prevalence observed from cattle of Ghimbi 3.5% and followed by Gechi 0.75%, Abdella 0.25% and none from Haru. There is no statistical significant difference observed in their area of origin for slaughtered animals.

Table 1.Prevalence of bovine cysticercosis by origin of the animals slaughtered in Ghimbi municipal abattoir.

No	Origin of animals	No inspected	No of infected	% infected
1	Ghimbi	237	14	3.5
2	Billa	72	3	0.75
3	Haru	15	0	0.00
4	Yubdo	76	1	0.25
Total		400	18	4.5

Meat inspection on sex bases of slaughtered animals revealed a prevalence rate of 4.5 %(18 out of 400 animals)only in male animals and none in female animals as shown in Table 3 (p>0.05).

Table 2.prevalence of bovine cysticercosis on sex bases of the animals slaughtered in Ghimbi Municipal abattoir.

No	sex	No inspected	No of infected	% infected
1	Female	22	0	0.
2	Male	378	18	4.5
Total		400	18	4.5

The frequency distribution of the infection rates in different parts of the body of slaughtered animals were 8(44.4%) in the heart ,7(38.9%)in the triceps muscle,4(22.2%)in the macetor muscle ,3(16.7%) in the tongue,3(16.7%) in the Diaphragm,2(11.1%) in the liver, and 2(11.1%) in the kidney.

Table: 3- Frequency distribution of bovine cysticercosis of the animals slaughtered in Ghimbi Municipal abattoir.

No	Organ/parts infested	No of cattle found infested by the site(s) examined	%(percentage)
1	Heart	8	44.4
2	Triceps	7	38.9
3	Macetor	4	22.2
4	Tongue	3	16.7
5	Diaphragm	3	16.7
6	Liver	2	11.1
7	Kidney	2	11.1

There was significant difference ($p < 0.05$) in the mean prevalence of cysticercus bovis infection between the carcass and visceral organs with the exception of the heart.

Table 4: Mean prevalence of cysticercus bovis in the carcass and visceral organs

	Heart	Triceps	Macetor	Tongue	Diaphragm	Liver	Kidney	Lung
Mean	± 0.02	± 0.0175	± 0.01	± 0.0075	± 0.0075	± 0.005	± 0.0025	$\pm -$
Standard deviation	0.1402	0.1313	0.09962	0.08639	0.08639	0.07062	0.0500	

Table 5: The distribution of C.bovis in different organ or parts in infested animals

No.	Organ/carcass infested	No.of cysts/sites examined	%(percentage)
1	Heart	21	27.6
2	Triceps	16	21.1
3	Macetor	15	19.73
4	Tongue	10	13.20
5	Diaphragm	6	7.89
6	Liver	3	3.94
7	Kidney	3	3.94
8	Lung	2	2.6

4. DISCUSSION

Cysticercosis is a parasitic condition of cattle caused by the intermediate tissue dwelling stages of human tape worm, *T.saginata*. Cattle harboring the cyst o *C.bovis*, are the source of infection to man. Infection of man is ensured when raw or undercooked beef carrying the viable cyst is consumed (Pawloski and Schultz,1972). The problem is frequently seen in developing countries as cattle are extensively raised, and public sanitation is not well developed. However, cysticercosis storms have been recovered in the developed nations too and are due to management failure. For instances, the recording of prevalence rises reaching 11% among feed lot cattle in the USA ,and was associated with taenia egg contaminated potato by product feed. Increased prevalence was also recorded among cattle grazing on camping ground and major travel arteries due to improper sewage treatment (Carbaret et al., 2002). The present study revealed, cysticercus infestation in 18 out of 400 cattle examined which was brought from in and around Ghimbi giving a prevalence rate of 4.5% (Table :2). The prevalence in Ghimbi 3.5%,0.75% in Billa,0.25% in Yubdo and none in Haru; these difference in the prevalence may be due to variation in sample size ,husbandry and management practice in the area ,while the corresponding variation in the predilection sites examined(Table :6),which was highest in carcass than in visceral organ except heart. This could be probably due to high blood circulation to this muscle as compared to visceral organ.

The prevalence of *C. bovis* varies between countries and between different regions of a country. Globally, prevalence of bovine cysticercosis ranges from 0-80 %(Yamasaki et al., 2004). Different results have been reported on the instances of *C. bovis* in Ethiopia. In this line Urquhart (1961) cited by Souls by (1982) reported prevalence rates of 80% while Solomon (1980) indicated 30% prevalence rate in areas highly

populated with cattle. Many abattoir surveys reports indicated that its prevalence rate varies from place to place. In this aspect Amsalu (1989) reported 10.6% at Gondar, Getachew (1990), 13.8% at Debre Zeit, Ahmed (1990), 21% at Nekemte, Dessie (1992), 2.7% at Assella, Mulgeta (1997), 19.5% at Bahir Dar, Tembo (2001), 3.11% at free University Berlin, Dawit (2004), 4.9% at North Gondar zone (North western), Nigatu (2004), 7.5% at Addis Ababa abattoir, Hailu (2005), 17.5% at Eastern shoa and Fufa (2006), 26.5% Hawassa. This abattoir survey indicated a 4.5% prevalence rate which is much closer to that of Dawit (2004) with 4.9% and Nigatu (2004) with 7.5% prevalence rate of Gondar abattoir and Addis Ababa abattoir respectively.

Regarding the predilection sites of the cyst in the intermediate host, many workers come up with different results. Amsalu (1990), Solomon (1980), Hailu (2005) and Ahmed (1990) reported tongue as being frequently affected by the cyst. Therefore, this finding is in agreement with the result of workers who indicated highest heart (27.6%) vulnerability to cyst attack. However, Mitchell (1978) in survey mode in Uganda cited by Gracey (1986), and Getachew (1990) and Fufa (2006) have indicated the triceps being most frequently affected while other workers indicated the liver (Faud, 1986), the heart Mulgeta (1997) and the neck muscles (Pandey et al., 1997) being the most frequently affected organs in their respective working sites.

When the result obtained by aforementioned workers is closely examined, clearly, the tongue, triceps, heart and masticator muscle were found to be frequently affected. Cysticercosis affects both the health of the consumers and more significantly the country's economy. The disease is responsible for large sum of money annually lost (Dessie, 1992) it influences the national economy through condemnation, quality down grading of frozen beef, cost of refrigeration, cost of human therapy and lowering productivity of infected workers who may be absent from work or reduce their working efficiency by creating uneasiness (FAO, 2004).

In area where inspection is carried out negligently, and raw or under cooked beef is consumed ignorantly of the risk, the economic loss is seemingly associated with human therapy although modern anticestodals exist, the presence of traditional antices today drugs strongly affect the appearance patients to medical centers which may aid in the awaring of the preisc disease status and cost analysis in one area concern. The price in put should not be looked as insignificant although are cheaper than the modern drugs. The indignation of patients to utilize traditional anticestodal could be for the reason that they are cheap.

5. CONCLUSION AND RECOMMENDATIONS

Bovine cysticercosis presents a great danger to public health as well as to a country's economy. This is particularly true in the developing nation since the knowledge on the dynamics of the diseases is poorly recognized. A 4.5% prevalence rate of bovine cysticercosis infection found in and around Ghimbi in the present study is potentially risk for the people in the study area since there is custom of eating raw meat , moreover, the back yard slaughtering of animals especially during holidays, ignorance incision of meat inspector during meat inspection and lack of sanitation.

Based on the findings of this study the following recommendations are forwarded:

- ❖ There should be a public awareness about the health and economic significance of the disease through the available media.
- ❖ Avoid eating of raw or undercooked meat that is not inspected by well experienced meat inspector.
- ❖ Infected meat and meat products must undergo the process of freezing, boiling or destruction of the cysticercus based on the intensity of infection.
- ❖ There should be strongly and close collaborations between medical and veterinary professionals to reduce the impact of the disease in both human and cattle population.
- ❖ The rural community and some of marginal urban community should construct toilets in order to improve sanitation and hygiene.
- ❖ Prohibition of backyard and home slaughtering.
- ❖ Researches on more sensitive and specific diagnostic techniques as well as vaccine development should be encouraged.

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