



**PREVALENCE AND ECONOMIC IMPORTANCE OF BOVINE HYDATIDOSIS IN  
DEMBI DOLO MUNICIPAL SLAUGHTER HOUSE**

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**ABSTRACT**

*A cross sectional study was conducted from September 2018 to July 2019 to identify bovine hydatidosis causes of organs condemnation and to estimate the direct financial implication due to condemnations of these organs of bovine that were slaughtered at Dembi dolo municipal slaughter house. From the total of 450 cattle examined during standard postmortem inspections of this study revealed that 24 (5.3%) livers, 41 (9.1%) lungs, 6 (1.3%) hearts and kidneys, 8 (1.8%) were condemned based on the principle meat inspection procedures for developing countries as a result of hydatidosis. In this study, organs condemnation rates did not show significant difference ( $P>0.05$ ) among age, sex and body condition groups. The average annual economic losses due to rejection of liver, lung, heart and kidney was estimated to be 26,009.00 ETB. In general, the economic losses encountered as a result of organs condemnation leads to the drawback of livestock industry and national economy of the country. Therefore, attention should be paid for strategic zoonotic diseases (parasitic diseases) control programs and to minimize economic losses at different abattoirs in the country.*

**Key words:** *Condemnation, Dembi dolo, Hydatidosis, Loss, Prevalence*

## 1. INTRODUCTION

Ethiopia owns huge number of ruminants having high contribution for meat consumption and generates cash income from export of live animals, meat, edible organs and skin. Ethiopia's livestock productivity, despite its huge population size, remains marginal due to high prevalence of animal diseases, malnutrition and management constraints. Among animal diseases; parasitism represents a major obstacle to the development of livestock sector and hampers the poverty alleviation programs in livestock farming system in the country (ILRI, 2009).

Hydatidosis is one of the major parasitic diseases having both economic and public health significance. It is associated with severe morbidity and is one of the world's most geographically widespread zoonotic diseases (Craig *et al.*, 2007). The disease is chronic and affects all kinds of food animals, including herbivorous and omnivorous mammals. It is characterized by the formation of variably sized cysts in the visceral organs of the intermediate host and tapeworm in the intestine of the definitive host (Eckert and Thompson, 1994).

It is a zoonotic parasitic infection of many mammalian species caused by the larval stage of *Echinococcus granulosus* (*E. granulosus*). Adult parasites are found in the

small intestine of dogs and other carnivores. Eggs passed in feces infect a large number of mammalian intermediate hosts including sheep, goats, cattle, and camels. The metacestode (larval) stages (hydatid cysts) develop in the liver, lung and occasionally, other organs. The life cycle is completed when organs containing these cysts are consumed by dogs. The adult tapeworm is comparatively harmless to the dog, but its larval stage (hydatid cyst) is a disease of immense medical and economic importance (Eckert and Deplazes, 2004).

The incidence of human hydatidosis and the prevalence of the hydatidosis in domestic animals are the highest in countries where there is a large dog population and high sheep production (Gracey, 1986). In Africa, *E. granulosus* has been recorded from most countries. This disease in ruminants results an enormous economic damage due to condemnation of affected organs and declining of the meat, milk and wool production. The existence of sylvatic cycles perpetuates the disease and creates obstacles for control and eradication programs. Due to this, the risk of infection with *E. granulosus* both in animals and man is expected to be high. The main reason for high transmission of this disease is the habit of keeping dogs in close association with human and the culture of feeding them with inappropriately

disposed offal's from the nearby abattoir. Echinococcosis and its cyst impose an economic and public health problem worldwide and causes particularly heavy burden in developing countries (Urquhart *et al.*, 2003). The absence of proper meat inspection procedures and the presence of large stray dog population are thought to contribute significantly to the prevalence of the disease in Ethiopia (Kebede *et al.*, 2009a).

In Ethiopia, high prevalence of hydatidosis is reported by different researchers in different parts of the country. A review of available literature strongly suggests that fasciolosis exists in almost all parts of the country. It is regarded as one of the major setbacks to livestock productivity, incurring huge direct and indirect losses in the country. Researchers indicated that hydatidosis is widespread in abattoirs of different locations in Ethiopia with great economic and public health importance (Sissay *et al.*, 2008; Kebede *et al.*, 2009, Tadesse *et al.*, 2016). Despite the above studies, on the prevalence and economic significance of bovine hydatidosis, in Ethiopia, its current prevalence and economic significance was not known and no information is available in cattle slaughtered at Dembi Dolo Municipality slaughter house to implement the control

program of the disease. Therefore, the objectives of the current study were to determine the current prevalence of bovine hydatidosis and to assess direct economic loss due to organ condemnation in cattle slaughtered at Dembi Dolo municipal slaughter house.

## **2. MATERIALS AND METHODS**

### **2.1. Study Area Description**

Dembi Dolo is capital of Kelem Welega zone of Oromia region. This town has a latitude and longitude of 8°32'N 34°48'E / 8.533°N 34.800°E with an elevation between 1701 and 1827 meters above sea level. Dembi Dolo is located about 652 km from Addis Ababa, capital of Ethiopia. The annual mean temperature ranges between 15.1-27 °c and the annual mean rainfall ranges 400-2000mm (CSA, 2007).

### **2.2. Study population**

The study animals were comprised of cattle which were slaughtered at Dembi Dolo municipal slaughter house.

### **2.3. Sample Size and Sampling Method**

The sample size was determined by simple random sampling method using 95% confidence interval and was calculated by using the formula given by Thrusfield (2018), with 5% absolute precision and at 50% expected prevalence. To increase sample size, a total of 450 cattle was

inspected during ante mortem and post mortem inspection.

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

Where, N = sample size, P = expected prevalence, d = desired level of precision.

#### 2.4. Study Design

Active abattoir survey was conducted based on cross sectional study during routine meat inspection on randomly selected cattle slaughtered at Dembi Dolo municipal slaughter house.

#### 2.5. Study Methodology

Regular inspection was made to conduct ante mortem examination of animals brought for slaughter and during this time, individual animals were identified with regard to age, origin and body condition score and the results were recorded accordingly. Visceral organs particularly lung, liver and kidney and heart of each study animal was carefully examined for presence of lesions suggestive of Hydatidosis infection by inspection and palpation externally and by incision for confirmation.

#### 2.6. Economic Analysis

Direct economic losses from hydatidosis was assessed by calculation based on cost of condemned organs (lung, liver, kidney and heart). Then, the financial implication/

economic losses were computed mathematically from the above three information by modifying formula set by Ogunrinade and Ogunrinade (1980) for liver rejection. This formula is given as follows:

$$EL = \Sigma Srx * Coy * Roz$$

Where:

EL = Annual economic loss estimated due to organ condemnation

$\Sigma Srx$  = Annual cattle slaughter rate of the abattoir

Coy = Average cost of each cattle liver/lung/ heart/ kidney

Roz = Condemnation/rejection rates of cattle liver/lung/heart/kidney

#### 2.7. Data Analysis

The data was recorded during the study period and was enter into Microsoft excel sheet. Data was summarized and analyzed using statistical package for social sciences (SPSS) version 21 computer program. The Pearson's chi-square ( $X^2$ ) test at a significance level of 95% CI was used to determine the differences in the prevalence of Hydatidosis infection among cattle from different origin, between different ages and among different body conditions. The difference was considered as statistically significant if the p- value was less than 0.05.

### 3. RESULTS

Out of 450 cattle examined 60 (13.6%) were found to be positive for hydatidosis.

Animals that have passed ante mortem inspection were subjected to PMI. From the total of organs examined during postmortem inspection, 24 (5.3%) lungs, 13 (2.9%) livers, 2 (0.4%) kidneys, 2 (0.4%) hearts, 9 (2.0%) lungs and livers, 4 (0.9%) lungs and kidneys, 4 (0.9%) lungs and heart and 2 (0.4%) livers and kidneys were condemned/rejected as unfit for human consumption (Table 1).

A total of 450 of cattle slaughtered at Dembi dolo municipality abattoir, which were 14 (12.6%) young and 46 (13.6%) adult animals were found to be positive for hydatidosis. Relatively higher number of lungs were rejected in adult than young animals (Table 2).

The rate of overall organ condemnation as a result hydatidosis was relatively higher in cattle with poor body condition 15 (27.8%) followed by overall organ condemnation of cattle with medium body condition 37 (12.6%) (Table 3).

The annual slaughter rate of abattoir was estimated to be 3100 cattle (obtained from retrospective abattoir records of the past three years). Therefore, the direct annual

economic loss due to condemnation of organs was calculated based on the current average market price per organ at the local area, Dembi dolo town as indicated in (Table 5) below.

The economic loss has been calculated on the basis of wholesome and intact visceral organs i.e. lung, liver, heart and kidney. The average price of each organ was 30, 80, 40, and 50 ETB (Ethiopian birr) (1 USD= 34 Ethiopian birr) respectively during the study period.

Finally, using all the above essential information, which were recorded during data collection period and the formula specified by Ogunrinade and Ogunrinade (1980), the total direct annual economic losses due to rejection of liver, lung, heart and kidney at Dembi dolo municipal abattoir was estimated to be 26,009.00 Ethiopian Birr. In this study, higher economic losses were encountered from liver condemnation 13,144.00 Ethiopian Birr and followed by economic losses from lung condemnation 8,463.00 Ethiopian Birr due to Hydatid cyst (Table 5).

**Table 1:** Overall organs condemnation by hydatidosis in cattle slaughtered that were recorded during postmortem inspections.

Condemned Organs	Frequency (n=450)	Percentage (%)
Lung only	24	5.3
Liver only	13	2.9
Kidney only	2	0.4
Heart only	2	0.4
Lung and liver	9	2.0
Lung and Kidney	4	0.9
Lung and heart	4	0.9
Liver and kidney	2	0.4
Overall	60	13.6

**Table 2:** Distributions of numbers and rates of hydatidosis in cattle slaughtered that were recorded during postmortem inspections according to age of animals.

	Young (n=111)		Adult (n=339)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Lung only	3	2.7%	21	6.2%
Liver only	4	3.6%	9	2.7%
Kidney only	1	0.9%	1	0.3%
Heart only	1	0.9%	1	0.3%
Lung and liver	2	1.8%	7	2.1%
Lung and Kidney	1	0.9%	3	0.9%
Lung and heart	2	1.8%	2	0.6%
Liver and kidney	0	0.0%	2	0.6%
Overall	14	12.6%	46	13.6%

**Key:** (n= represent frequency of lesions occurrence)

**Table 3:** Distributions of numbers and rates of hydatidosis in cattle slaughtered that were recorded during postmortem inspections according to body condition scores of animals.

	BCS					
	Poor (n=54)		Medium (n=293)		Good (n=103)	
	Frequency	Percentage (%)	Frequency	Percentage (%)	Frequency	Percentage (%)
Lung only	7	13.0%	14	4.8%	3	2.9%
Liver only	3	5.6%	7	2.4%	3	2.9%
Kidney only	0	0.0%	2	0.7%	0	0.0%
Heart only	0	0.0%	1	0.3%	1	1.0%
Lung and liver	2	3.7%	6	2.0%	1	1.0%
Lung and Kidney	1	1.9%	3	1.0%	0	0.0%
Lung and heart	1	1.9%	3	1.0%	0	0.0%
Liver and kidney	1	1.9%	1	0.3%	0	0.0%
Overall	15	27.8%	37	12.6%	8	7.8%

**Key:** (n= represent frequency of lesions occurrence)

**Table 5:** Distribution of organs, causes of condemnation, total rejection rates, average current market price and money losses due to rejection of these organs.

Organs	Total rejection of each organ	Average current market price	Annual slaughter rates of cattle	Money losses in ETB
Lung	41 (9.1%)	30.00 birr	3100	8463.00
Liver	24 (5.3%)	80.00 birr	3100	13144.00
Heart	6 (1.3%)	40.00 birr	3100	1612.00
Kidney	8 (1.8%)	50.0 birr	3100	2790.00
<b>Total</b>				<b>26,0009.00 ETB</b>

**Table 4:** Distributions of numbers and rates of hydatidosis in cattle slaughtered that were recorded during postmortem inspections depending on origin of animals

condemned organ	Origin of animals					
	Dembi dolo (n=178)		Machera (n=134)		Gambela (n=138)	
	Frequency	Percentage (%)	Frequency	Percentage (%)	Frequency	Percentage (%)
Lung only	11	6.2%	4	3.0%	9	6.5%
Liver only	2	1.1%	7	5.2%	4	2.9%
Kidney only	1	0.6%	0	0.0%	1	0.7%
Heart only	2	1.1%	0	0.0%	0	0.0%
Lung and liver	4	2.2%	1	0.7%	4	2.9%
Lung and Kidney	3	1.7%	1	0.7%	0	0.0%
Lung and heart	1	0.6%	2	1.5%	1	0.7%
Liver and kidney	2	100.0%	0	0.0%	0	0.0%
Overall	26	14.6%	15	11.2%	19	13.8%

**Key:** (n= represent frequency of lesions occurrence)

#### 4. DISCUSSION

In this present study, the total of prevalence of 13.3% of bovine hydatidosis was obtained from (5.3% liver, 9.1% lung, 1.3% heart, and 1.8% kidney) condemnation out of 450 cattle slaughtered at Dembi dolo municipality abattoir. In the present study, bovine hydatidosis prevalence is a relatively lower when compared with the prevalence of previous findings of bovine hydatidosis in Ethiopia; for instance, at Assella municipal abattoir (Wasihun, 2012), at Addis Ababa abattoir (Tilahun, 2011), at Bahir Dar municipality abattoir (Asmare *et al.*, 2012), at Gonder Elfora (Yifat *et al.*, 2011), at

Ambo municipality abattoir (Endalew and Nuraddis, 2013), and at Asella municipality abattoir (Miruk, 2005), at Nazareth abattoir (Shiferaw, 2002) and at Gonder Elfora abattoir (Endalew and Nuraddis, 2013) with the prevalence of 62.38%, 23.7%, 35.7%, 24.7%, 29.69%, 52.75%, 54% and 28% respectively. On the other hand, the present-day study finding of bovine hydatidosis was comparable with a previous finding of studies on bovine hydatidosis, at Kombolcha Elfora abattoir (Fufa *et al.*, 2012), 12.17%. This variation in prevalence of bovine hydatidosis is more probably as a result of the difference in origin of animal for



slaughter, change in environmental and epidemiological factors, which could affect the rate transmission of hydatidosis. In addition, the age of animals brought for slaughter and difference in socio-cultural structure and the degree of association among the society, livestock and dogs are also contribute to difference in prevalence of bovine hydatidosis.

In agreement with different researchers reported that liver and lung were the commonly affected organs by hydatid cyst (Bizuwork *et al.*, 2013). The reason is explained by Gracey (1986) in that liver and lung contain the highest capillary bed in the body and the majority of oncospheres are filtered out and trapped in the fine blood capillaries of these organs and small number of oncospheres reached the remaining organs.

The direct abattoir loss due to condemnation of liver, lung, heart and kidney, in the present-day study was calculated using the formula specified by (Orgunrinade and Orunrined, 1980), which was 26,009 ETB of the total direct economic abattoir annually in average (Table 5). In general, this much of economic loss for this is too much high. However, the average annual economic loss encountered in this study area is relatively lower than the different previous studies of economic loss findings from Ambo

municipal Abattoir (Workineh *et al.*, 2020). The differences in the amount of money lost in various meat industries could be attributed to differences in the prevalence of diseases, difference in the rejection rate of organs, difference in the slaughtering capacity of abattoirs and also variations in the management of animals in different part of the country (Amene *et al.*, 2012).

## 5. CONCLUSION

During this present study, postmortem inspection of visceral organs revealed that a significant number of organs were condemned from the cattle slaughtered at Dembi dolo municipal abattoir as a result of gross pathological lesions caused by hydatidosis. Hydatidosis causes considerable economic loss in livestock due to condemnation of organs. It is well known that an efficient meat inspection service should function as an important monitoring agent in the control of animal diseases with considerable economic and public health significance mainly in cases of chronic and ill-defined conditions which are not apparent either to the livestock owners or Veterinary surgeon. More importantly a feedback from the slaughterhouses to the individual farm is of great value in the field of preventive medicine. Therefore, the establishment of well-equipped standardized abattoirs, veterinary professional provides public

awareness in terms of knowledge of zoonotic importance of hydatidosis and control of stray dogs in order to minimize the risk of acquiring most important zoonotic diseases are paramount importance.

#### **Conflict of interests**

The authors have no conflict of interest regarding the publication of this paper.

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#### **Authors' contributions**

**Dame, M.** conceived the study, coordinated the overall activity, and carried out the statistical analysis, drafted the manuscript.

**Abdisa, E., Sidise, M., Bekuma, F.** and **Belayineh Tsegaye.** were carried out the statistical analysis, drafted the manuscript, edited and reviewed the manuscript.

**All authors** read and approved the final manuscript.

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