



Research Paper

**ECONOMIC LOSS CAUSED BY ORGAN CONDEMNATION IN CATTLE
SLAUGHTERED AT HAWASSA MUNICIPAL ABATTOIR, SOUTHERN
ETHIOPIA**

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Abstract

A cross-sectional study was conducted from December 2017 to March 2018 to estimate the direct economic loss due to condemnation of edible organs during meat inspection and to identify the major causes of organ condemnation in cattle slaughtered at Hawassa municipal abattoir. A total of 600 cattle were examined by antemortem and post mortem inspections using standard inspection procedures. During antemortem inspection, the abnormalities encountered were blindness 5 (0.8 %), depression 7(1.2%), lameness 7 (1.2%), Diarrhea, 3(0.5%), Hernia 4(0.7%), rough hair coat 8(1.3%), Salivation 8(1.3%), nasal discharge 9(1.5%), and emaciation 39(6.5%). Postmortem examination revealed that there were 146 (24%) hydatid cysts, 107 (17.8%) fasciolosis, 22(3.7%) cirrhosis, 89(14.8%) calcification, and 8 (1.3%) discolorations in the liver. Hydatid cyst was the main cause of liver condemnation followed by Fasciolosis, calcification, cirrhosis, and discoloration respectively. The major causes of lung condemnation were hydatid cyst, 234(39%), emphysema, 81(13.5%), and pneumonia 57 (9.5%) respectively. The carcasses were condemned mainly due to *C. bovis* 1(0.17%) and Tuberculosis (TB) 1 (0.17%). The condemned tongue was affected by *c. bovis* 5(0.8%). An estimated annual loss of 2, 587, 807.75 Ethiopian Birr was incurred due to condemnation of these organs. Fasciolosis and hydatidosis were found to account 17.8% and 63.5% of all the losses. The findings showed that the rate of organ condemnation at the abattoir was very high which signifies the need for prompt disease control programs to be implemented.

Key words: Ante Mortem, Cattle, Economic Loss, Organ Condemnation, Post mortem.

INTRODUCTION

Developing countries in the world have about two third of the world's livestock population [1]. Ethiopia is one of developing countries and has the largest livestock population in Africa with an estimated population of 53.99 million cattle, 25.5 million sheep, 24.06 million Goats, 1.91 million horse, 6.75 million donkeys, 0.35 million mules, 0.92 million camels and 50.38 million poultry [2]. Ethiopia's great livestock potential is not properly exploited due to different factors such as traditional management system, limited genetic potential, lack of appropriate disease control policy and lack of appropriate veterinary services. Each year a significant loss results from the death of animals, inferior weight gain, condemnation of edible organs and carcass at slaughter [3]. Animal diseases are considered as a major health problem and cause a significant economic loss in countries where livestock production is an important segment of the agricultural practice [4].

Abattoir data can be a source of valuable information on the incidence and epidemiology of animal diseases conditions, to know to what extent the public is exposed to certain zoonotic diseases and estimate the financial losses incurred through condemnation of affected organs and carcasses [5]. Meat inspection is commonly perceived as the sanitary and safety control of slaughter animals and meat. Antemortem and post mortem examinations of animals slaughtered in abattoirs give a good opportunity to identify the most important diseases prevalent in the animal's source region [6]. The inspection of meat conducted in the abattoir is for the purpose of screening animal products with abnormal pathological lesions that are unattractive and unsafe for human consumption, to protect public health and to provide risk-free products to the society. Also, it provides information that can be utilized for animal diseases control option, for detecting diseases of both economic and public health importance [7].

Diseased or animals showing a sign of abnormality during antemortem inspection should not be allowed to enter the abattoir for slaughter [8]. Post-mortem inspection is a screening or sorting process to separate the normal from abnormal. It is the center around which meat hygiene revolves since it provides information indispensable from the scientific evaluation of clinical signs and pathological process that affect the wholesomeness of meat [9]. Routine post-mortem inspection of a carcass and organs

should be carried out as soon as possible after completion of dressing and prevent the distribution of infected meat [10, 11].

Most of the abattoir studies undertaken in Ethiopia were on the prevalence of Fasciolosis, *Cysticercus bovis* and hydatidosis and the extent of losses from organs condemnation due to these reasons in different parts of the country [8]. Most of the studies did not include other major problems of condemnations in different parts of the country. This is also true in Hawassa town. Hence, the present study was conducted to investigate the major causes of organ condemnation in cattle slaughtered in Hawassa municipal abattoir, to estimate the annual economic losses encountered due to organs condemnation.

MATERIALS AND METHODS

Study Area

The study was carried out in Hawassa city in southern Ethiopia which is situated 275 km south of Addis Ababa located between 4° 27' and 8° 30'N latitude and 34° 25' and 39° 1' E longitude. The altitude ranges from 1650 to 1700 meters above sea level. The mean annual rainfall and temperature are 900-1100 mm and 27°C, respectively [12].

Study Population

The study population was cattle which come to Hawassa municipal abattoir for slaughtering and majority of the cattle were brought to the abattoir from Tula, Hawassa, Negele areas, but some are from Harrar, Nazret, and Alagie.

Study Design

A cross-sectional study was employed to identify the major cause of organ condemnation in Hawassa town municipal abattoir and to evaluate the direct financial losses incurred due to organ condemnation. The systematic random sampling method was employed to include the representative cattle from those slaughtered cattle during the study period. Economic loss due to condemnation was also calculated.

Sample size and sampling method

The study animals were selected using a simple random sampling method and origins of the animals were taken into consideration. The desired sample size was calculated using the standard formula described by Thrusfield [13] for a simple random sampling method as follows;

$$N = \frac{(1.96)^2 \cdot p(1-p)}{d^2}$$

Where;

N = Sample size

p = Expected prevalence (50%)

1.96 = the value of Z at 95% confidence level

d = Desired absolute precision = 5%

Therefore, the sample size required as per the above formula was 384 heads of cattle. However, in the current study, a total of 600 cattle were included to increase the precision.

Data collection

During antemortem inspection, each animal was enumerated on its body surface using ink. A total of 600 cattle were subjected to a complete antemortem examination (AMI) in the abattoir prior to slaughter. Inspection of the animals was made while animals are at rest or in motion for any obvious sign of diseases and abnormalities and recorded according to the standard antemortem inspection procedures [6]. Before conducting the postmortem examination, the identification marks done in the antemortem examination was transferred to all organs that are going to be examined by postmortem examination. Organs and carcasses were examined thoroughly using visual inspection, palpation and systematic incision of each organ and carcass for the presence of abnormalities. Pathological lesions were differentiated and judged according to the guideline of meat inspection for developing countries [10].

Economic Loss Analysis

To analyze financial loss due to organ condemnation, the average annual slaughter capacity of the abattoir, the average market price of each organ in Hawassa city and the rejection rate of each organ were used. The average market price was also determined by interviewing different butchers. The financial loss due to the condemnation of organs was estimated by the formula given by Ogunrinade [14] as follows.

$$EL = \Sigma sr_x \cdot Coy \cdot Roz$$

Where

EL = Annual economic loss estimated due to organ condemnation

Σsr_x = Annual cattle slaughter rate of the abattoir.

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

Roz = Condemnation rate of each cattle liver/lung/heart/kidney/tongue/spleen/carcass.

RESULTS

Out of 600 cattle examined upon antemortem examination, various types of abnormalities were detected on 83 (13.8%) of cattle. As indicated in Table 1 below, the abnormalities identified during antemortem examination with their decreasing order were emaciation 39 (6.5%), nasal discharge 9 (1.5%), salivation 8 (1.3%), rough hair coat 8(1.3%), lameness 7(1.2%), depressed 7 (1.2%), blindness 5(0.8%), hernia 4 (0.7%), and diarrhea 3 (0.5%) (Table 1).

Table 1: Rate of abnormalities encountered during antemortem inspection in cattle slaughtered at Hawassa municipal abattoir

Abnormalities encountered during AME	Number of affected animals	Percentage (%)
Emaciation	39	6.5
Nasal discharge	9	1.5
Salivation	8	1.3
Rough hair coat	8	1.3
Lameness	7	1.2
Depression	7	1.2
Blindness	5	0.8
Hernia	4	0.7
Diarrhea	3	0.5
Total	83*	13.8

* Since some animals were affected by more than one problem, the total number of animals affected was obtained by avoiding repeated counting for each case

The postmortem examination result shows 24% (146) of liver were affected by hydatid cyst, 17.8% (107) by Fasciolosis, 14.8% (89) by calcification, 3.7% (22) by cirrhosis and 1.3% (8) by discoloration. The major causes of lung condemnation were hydatid cyst, 234 (39%), emphysema, 81 (13.5%) and pneumonia 57 (9.5%). Furthermore, the total rejection rate of the lung during the study period for a different reason was 54.3%. Out of the total examined hearts, only 3(0.5%) were affected by hydatid. The whole carcass of one animal was totally condemned due to *C. bovis* and similarly, the carcasses of one animal were totally condemned due to generalized Tuberculosis at the current study (Table 2 and 3).

Table 2. Organ condemnations rate due to different Cause

Cause Of Condemnation	Organ Condemned (N = 600)											
	Carcass		Heart		Liver		Lung		Spleen		Tongue	
	n	%	n	%	n	%	n	%	n	%	n	%
Abscessation	-	-	1	0.17	-	-	-	-	-	-	-	-
Calcification	-	-	-	-	89	14.8	-	-	2	0.3	-	-
Cirrhosis	-	-	-	-	22	3.7	-	-	-	-	-	-
<i>Cysticercus bovis</i>	1	0.17	-	-	-	-	-	-	-	-	5	0.8
Discoloration	-	-	-	-	8	1.3	-	-	-	-	-	-
Emphysema	-	-	-	-	-	-	81	13.5	-	-	-	-
Fasciolosis	-	-	-	-	107	17.8	-	-	-	-	-	-
Hemorrhage	-	-	-	-	-	-	-	-	2	0.3	-	-
Hydatid cyst	-	-	3	0.5	146	24%	234	39	-	-	-	-
Pneumonia	-	-	-	-	-	-	57	9.5	-	-	-	-
Tuberculosis	1	0.17	-	-	-	-	-	-	-	-	-	-
Total	2	0.33	4	0.67	372	62	372	62	4	0.6	5	0.8

Table 3: Analysis of organ condemnation rates and the corresponding annual financial loss (average number of cattle Slaughtered per year = 18,500)

Organ	Causes of Condemnation	Rejection rates (%)	Annual loss (ETB)
Liver	Hydatid cyst	24	399,600
	Fasciolosis	17.8	296,370
	Calcification	14.8	246,420
	Cirrhosis	3.7	61605
	Discoloration	1.3	21645
Lung	Hydatid cyst	39	505,050
	Emphysema	13.5	174,825
	Pneumonia	9.5	123,025
Heart	Hydatid cyst	0.5	4162.5
	Abscessation	0.17	1,415.25
Carcass	<i>Cysticercus bovis</i>	0.16	444000
	Tuberculosis	0.16	444000
Tongue	<i>Cysticercus bovis</i>	0.8	5920

† The total no of liver and lung rejection rate during the study period was calculated by avoiding repeated counting of organs affected by more than one condition

Table 4: Financial loss per annum due to the condemnation of organs (average cattle slaughtered per year = 18,500)

Organs affected	Rejection rate (%)	Average price of an organ	Annual loss in each organ
Carcass	0.33	15,000	915750
Heart	0.67	45	5577.75
Liver	57.5	90	957375
Lung	54.3	70	703,185
Tongue	0.8	40	5920
Total loss			2,587,807.75 ETB

According to the data collected from Hawassa town butchery shops, the mean current prices of visceral organs for liver, lung, heart, and tongue was 90, 70, 45, and 40 Ethiopian Birr, respectively. In Hawassa town a cattle with good body condition on

average can cost about 15, 000 Ethiopian Birr. Based on the information gained from the abattoir personnel, the mean numbers of cattle slaughtered per annum in Hawassa municipal abattoir was estimated to be 18,500. Thus, the total annual direct financial loss incurred due to the rejection of visceral organs and carcass condemnations was 2, 587, 807.75 Ethiopian Birr/year (Table 4).

DISCUSSION

The current study showed that fasciolosis, hydatid cyst, *Cysticercus bovis*, pneumonia, emphysema, cirrhosis, calcification, TB and Abscessation were the major causes of organs condemnation and associated economic loss in cattle slaughtered at Hawassa municipal abattoir. Out of the total 600 cattle examined in postmortem, 345 (57.5%) livers, 326 (54.3%) lungs, 5(0.8%) Tongues and 4 (0.7%) hearts were condemned due to various causes. The rejection rates of the liver in the current study were lower than the rate reported by Nurit *et al.* [15] from Kombolcha and Amene *et al.* [4] from Jimma municipal abattoir who reported, 66.55%, and 64.4% respectively. But it was observed higher as compared with studies conducted by Yifta *et al.* [16] from Gonder, and Hassan *et al.* [17] from Iran with a rate of 31.1%, and 7.9% respectively. The rejection rate of lung in the current finding was higher than reports by Genet *et al.* [18] at Gondar, Asmare *et al.* [19] at Bahir Dar and Amene *et al.* [4] at Jimma municipal abattoirs with a rejection rate of 19.68%, 25.8%, and 46.2% respectively. The rejection rates of hearts in the current study were lower than the rejection rate of 11% that reported by Amene *et al.* [4] from Jimma and 3.71% by Shagaw *et al.* [20] from Mekelle abattoirs. Variations in the rejection rate of organs might probably due to differences in agro-ecological conditions that favorable to the parasites, livestock management system and prevalence of diseases at the different study sites. The current finding showed that hydatid cyst (24%) was the main cause of liver condemnation. This finding was higher than the previous studies conducted by Gebretsadik *et al.* [21] who reported 12.56% from Tigray. But lower than that 33.33% from Dire Dawa, by Zelalem *et al.* [22], and 31.7 % from Addis Ababa by Asmare *et al.* [19]. Fasciolosis (6.7%) was the second main cause of liver condemnation which was lower than reports at Jimma abattoir by Tadelle [23], at Gondar by Genet *et al.* [18] and at Kombolcha by Nurit *et al.* [15] who reported 63.89, 48.5 and 36.06 % respectively. Losses from liver condemnation were generally associated with the infection of public health importance and aesthetic reasons [24].

Liver condemnation due to cirrhosis in the present study (2.3%) was relatively higher than the report of Denberga *et al.* [25] who reported 1.1% rate of rejection for cattle slaughtered in Gondar abattoir but lower than report by Alawa *et al.* [26] in which 12.8% rate of rejection was found from cattle slaughtered in Nigeria.

Hydatid cyst found to be the main cause of lung condemnation with a rate of 39% which was much higher, than reports from Mekelle, Ambo, Nekemte and Dire Dawa abattoirs by Gebremeskel and Kalayo [27], Endrias *et al.* [28], Fufa *et al.* [29] and Mihret *et al.* [30]. The study revealed that the rejection rate of lung due to emphysema was 13.5% which was higher than the rate reported by Yifat *et al.* [16] who reported 1.5% rejection rate from Gondar, Amene *et al.* [4] who reported the rate of 6.77% from Jimma and Genet *et al.* [18] who reported the rejection rate of 10.5% from Gondar abattoirs. Another cause of lung condemnation was pneumonia and it was observed at a rate of 9.5 %. This finding was lower than the finding reported by Genet *et al.* [18] who reported 12.45% in cattle slaughtered from Gondar abattoir whereas, a higher rejection rate of 31.02% rate was reported for cattle slaughtered in Nigeria by Cadamus and Adesokan [31] The observation of Emphysema and pneumonia in the current study area could be due to exposure of cattle to bacterial or viral origin infections, stressor factors including exposure to dust and starvation. Moreover, penetration of lung by a foreign body, adverse weather condition or accidental inhalation of liquid may cause pneumonia [31].

The total economic loss incurred due to the condemnation of organs in Hawassa municipal abattoir was 2, 587, 807.75 Ethiopian birr annually. The current finding was higher than the annual loss of 178,274.90 Ethiopian Birr reported from Asella municipal abattoir by Kumbe [32] and nearly similar to the annual loss of 2,535,022.42 Ethiopian Birr/year reported by Tilahun *et al.* [33] from the current study area. However, the annual loss incurred in the current study was lower than the loss of 3,522,005 Ethiopian Birr reported by Desie and Kedir [34] from Kombolcha ELFORA abattoir. The economic losses variation observed in different parts of the country might be due to differences in animal management systems, disease prevalence, slaughtering capacity of the abattoir, rejection rates of organs, and local market prices of organs in the respective study areas.

CONCLUSIONS

The current study revealed different causes of organ condemnation lead to a huge amount of financial losses in cattle slaughtered at Hawassa municipal abattoir. As the finding revealed, the estimated annual financial loss from organ condemnation was 2, 587, 807.75 Ethiopia Birr. This overall the total economic loss incurred due to organ and carcass condemnation was high and significantly affect the economy of the country. In light of this conclusion, the proper management of animals, routine follow-up of animal health and awareness creation for animal owners should be conducted at the area.

ACKNOWLEDGMENT

The authors are grateful for the technical assistance rendered by meat inspectors in the study area during data collection.

CONFLICT OF INTEREST:

The Authors declare that there is no conflict of interest regarding the publication of this work.

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