

Research Article

Financial Loss Caused by Organ Condemnation in Cattle Slaughtered at Asella Municipal Abattoir

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• Asella abattoir; Organ condemnation; Financial loss

Abstract

A cross sectional study was carried out on cattle slaughtered at Asella municipal abattoir from November 2015 to April 2016 with the aim of determining the major causes of organ condemnation and estimate associated financial loss. A total of 600 randomly selected cattle were managed through ante-mortem and post-mortem examinations. From the total cattle inspected at ante-mortem examination 57 (9.5%) were found affected with different abnormal physical conditions. Majority of pathological lesions rendering organ condemnation in the abattoir were attributed to parasitic diseases accounting for 300 (50.0%) of major causes of organ condemnation followed by miscellaneous lesions contributing for 180 (30.0%) of losses. On the basis of organ condemnation rate recorded during the study period an estimated annual financial loss of 178,274.90 ETB was inevitably incurred due to rejection of organs. Conclusively parasitic diseases were the common causes of organ condemnation at Asella abattoir indicating that cattle owners should get awareness on management of parasitic diseases to decrease its burden and associated loss in their animals. Furthermore, abattoir workers and butchers should get relatable training to implement proper examination and disposal of organs condemned during meat inspection.

INTRODUCTION

The livestock sector is highly dynamic globally, contributes forty percent of the global value of agricultural output, and support the livelihoods and food security of almost a billion people [1]. In Ethiopia, livestock production is an integral part of the agricultural system. The livestock sub sector accounts for forty percent of the agricultural gross domestic product (GDP)

Livestock and livestock products are the major foreign exchange earns in Ethiopia. The only second to coffee with hides and skins contributing the most. However, the overall livestock production constraints in Ethiopia are feed shortages, livestock diseases, low genetic potential of indigenous livestock, and lack of marketing infrastructure and water shortages. The production loss to the livestock industry is estimated at more than 900 million USD annually [2].

Abattoirs provide excellent opportunities for detecting diseases of both economic and public health importance. In abattoirs of various locations, researchers indicated that hydatidosis is widespread in Ethiopia with great economic and public health significance [3].

The primary aim of the abattoir is to produce healthy meat, wholesome and clean products that are safe for human consumption.

Ante-mortem inspection attempts to avoid introduction of clinically diseased animals into the slaughterhouse and serves to obtain information that will be useful in making sound post-

mortem inspection [4]. Postmortem inspection is a screening or sorting process devoted to separate the normal from abnormal meat. A proper postmortem inspection is important to detect and eliminate abnormalities, including contaminations, thus ensuring the hygiene of meat that fits the basic requirements for human consumption [5]. The decision whether meat fits to appropriate standard for human consumption or not requires utilizing many skills of observation and evaluation [6].

Each year a significant economic loss results from mortality, poor weight gain, condemnation of edible organs and carcasses at slaughter. Apart from this economic loss, diseases that occur in livestock have public health impact. The final judgment as to be taken with an organ or part of it is based on the total evidence produced by observation, palpation and incision of each organ and carcasses, any ante-mortem signs and the result of any laboratory test.

Major parasitic disease such as fasciolosis, hydatidosis, cysticercosis and other causes like abscessation and cirrhosis are of great public health concern and cause significant economic losses by lowering productivity of cattle and condemnation of edible organs [7] Studies conducted in different abattoirs of Ethiopia revealed that parasitic infection of livers, lung (pneumonia), pericarditis and hydronephrosis are the major cause of organs condemnation [8].

Echinococcosis is a major public health problem in some countries, and it may be emerging or re-emerging in some areas. Cysts or lesions of *Echinococcosis multilocularis* occur

primarily in the liver, grow slowly and occasionally rupture and cause severe allergic reactions in humans [9]. Echinococcosis is a near-cosmopolitan zoonosis caused by adult or larval stages of tapeworms (cestodes) belonging to the genus *Echinococcus* (family Taeniidae). *Echinococcus* is a cestode whose life cycle involves dogs and other canids as definitive hosts for the intestinal tapeworm as well as domestic and wild ungulates as intermediate hosts for the tissue-invading metacestode (larval) stage. Larval infection (hydatid disease, hydatidosis) is characterized by long-term growth of metacestode (hydatid) cysts in the intermediate host.

Bovine cysticercosis formerly known as beef measles causes small cysts in the muscles of cattle and their presence can lead to all or part of the carcass being condemned. Cattle become infected with get *Cysticercus bovis* from ingesting foodstuffs contaminated with eggs passed from humans [7]. Bovine cysticercosis has little effect on animal health; but the adult tapeworm in man cause diarrhea, hunger pain, abdominal discomfort, constipation and nausea [10]. Fasciolosis is an important parasitic disease of domestic ruminants caused by two liver fluke species: *Fasciola hepatica* and *Fasciolagigantica* (Trematoda). *Fasciola hepatica* has a cosmopolitan distribution, mainly in temperate zones, while *Fasciolagigantica* is found in tropical regions of Africa and Asia [11]

Emphysema refers to an excessive abnormal permanent accumulation of air in the lungs. Bovine emphysema can be excessive amounts of air pressure or secondary to either chronic bronchitis or bronchiolitis that causes obstruction of airways on expiration due to exudates plugging airway passages [12] Congestion is an excess of blood contained within blood vessels in a part of the body due to a passive process. A dark blue red tinge, swollen and cooler than normal of lung was inspected and the cut surface of such tissues oozes blood freely. [13]: Cirrhosis of liver is a condition in which the liver slowly deteriorates and is unable to function normally due to chronic, or long lasting, injury. Scar tissue replaces healthy liver tissue and partially blocks the flow of blood through the liver [14].

Most of the abattoir studies undertaken on prevalence of fasciolosis and hydatidosis and the extent of loss from organs condemnation in different parts of Ethiopia as reported by Even though in many parts of Ethiopia, studies have been carried out to identify the major causes of organ condemnation during postmortem inspection, there is no enough information on the major causes of organ condemnation and their economic importance at Asella municipal abattoir. Therefore, the objectives of this research were to determine the major causes of organ condemnation and estimate associated direct economic losses in cattle slaughtered at Asella municipal abattoir.

MATERIALS AND METHODS

Study area

The study was conducted from November 2015 to April 2016 at Asella municipal abattoir in Asella town. Assela is a town and separate woreda in central Ethiopia, located in the Arsi Zone of the Oromia Region state, which is about 175 kilometers from Addis Ababa. The town has a latitude and longitude of 7°57'N 39°7'E, with an elevation of 2,430 m.a.s.l. Asella was the capital

town of Arsi Zone of Oromia regional states and characterized by mid subtropical temperature ranging from 5°C-28°C. The annual average rainfall is 1200 mm and mostly with clay type of soil and in rare case black soil.

Study population

The study animals were animals brought to the abattoir for slaughter from different districts in and around Asella town and it include both sexes weather they are local or cross breed.

Sampling

Sample size determination: Random sampling method was employed for determining the prevalence of fasciolosis, hydatidosis, and other visceral abnormalities like Calcification, Abscessation, Cirrhosis, Congestion and Emphysema among cattle and the magnitude of direct monetary loss due to organ condemnation. To calculate the total sample size, the following parameters were used: 95% level of confidence (CL), 5% desired level of precision and with expected prevalence of 50% of cattle slaughtered in Asella municipal abattoir, the sample size was determined using the formula given in [15].

$$n = (1.96)^2 \frac{p}{d^2}$$

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%

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

Sampling method: Random sampling technique was used to select animals and to determine the prevalence and monetary loss due to presence of Fasciolaspp, hydatid cyst, *Cysticercus bovis*, and other abnormalities among cattle slaughtered in Asella municipal abattoir during the study period.

Study design

A cross-sectional study design was employed from November, 2015 to April, 2016 in Assela town in Asella municipal abattoir to identify the prevalence of fasciolosis, hydatidosis, and other visceral abnormalities including Calcification, Abscessation, Cirrhosis, Congestion and Emphysema. A total of 600 cattle animals were randomly selected and their organs were routinely examined by ante mortem and post mortem examination using standard examination procedures.

Study methodology

Ante mortem examination: Ante mortem examination was carried out on individual animal in the lairage. Inspection of the animals was made while at rest or in motion for any obvious sign of disease and abnormality following the guidelines [16]. During

antemortem inspection, each of study animals was identified by making numbers on their body with a color marker. Origin, Breed, body condition scoring (BCS), Sex and Age of animals were recorded. BCS was categorized into three groups: poor (0 and 1), medium (2 and 3) and good (4 and 5) which is determined by observation of the anatomical features (back and flank) of the cattle based on the guidelines [17]. Estimation of age was carried out by dental eruption and wears examination according to and categorized into young and adult [18]. Both sides of the animal were inspected at rest and in motion. Moreover, the general behavior of the animals, nutritional status, cleanliness and signs of disease or abnormality were registered. Judgment was done based on the procedure given by [19].

Postmortem inspection: Post-mortem examination was done on all animals that passed ante-mortem inspection. During postmortem inspection liver, lungs, heart, kidney, brain and carcasses were thoroughly inspected by visualization, palpation and making systemic incisions where necessary for the presence of cysts, parasites and other abnormalities. Pathological lesions were differentiated and judged according to guidelines on meat inspection for developing countries [4] and the results were recorded on the predesigned data collection format. The decisions at postmortem inspection were classified in to the following categories of judgments: approved as fit for human consumption, conditionally approved as fit for human consumption, totally condemned as unfit for human consumption and partially condemned as fit for human consumption [20]. The carcasses of cattle slaughtered were thoroughly and systematically inspected by visual examination, palpation and incision using the methods as described by [21].

Assessment of economic loss

The economic losses from organ rejection were calculated by considering the overall mean price of organs. Market prices of organs were obtained from recorded data and cattle butcher houses. An estimated economic loss due to condemnation of organs was calculated and economic loss due to partial condemnation was calculated by 50% of organ was trimmed out and half of organ was passed according to the formula of Ogunrinade and Ogunrinade (1980) as follows: $EL = Srx \times Coy \times Roz$

Where: EL = Annual economic loss estimated due to organ condemnation

Srx = Annual number of cattle slaughtered at the abattoir.

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

Roz = Condemnation rate of each liver/ lung/heart/ kidney/

Data management and analysis

Raw data obtained was entered and stored in a Microsoft excel 2010 spread sheet computer program and summarized. The data were analyzed by using SPSS version 20 software of the computer programmed for the statistical analysis.

RESULTS

Out of a total of 600 cattle inspected at ante-mortem examination 57 (9.5%) were found affected with different

abnormal physical conditions (Table 1) which did not essentially exclude them from slaughter.

All animals passed ante-mortem examinations were slaughtered and major organs involving lungs, liver, heart, kidneys, spleen and muscles were inspected and the major causes of organ condemnation are summarized in Table 2. Majority of pathological lesions rendering organ condemnation were attributed to parasitic causes amounting to 50.0%.

During the study, an estimation of economic loss in terms of money from total and partial condemnation of edible organs was calculated based on the local market price is also presented in Table 3.

DISCUSSION

Out of 600 cattle physically examined during antemortem inspection in Asella municipal abattoir, different abnormalities were found in 57 (9.5%) head of cattle. However, these animals were passed for slaughter with great caution with thorough postmortem examination by considering some of these different abnormalities either might be symptom of diseases or resulted from the journey to the abattoir.

During postmortem inspection of all organs and associated structure for the presence of abnormalities or diseases different parasitic and other pathological abnormalities were found. In present study; fasciolosis, hydatid cyst, *Cysticercus bovis*, pneumonia, congestion, emphysema, pericarditis, hydronephrosis, cirrhosis, calcification, splenomegally, and abscessation were the major causes of organs condemnation in cattle slaughtered at Asella municipal abattoir and These results are similar to a reports of [22-26] in different parts of Ethiopia.

The present study showed that parasites and pathological lesion were the major causes of organ condemnation. Out of the total examined organs 228 (38.0%) liver, 196 (32.7%) lung, 28 (4.7%) heart, 17 (2.8%) kidney and 11 (1.8%) spleens were condemned due to various reasons. The most frequently condemned organ was liver followed by the lungs. The rate of condemnation due to parasitic causes also higher in affected organ (50%) than the miscellaneous pathological lesion (30%).

From total lesion on liver 214 (35.67%) totally condemned and 14(2.33%) was partially condemned as unfit for human consumption because of various types of parasitological and

Table 1: Abnormal conditions encountered during ante-mortem inspections.

| Abnormal conditions | Number of animals affected (%) |
|---------------------|--------------------------------|
| Lameness | 9(1.5) |
| Salivation | 30(5.0) |
| Branding | 1(0.16) |
| Abrasion | 3(0.5) |
| Emaciation | 4(0.67) |
| tick infestation | 2(0.33) |
| Rough hair coat | 1(0.16) |
| Localized swelling | 7(1.16) |
| Total | 57(9.5) |

Table 2: Major causes of organ condemnation in cattle slaughtered at Asella municipal abattoir.

| Number of animals examined | Organs inspected | Major Lesions | No. of organs affected (%) | Judgment | |
|----------------------------|------------------|----------------------|----------------------------|-----------|---------|
| | | | | TC (%) | PC (%) |
| 600 | Lung | Hydatid cyst | 122(20.3) | 122(20.3) | - |
| | | Pneumonia | 8(1.3) | 8(1.3) | - |
| | | Calcification | 15(2.5) | 2(0.3) | 13(2.2) |
| | | Granulomatous lesion | 3(0.5) | 3(0.5) | - |
| | | Emphysema | 22(3.7) | 22(3.7) | - |
| | | Abscess | 8(1.3) | 8(1.3) | - |
| | | Congestion | 18(3.0) | 12(2.0) | 6(1.0) |
| | | Total | 196 (32.7) | 177(29.5) | 19(3.2) |
| | Liver | Cirrhosis | 40(6.7) | 40(6.7) | - |
| | | Hydatid cyst | 50(8.3) | 50(8.3) | - |
| | | Calcification | 28(4.6) | 14(2.3) | 14(2.3) |
| | | Fasciolosis | 100(16.7) | 100(16.7) | - |
| | | Abscess | 10(1.7) | 10(1.7) | - |
| | | Total | 228(38.0) | 214(35.7) | 14(2.3) |
| | Heart | Hydatid cyst | 14(2.3) | 14(2.3) | - |
| | | <i>C. bovis</i> | 8(1.3) | 8(1.3) | - |
| | | Pericarditis | 6(1.0) | 2(0.3) | 4(0.7) |
| | | Total | 28(4.7) | 24(4.0) | 4(0.7) |
| | Kidney | Hydatid cyst | 6(1.0) | 6(1.0) | - |
| | | Hydronephrosis | 6(1.0) | 6(1.0) | - |
| | | Calcification | 5(0.8) | - | 5(0.8) |
| | | Total | 17 (2.8) | 12(2.0) | 5(0.8) |
| | spleen | Hydatid cyst | 8(1.3) | 8(1.3) | - |
| | | Splenomegally | 3(0.5) | 3(0.5) | - |
| | | Total | 11(1.8) | 11(1.8) | - |

TC = condemnation; PC = partial condemnation; C = cysticercus

Parasitic case causes of organ condemnation is 300 (50%) with confidence interval of 46-54 and miscellaneous lesions are 180 (30%) with confidence interval of 26-34. From total animal examined, 480 (80%) animal was infected.

Table 3: An estimated annual financial loss from organ condemnation in cattle slaughter at Asella municipal abattoir during 2015/2016.

| Organs | Total condemnation (%) | Partial condemnation (%) | Unit price (ETB) | Total estimated annual financial loss (ETB) |
|--------|------------------------|--------------------------|------------------|---|
| Liver | 214(35.67) | 14(2.33) | 75 | 132,715.3 |
| Lung | 177(29.5) | 19(3.16) | 25 | 37,311.5 |
| Heart | 24(4) | 4(0.67) | 30 | 6,245 |
| Kidney | 12(2) | 5(0.83) | 15 | 1,739.5 |
| Spleen | 11(1.83) | - | 3 | 263.6 |
| Total | | | | 178,274.90ETB(8365.38USD) |

ETB = Ethiopia Birr

pathological abnormalities. The rejection rate of liver (38%) in this study is higher than that of the report by [24] in Adigrat abattoir and [26] in Adama municipal abattoir that was 17.58% and 25.7% respectively. However, this finding is lower than that of Jimma municipal abattoir (64.4%) which was reported by [20]. The variations in the rejection rate of organs probably due to differences in livestock management system study sites.

This study indicate that fasciolosis is the major causes of

organ condemnation in the liver (16.7%) followed by hydatid cysts (8.3%) and cirrhosis (6.7%). The present finding on causes of organ condemnation due to fasciolosis in Asella municipal abattoir (16.7%) is lower than the report of [25] in Gondar, [22] [20] in [18] in Bahir Dar abattoir which was 26.9%, 24.24%, 46.2% and 22.9% respectively. However, the present report of liver condemnation due to fasciolosis in Asella municipal abattoir was higher than 9.6%, 12.17%, and 9.26% that was

reported by [26] in [16] in [24] in Adigrat abattoir respectively. It is also higher than the report of Swai and Ulicky (14.05%) from [27]. The differences in the frequencies of liver condemnation due to fasciolosis of the present study compared with other finding within the country might be attributed mainly due to variations in the origin of the cattle slaughtered, ecological and climatic conditions such as altitude, rainfall, and temperature; management systems of animals, the sample size and the ability of the inspector to detect the infection may play a part.

The major gross pathological conditions observed in lung were hydatid cyst and emphysema accounting for 20.3% and 3.67%, respectively from the total lungs rejected. The rejection due to other causes such as; abscess, congestion, granulomatous lesion, pneumonia and calcifications were 8.6%. The present rejection rate of hydatidosis in lung condemnation at Asella municipal abattoir is closer to that reported by [26] from Adama municipal abattoir which was 21.5%. Even though the present finding was higher than the report of [22] from Wolaita Sodo (15.95%), [24] from Adigrat abattoir (5.1%), [23] from Nekemte abattoir (12.7%) and [28] from Nekemte it is lower than that of [25] from Gondar Elfora abattoir (24.2%). Factors like differences in culture, social activity, systems of animal husbandry, lack of proper removal of infected organ and attitude to dogs in various regions might have accounted for variation of the prevalence in different areas of a country. In this study, pneumonia was also responsible for the lung condemnation in cattle. It may be observed that animals suffer from transportation stress and might be also a result of endemic diseases of cattle such as pasteurellosis, which is triggered by stress. Lung congestion is associated with improper stunning and bleeding and it is a common finding in abattoirs.

From the total inspected organ 4% and 0.67% of the heart was totally and partially condemned respectively as unfit for human consumption because of various types of parasitological and pathological abnormalities. The causes of heart condemnation were hydatidosis, pericarditis and *Cysticercus bovis*. Of these, hydatidosis accounted for 14 (2.3%) the rejected heart from total condemned organ. Pericarditis and *Cysticercus bovis* was responsible for 1.3% and 1% heart condemnation respectively. Fasil, (2009) reported that hydatid cyst was the most common cause of heart condemnation followed by *Cysticercus bovis* and pericarditis at Gondar abattoir. [29] reported a consistent prevalence of 1.5% for *Cysticercus bovis* on heart at Jimma which was relatively approach with the present finding in Asella abattoir (1.3%). The difference in the rejection rate of organs with related to different causes may be due to the difference in the prevalence of the disease and variation in animal management system at different study site.

Organ condemnation due to kidney was share 2.83% from the total abnormalities of the different condemned organ. In the present study Kidney condemnation due to hydatid cyst (1%), hydronephrosis (1%) and calcifications (0.83%) is slightly higher than that of previous reports by [22], [25], and [28] in Adigrat (1.54 %), Gondar (1%) and Nekemte (1.15%) respectively. However, kidney condemnation due to calcification (0.83%) is in agreement with that of reported by Abunna and Debele (0.74%) in 2013 in Woliata Sodo municipal abattoir.

In the present study 1.83% of the spleen was totally condemned from the total abnormalities mainly by hydatid cyst and enlargement of the spleen (splenomegally). The frequency in which spleen was condemned due to hydatidosis (1.3%) and splenomegally (0.05%) of this study is related to Abunna and Debele (0.94% hydatidosis and 0.5% splenomegally) that was reported in 2013 in wolaitasoddo abattoir.

The total financial loss calculated in this study, due to only to offal organs (Liver, lungs, heart, kidneys and spleen) condemnation was 8365.38 USD annually. This finding is relatively similar with the financial loss analysis done in Jimma municipal abattoir 172,664.09 Ethiopian Birr/year or 10464.5 USD annually by [4] but it observed that lower than the report of [15] from Dire-Dawa municipal abattoir 109,492,727.5 Ethiopian Birr/year or 547,463,637.5 USD annually and higher than the report of [25] from Gondar ELFORA abattoir 154,850.22 Ethiopian Birr/year. Variation in the amount of economic losses in different parts of the country of abattoir is probably due to the differences in the prevalence of disease, rejection rates of organ, slaughtering capacity of the country abattoir, local market prices of the organ and management ways of the animal [22].

CONCLUSION AND RECOMMENDATIONS

- The present study revealed parasitic causes accounting for significant economic losses followed by other miscellaneous pathological lesions were that among the major reasons of organ condemnation in cattle slaughtered at Asella municipal abattoir. According to this study an estimated annual financial loss from organ condemnation was considerably high amounting to 178274.90 Ethiopia Birr. Therefore, based on these findings it is relevant to suggest the following recommendations Cattle owners should get awareness on management of animal diseases to decrease parasitic burden and associated losses in their animals
- Abattoir workers and butchers should get relevant training to implement proper disposal of organs condemned during meat inspection

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