

Major Causes of Organ Condemnation and Its Financial Losses in Cattle Slaughtered at Dire Dawa Municipal Abattoir, Eastern Ethiopia

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Abstract: The aim of this study was to identify and determine the major diseases and pathological conditions of organ condemnation and to estimate the magnitude of the direct financial losses attributed to the condemned organs from cattle slaughtered in the Dire Dawa municipal abattoir. A cross-sectional abattoir survey type of study design was employed. Standard postmortem inspection procedures were followed on all cattle approved for slaughter throughout the study period. Postmortem examination was conducted on liver, lungs, heart and kidneys of all cattle slaughtered during the study period. An attempt was also made to estimate the direct financial losses due to condemnation of edible organs during meat inspection. A total of 6441 cattle were slaughtered at the Dire Dawa abattoir in the period of five months from November 2014 to March 2015. Out of examined organs, a total of 1116 (17.3%) organs were condemned. The most condemned organ was liver (73.75%) followed by lungs (14.34%), heart (10.66%) and kidneys (1.25%). The current study revealed that the main causes of organ condemnation were fasciolosis (30.02%) followed by, hydatid cyst (22.67%), hemorrhage and hematoma (16.49%), calcification (15.32%), abscess (4.03%), *Cysticercus bovis* (3.23%), pneumonia (2.42%) and others resulting in considerable financial loss of about 109,492,727.5 ETB per annum. The findings showed that the rate of organ condemnation at the abattoir is very high which signifies the need for rapid disease control programs to be implemented.

Key words: Abattoir • Cattle • Dire Dawa • Financial Loss • Organ Condemnation

INTRODUCTION

Ethiopia has the largest livestock population in Africa with an estimated population of 44,318,877 cattle 23,619,720 sheep, 23,325,113 goats, 6 million equines, 2.3 million camels and 43 million poultry [1]. 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 [2].

The significant financial losses incurred each year in the different abattoirs in Ethiopia are due to inferior weight gain and condemnation of edible organs at slaughter. This production loss in the livestock industry is estimated at more than 900 million USD annually [3]. Major parasitic diseases such as fasciolosis, hydatid cyst,

Cysticercus bovis and others causes like abscessation and cirrhosis cause a significant financial loss by lowering the productivity of cattle and condemnation of edible organs [4].

Several studies have been conducted through abattoir survey to determine economic loss resulting from organ condemnation in many abattoirs of Ethiopia [5]. However, most of the studies were focusing only on specific diseases. Furthermore, financial loss due to various diseases/causes was estimated in some abattoirs of the country [4]. Postmortem inspection is the center around which meat hygiene revolves since it provides information indispensable for the scientific evolution of clinical signs and pathological processes that affect the wholesomeness of meat [6].

All gross lesions should be identified at least in a general way. A routine postmortem inspection of a

carcass or an organ should be carried out as soon as possible after completion of dressing. The main purpose of post mortem examination is to detect and eliminate abnormalities, including contamination, thus ensuring that only meat fit for human consumption is passed for food [6].

Meat inspection is commonly perceived as the sanitary and safety control of slaughter animals and meat. The purpose of meat inspection is to protect public health and to provide safe and wholesome meat for human consumption. The responsibility for achieving this objective lies primarily with the relevant public health authorities who are represented by veterinarians and meat inspectors at the abattoir stage [7].

In Ethiopia many studies have been carried out to identify the major causes of organ condemnation during postmortem inspection and to determine the financial losses due to organ condemnation. However, there is not enough information on the major causes of organ condemnation and its financial importance at Dire Dawa municipal abattoir. Therefore, the objectives of this research paper were to identify the major causes of organ condemnation and to estimate the direct financial losses from organ in cattle slaughtered at Dire Dawa municipal abattoir

MATERIALS AND METHODS

Study Area: The current study was conducted from November 2014 to March 2015 at Dire Dawa Municipal abattoir. It is located in Dire Dawa Administration Council (DDAC), situated in the eastern part of Ethiopia at about 515km from capital, Addis Ababa. The area is located between 9° 27' N and 9°49' E latitudes and 41°38' and 42° 19' E longitude. The rain fall pattern of the area is characterized by small rainy season from February to May and big rainy season from July to September. The dry season extends from October to January. The mean annual rain fall in the study area varies from 550 mm in the lowland northern part to above 850 mm in the southern mountain. The monthly mean maximum and minimum temperature ranges from 34.6°C to 14.5°C respectively. The entire territory of DDAC rests on an elevation ranging between 950 m.a.s.l. in the north east to 2260 m.a.s.l. in south west. Using the 1500 m contour as a line of separation, two agro-ecological zones, the kola (Below 1500 m) and Woina Dega (Above 1500 m) have been recognized [8].

Study Animals: The study animals were cattle brought to the abattoir for slaughter from different districts in and around Dire Dawa town and it included both sexes whether they are from intensive or extensive farming system.

Study Design: A cross-sectional study design was employed to identify the major cause of organ condemnation in Dire Dawa town municipality abattoir and to evaluate the direct financial losses due to organ condemnation. The organs of cattle slaughtered in the abattoir during the study period were investigated and the causes for condemnation of the organs were recorded.

Sample Collection: For this study all cattle slaughtered during the study period were considered. Accordingly each cattle slaughtered at abattoir were subjected to both ante mortem and post mortem inspection according to the meat inspection standard. After that the organs condemned were investigated and the major causes of condemnation were identified [6]. Organs and carcasses were collected and 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 [9].

Financial Loss Assessment: To assess the financial losses of organ condemned only direct financial losses were considered. To establish the price per unit organ the average organ price was determined and this price index was used to calculate the loss [10]. The analysis was based on annual slaughter capacity of the abattoir considered, market demand, average market price of each organ in Dire Dawa city and the rejection rate of specific organ. Information obtained was subjected to mathematical computation by modifying the formula described by Ogunrinade and Ogunrinade [11].

$$EL = Sr \times Coy \times Roz$$

where,

EL = Estimated annual financial loss due to organs condemnation

Sr = Annual cattle slaughter of the abattoir

Coy = Average cost of each cattle liver/lung/spleen

Roz = Condemnation rate of cattle liver/lung/spleen

Data Management and Analysis: The data collected from the abattoir was recorded in the format developed for this purpose and later on entered into the Microsoft excel 2007 program and analyzed using STATA 11.0 software. Tables were used to present results of pertinent findings.

RESULTS

Post Mortem Examination: A total of 6441 cattle were slaughtered at Dire Dawa municipal abattoir in the period of five months from November 2014 to March 2015. Out of examined organs, a total of 1116 (17.3%) organs were condemned. The most condemned organ was liver (73.75%) followed by lung (14.34%), heart (10.66%) and kidney (1.25%) (Table 1). As indicated in the table 2 below, the most common disease encountered was fasciolosis (30.02%) followed by, hydatid cyst (22.67%), hemorrhage and hematoma (16.49%), calcification (15.32%), abscess (4.03%), *Cysticercus bovis* (3.23%), pneumonia (2.42%) and others

Liver was the most often condemned organ and parasitic pathological conditions were the major cause of condemnation. Fasciolosis 335 (40.07%) was found to be the main cause of liver condemnation followed by hydatid cyst 206 (25.03%), calcification 171 (20.78%) and *Cysticercus bovis* 26 (3.16%). The major causes of lung condemnation were hemorrhage and hematoma 94 (58.75%), pneumonia 27 (16.88%), hydatid cyst 20 (12.50%) and emphysema 9 (5.63%). The major causes of heart condemnation were hemorrhage and hematoma 72 (60.5%), hydatid cyst 27 (22.69%) and *C. bovis* 10 (8.4%). Abscess 6 (42.86%), atrophy 4 (28.57%) and hydronephrosis 3 (21.43%) were the major causes of kidney (Table 3).

Financial Loss Assessment: The total financial loss due to organ condemnation in cattle slaughtered at Dire Dawa Municipal abattoir was assessed from the annual organ condemnation cost (Direct loss). The direct financial loss was resulted from organs condemnation as the result of major pathological findings. Generally all infected organs were unfit for human consumption. Out of 6441 slaughtered cattle 1116 organs were condemned. In Dire Dawa Manucipal abattoir, the average annual cattle slaughter rate was estimated to be 13975 heads while by taking the average market price of each lung, liver, heart and kidney as 10, 100, 25 and 40 Ethiopian Birr respectively, the financial loss due to organ condemnations at Dire Dawa Manucipal abattoir was estimated (Table 4). Hence the direct annual financial loss

Table 1: The overall condemned organs during postmortem inspection at Dire Dawa Municipal Abattoir (November, 2014 – March, 2015)

Organs	Total N ^o of Condemned Organs	Percent(%)
Liver	823	73.75
Lung	160	14.34
Kidney	14	1.25
Heart	119	10.66
Total	1116	100.00

Table 2: Major pathological conditions encountered during postmortem inspection at Dire Dawa Municipal Abattoir (November, 2014 – March, 2015)

Major cause	Frequency	Percent(%)
Abscess	45	4.03
Atrophy	4	0.36
Calcification	171	15.32
Cirrhosis	15	1.34
Cysticercus bovis	36	3.23
Enphysema	9	0.81
Fasciola	335	30.02
Hemorrhage and Hematoma	184	16.49
Hepatzation	22	1.97
Hydatid cyst	253	22.67
Hydronephritis	3	0.27
Nephritis	1	0.09
Others	6	0.54
Pericarditis	5	0.45
Pneumonia	27	2.42
Total	1116	100.00

due to rejection of organ was calculated based on average price per organ according to the formula described by Ogunrinade and Ogunrinade [11].

$$EL = Sr \times Coy \times Roz$$

- EL=Estimated annual financial loss due to organs condemnation
- Srx = Annual cattle slaughter of the abattoir
- Coy= Average cost of each cattle liver/lung/heart/kidney
- Roz= Condemnation rate of cattle liver/lung/heart/kidney

$$\text{For liver: } EL = Sr \times Coy \times Roz$$

$$EL = 13975 \times 100 \times 73.75 = 103065625 \text{ ETB}$$

$$\text{For lung: } EL = Sr \times Coy \times Roz$$

$$EL = 13975 \times 10 \times 14.34 = 2004015 \text{ ETB}$$

$$\text{For heart: } EL = Sr \times Coy \times Roz$$

$$EL = 13975 \times 25 \times 10.66 = 3724337.5 \text{ ETB}$$

$$\text{For kidney: } EL = Sr \times Coy \times Roz$$

$$EL = 13975 \times 40 \times 1.25 = 698750 \text{ ETB}$$

$$\text{Total grand cost of all organs} = 109,492,727.5 \text{ ETB}$$

Table 3: Major causes and No of organ condemned at Dire Dawa Municipal Abattoir (November, 2014 – March, 2015)

Major cause	Organs				Total
	Heart	Kidney	Liver	Lung	
Abscess	5 (4.20%)	6 (42.86%)	26 (3.16%)	8 (5.00%)	45 (4.03%)
Atrophy	–	4 (28.57%)	–	–	4 (0.36%)
Calcification	–	–	171 (20.78%)	–	171 (15.32%)
Cirrhosis	–	–	15 (1.82%)	–	15 (1.3%)
<i>C. bovis</i>	10 (8.40%)	–	26 (3.16%)	–	36 (3.23%)
Emphysema	–	–	–	9 (5.63%)	9 (0.81%)
Fasciola	–	–	335 (40.70%)	–	335 (30.02%)
Hemorrhage and Hematoma	72 (22.69%)	–	18 (2.19%)	94 (58.75%)	184 (16.64%)
Hepatitis	–	–	22 (2.67%)	–	22 (1.97%)
Hydatid cyst	27 (22.69%)	–	206 (25.03%)	20 (12.50%)	253 (22.67%)
Hydronephritis	–	3 (21.43)	–	–	3 (0.27%)
Nephritis	–	1 (7.14%)	–	–	1 (0.09%)
Others	–	–	4 (0.49%)	2 (1.25%)	6 (0.54%)
Pericarditis	5 (4.20%)	–	–	–	5 (0.45%)
Pneumonia	–	–	–	27 (16.88%)	27 (2.42%)
Total	199 (100%)	14 (100%)	823 (100%)	160(100%)	1,116 (100)

Table 4: Causes and percentage of organ condemnation at Dire Dawa Municipal Abattoir (November, 2014 – March, 2015)

Organ	Causes	No and Percent
Liver	Fasciola	335 (40.70%)
	Calcification	171(20.78%)
	Hydatid cyst	206(25.03%)
	<i>Cysticercus bovis</i>	26 (3.16%)
	Abscess	26(3.16%)
	Hepatitis	22(2.67%)
	Hemorrhage and Hematoma	18(2.19%)
	Cirrhosis	15(1.82%)
	Others	4(0.49%)
Lungs	Hemorrhage and Hematoma	94(58.75%)
	Pneumonia	27(16.88%)
	Hydatid cyst	20(12.50%)
	Emphysema	9(5.63%)
	Abscess	8(5.00%)
	Others	2(1.25%)
Heart	Hemorrhage and Hematoma	72(39.13%)
	Hydatid cyst	27(10.67%)
	<i>Cysticercus bovis</i>	10(27.78%)
	Pericarditis	5(4.2%)
	Abscess	5(4.2%)
Kidneys	Abscess	6(42.86%)
	Atrophy	4(28.57%)
	Hydronephritis	3(21.43%)
	Nephritis	1(7.14%)

Table 5: Summary of estimated financial losses due to organ condemnation in cattle slaughtered at Dire Dawa Municipal abattoir

Organ	Nº of Organs Condemned	Average price of each organ in ETB	Total price of Condemned organ in ETB
Liver	823	100	103065625
Lung	160	10	2004015
Heart	119	25	3724337.5
Kidney	14	40	698750
Grand Total	1116	175	109,492,727.5 ETB

Finally, based on the relevant information mentioned above, the cost associated with condemnation of organs was estimated to be 109,492,727.5 Ethiopian Birr (547, 463, 6.375 USD, exchange rate 19.17) per annum as summarized in table 5.

DISCUSSION

The present study revealed that fascioliasis, hydatid cyst, calcification, *Cysticercus bovis*, pneumonia, emphysema, pericarditis, hemorrhage and hematoma, atrophy, nephritis, hydronephrosis, cirrhosis, hepatitis, and abscessation were the major causes of organs condemnation in cattle slaughtered at Dire Dawa Municipal abattoir.

From a total of 6441 head of cattle slaughtered, 1116 (17.3%) organs of cattle were condemned because of different diseases and pathological findings.

Out of the total examined organs 73.75% liver, 14.34% lungs, 1.25% kidneys and 10.66 % hearts were condemned due to various causes. The rate of liver condemnation in this study was much higher than the report of Denbarga *et al.* [12] in Gondar ELFORA abattoir which was 31.1% and Amene *et al.* [4] in Jimma Municipal abattoir which was 64.44%.

Accordingly, 40.70%, 25.03% and 20.78% of liver was condemned due to fascioliasis, hydatid cyst and calcification respectively. This study indicated that fasciolosis was the major cause for liver condemnation whereas the whole frequency of liver condemnation was relatively higher than the findings of Fufa and Debele [13] in which they reported 39.68% and the report in Nigeria (20.28%) by Ojo [14]. These could be due to poor health care, extensive cattle husbandry and grazing system. Calcification, hydatid cyst, *C. bovis*, abscess, hepatization, hemorrhage and hematoma and cirrhosis were also other causes of liver condemnation.

The rate of lung condemned due to hemorrhage, emphysema, hydatid cyst, pneumonia and abscessation was 58.75%, 16.88%, 12.50%, 5.63 and 5.00% respectively. In this study hemorrhage was the main cause of lung condemnation. Hydatid cyst was found to be another cause of lung condemnation which is relatively higher than reports by Denbarga *et al.* [12] and Mewcha [15]. The rate of condemnation due to Ephysema (16.88%) was higher than the finding reported by Fasil [16] with 1.2% rate of rejection, but lower than report by Kambarage *et al.* [17] with 22% in Tanzania. The rejection rate due to pneumonia was also 5.63% and higher rejection rate 3.33% was reported in cattle slaughtered in Tanzania.

The present study also showed that the heart was condemned due to hematoma, hydatid cyst, pericarditis and abscess and its rate of rejection was 39.13%, 10.67%, 4.2% and 4.2% respectively. Taresa *et al.* [18] reported a consistent prevalence of 1.5% for *Cysticercus bovis* on heart at Jimma abattoir which is less than the current result (27.78%). However, a higher rejection rate of pericarditis (36%) was reported by Kambarage *et al.* [17] from cattle slaughtered in Tanzania. Fasil [16] reported that hydatid cyst was the most common cause of heart condemnation followed by *C. bovis* and pericarditis at Gondar abattoir, but according to this study hematoma was the most common cause of heart condemnation. This may be due to improper handling during slaughter and insufficient bleeding.

In the current study, kidney was condemned mostly due to abscesses and atrophy which account

42.86% and 28.57% respectively. Hydronephritis (21.43%) and nephritis (7.14%) were also other causes of condemnation. According to the report by Fasil [16] the main cause of kidney rejection were nephritis, hydronephrosis and renal calculi from cattle slaughtered in Gondar ELFORA abattoir with the rejection rate of 0.26%, 0.33% and 0.46%, respectively.

The total financial loss calculated in this study, due to organs (Liver, lungs, heart and kidneys) condemnation was 109,492,727.5 Ethiopian Birr/year which is greater than financial loss analysis done in Ambo and Sodo Municipal Abattoir which was estimated to be 160,032.23 and 4000 USD as reported by Zewdu *et al.* [19] and Abunna *et al.* [20] and the financial loss due to organ condemnation at Wolaita Soddo Municipal abattoir by Fufa and Debele [13] was estimated to be 24,340 ETB (24323.49 USD). These may be due to the variation in the cost of the each organ in different study areas and numbers of organs condemned during the study period.

CONCLUSION

In the present study fascioliasis, hydatid cyst, *C. bovis*, hemorrhage and hematoma, pneumonia, emphysema, hydronephrosis, cirrhosis, hepatitis, calcification and abscessation were found to be the major diseases and pathological causes of organs condemnation. In conclusion the results in the present study revealed that the main causes of organ condemnation were parasitic diseases and pathological conditions in cattle slaughtered at Dire Dawa municipal abattoir resulting in considerable financial loss of about 109,492,727.5 ETB per annum which need further investigation.

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