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Major Causes of Lung and Liver Condemnation and Financial Impact in Cattle Slaughter at Bahir Dar Municpial Abattior

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Abstract: A cross-sectional study was conducted from November 2011 to March 2012 in Bahir Dar municipal abattoir, northwest Ethiopia, to identify the major causes of liver and lung condemnation from cattle slaughter and to estimate the direct economic loss associated with these organs condemnation. A total of 384 cattle were considered for antemortem and postmortem examination. During the antemortem examination, among 384 cattle destined for slaughter, nasal discharge (1.8%) and skin scar (0.5%) and body swelling (0.5%) had taken the highest and the lowest proportion rates, respectively. Post mortem examination revealed that 379 (91.7%) livers, 116 (28%) lungs, in both age categories were condemned due to various causes. Fasciolosis (22.9%) and hydatidosis (35.7%) were found the major causes responsible for rejection. Statistically significant differences were not observed (P>0.05) for liver and lung condemnation rates and factors considered like age, source and breed of animals. There was a statistically significant difference observed between body condition scoring categories and liver and lung condemnation (15.023, p<0.05) in this study. The average annual economic loss from liver and lung condemnation was estimated to be about 9257.914 USD. The current study revealed that fasciolosis and hydatidosis were the major causes for condemnation that lead to huge economic losses. Therefore, to alleviate this problem, further studies and preventive measures (for the two major diseases found) should be undertaken to reduce unnecessary financial losses encountered.

Key words: Bahir Dar · Cattle · Condemnation · Financial · Liver and Lung · Postmortem

INTRODUCTION

Diseases that occur in livestock have two major impacts. These two major impacts have highly pronounced effect on large scale abattoirs where there is large number of animals' slaughtered [1, 2]. Meat inspection as part of the veterinary public health activities ensures the delivery of hygienically processed meat for public consumption while preventing the transmission of infectious and zoonotic diseases to humans [3-5]. The activity also provides vital data and valuable information on the incidences and prevalence of animal diseases and conditions within any country [6-9].

Disease causes extensive financial wastes as a result of direct and indirect economic losses, is the major concern to livestock industry. Studies conducted in different abattoirs of Ethiopia revealed that parasitic infection of livers, lungs (pneumonia), pericarditis and pyelonephyritis are found to be the major causes of organs condemnation, with an approximate annual loss of 154,286.00USD at Debre Zeit Helimex abattoir [6]; 6102.20USD in Gondar municipal labattoir [10]; 10339.57 USD in Bahir Dar Municipality abattoir [11].

Even though various investigation have been conducted through abattoir survey to determine the prevalence and economic losses resulting from organs condemnation in Ethiopia, most of the survey focused on parasitic case such as hydatidosis, fasciolosis and cysticercosis [12-18]. Organ condemnation due to other factors was lacking.

In addition, many municipality abattoirs in Ethiopia like Ashiraf, Helmix, ELFORA, Metehara, Mojo and Luna have been established. This increase the number of export abattoirs showing increase in demand of carcass and

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organs supply but the supply is decreasing due to disease, production and other various constraints. In view of this, the current status of organ condemnation and the evaluation of economic losses from various abattoirs including Bahir Dar municipal abattoirs are needed. Therefore, the objectives of this study were to determine the magnitude of liver and lung condemnation, identify the major causes in cattle slaughter at Bahir Dar municipality abattoir assess the possible factors associated with organ condemnation and determine the magnitude of direct financial loss attributed to the condemnation of liver and lung organs.

MATERIALS AND METHODS

Study Area: The study was conducted from November 2011 to March 2012 at Bahir Dar municipal abattoir. Bahir Dar, the capital city of the Amhara Regional Administrative State, is situated in West Gojjam administrative zone, northwest Ethiopia [19]. The land is covered by various bushes, low woods mainly evergreen plants and some semi-humid and humid high land vegetation with major agricultural products like teff, wheat, sorghum, millet, maize and pulse crops. The livelihood of the people mainly depending on agricultural/ mixed crop-livestock production.

Study Animals: The study animals were those cattle coming to Bahir Dar abattiore for slaugher.

Study Design and Sample Size: Across-sectional study was conducted to determine the pathologic causes of condemnation for lung and liver. In this study, cattle were randomly sampled using systematic random sampling methods. A total of 384 cattle destined for slaughter were taken as and inspected. Every animal during the study period was examined after and before slaughter and data was recorded. In this study, according to Pace and Wakeman [20] cattle were grouped into young ($\leq$2 years), young adult (2-6 years) and adult (> 6 years) and age estimation based on eruption of one or more incisor teeth.

Antemortem Examination: Antemortem inspection was conducted on individual animals, while the animals were entered in to the lairage. The general behavior of the animals, gait, structure, conformation, body condition scoring and signs of disease and abnormalities of any type were registered according to the standard of antemortem examination procedures given by Gracey *et al*. [21]. Following these, judgments were passed based on FAO [22].

Postmortem Examination: During postmortem, liver and lung examination was conducted by visualization, palpation and incisions where necessary for the presence of cyst, parasites and other gross abnormalities. Pathological lesions were differentiated and judged according to guidelines on meat inspection for developing countries FAO [22] guideline on meat inspection for developing countries.

Assessment of Direct Economic Loss: All affected organs and partially trimmed off carcass were rejected from local market since total condemnation of carcass was not allowed to practice in the abattoir due to economic reason. The analysis was based on the average annual slaughter capacity of the abattoir considering market demand, average market prices in local market and the rejection rates of specific organs at Bahir Dar municipal abattoir. Average market price of each organ and carcass was determined from interviews made with personnel's of the abattoir and butcher men. The economic loss due to condemnation was estimated by the formula set by [23].

EL = Srx X coy X Roz

where;

EL = Average annual economic loss estimated due to liver and lung condemnation from local market.
Srx = Average annual cattle slaughter rate of the abattoir.
Coy = Average cost of each cattle liver and lung
Roz = Average condemnation rate of cattle liver and lung

RESULTS

Abattoir Survey: Antemortem examination was carried out on 384 cattle slaughtered for the detection of any abnormalities encountered in liver and lungs in Bahir Dar municipal abattoir. A total of 26(6.77%) cattle were found to have the abnormalities listed below (Table 1) and nasal discharge was the highest (1.8%). Whereas, skin scar (0.5%) and body swelling (0.5%) were the lowest antemortem findings in both age categories.

Postmortem Examination: All cattle that had been examined in antemortem inspection were subjected to postmortem examination. From the total organs examined in both age categories, 213 (55.5%) lungs and 205 (53.4%) livers were totally condemned from local market due to various parasitic and gross pathological lesions (Tables 2 and 3).

Table 1: Abnormal conditions encountered during antemortem examination in cattle ready for slaughter

Condition encountered	Young adults (85)	Adults (299)	Total (384) (%)
Abdominal hernia	1	2	3 (0.78%)
Local swelling	1	1	2 (0.52%)
Lameness	1	2	3 (0.78%)
Rough hair coat	1	4	5 (1.3 %)
Skin scar	1	1	2 (0.52%)
Nasal discharge	3	4	7 (1.822%)
Tick infestation	2	2	4 (1.041%)
Total	10	16	26 (6.77%)

Table 2: Major causes of liver condemnation and frequency of lesions (percentage of rejected liver)

	Frequency of lesion and percentage of rejected liver	
Major causes of liver condemnation	Frequency	Percent
Fasciolosis	88	22.9
Calcification	39	10.2
Abcsess	14	3.6
Cirrhosis	12	3.1
Hydatidosis	46	12.0
Total	205	53.4

Table 3: Major Causes of lung condemnation and frequency of lesion (percentage of rejected lungs)

	Frequency of lesion and percentage of rejected lungs	
Major causes of lung condemnation	Frequency	Percent
Haydatid cyst	137	35.7
Calcification	34	8.9
Emphysema	17	4.4
Pneumonia	4	1.0
Abscess	7	1.8
Haemmorage	6	1.6
Congestion	8	2.1
Total	213	55.5

Table 4: Rejection rate of liver and lungs based on age categories in this study

		Frequency of lesion and percentage of rejected organs		
Age of animals examined	Total number of cattle slaughtered	Lung condemnation	Liver condemnation	Lung and liver condemnation
Young adults	85	25(29.4%)	19(22.4)	25(29.4%)
Adults	299	74(24.7%)	72(24%)	89(29.8%)
Total	384	99(25.78%)	91(23.7%)	114(29.7%)

($\chi^2 = 0.578$, $P = 0.749$)

Table 5: Rejection rates of organs and association with body condition scoring

		Frequency of lesion and percentage of rejected organs (%)		
Body condition of animals	Total number of cattle slaughtered	Lung	Liver	Liver and lung
Poor	158	47(29.7%)	32(20.3%)	47(29.7%)
Medium	175	39(22.3%)	33(18.9%)	67(38.3%)
Good	51	13(25.5%)	11(21.6%)	15(29.4%)
Total	384	99(25.8%)	91(23.7%)	114(29.7%)

(χ^2=15.023, $P < 0.05$)

Table 6: Rejection rates of organs and association with source and breed of cattle

		Source of cattle		Breed	
Condemned organs	No. and percent of condemned organs	Bahir dar	Out of Bahir Dar	Local	Cross
Lung	99(25.8%)	46(34.1%)	53(31.4%)	90(32%)	9(39.1%)
Liver	91(23.7%)	42(31.1%)	49(28.9%)	85(30.2%)	8(34.8%)
Lung and liver	114(29.7%)	47(34.8%)	67(39.6%)	106(37.7%)	6(26.1%)
Total	304	135	169	281	23

Table 7: Findings of the study used in the direct financial loss assessment

Organ	Average rejction rate of organs	Total number cattle slaughter rate	Average price of each organ
Liver	53.3%	6480	2.29USD
Lung	55.5%	6480	1.14USD

As indicated below 29.4% and 24.7% of lungs were condemned in young adult and adult animals and 22.4% and 24% of liver were condemned in young adult and adult animals, respectively. Both liver and lung were condemned at 29.4% and 29.8% in young adult and adult animals, respectively. There was no statistically significant difference ($\chi^2 = 0.578$, $P > 0.05$) between the two age categories and lung and/or liver condemnation.

As depicted below in Table 5 lungs of 29.7%, 22.3% and 25.5% condemned from poor, medium and good body conditioned animals, respectively. Cattle were judged by totally condemnation of liver and 20.3%, 18.9% and 21.6% was condemned from poor, medium and good body conditions, respectively. Both liver and lung were 29.7%, 38.3% and 2 9.4% totally condemned form poor, medium and good body condition animals, respectively. There was a statistically significant difference observed between liver and/or lung rejection rates and the different body condition categories ($\chi^2 = 15.023$, $P < 0.05$) of cattle.

Out of the total number of lungs condemned, 34.1% and 31.4% were originated from Bahir Dar and out of Bahir dar, respectively. Out of total liver condemnation, 31.1 % and 28.9% were originated from Bahir dar and out of Bahirdar, respectively. Total number of both liver and lung condemnation from both origins was 34.8% (cattle from Bahir dar) and 39.6% (cattle out of Bahir dar). However, there was no statistical significance ($\chi^2 = 0.501$, $P>0.05$) between liver and lung condemnation and source of cattle. Lung condemnation rate was 32% and 39.1% from cattle of local breeds and cross breeds, respectively and liver condemnation was 30.2% and 34.8% from local and cross breeds, respectively. Both liver and lung condemnation was 37.7% and 26.1% from local and cross breed cattle, respectively. However, there were no statistical significant difference ($\chi^2 = 0.749$, $P>0.05$) observed in the two breeds of cattle and liver and/or lung condemnation (Table 6).

Assessment of direct financial loss: The average annual direct economic loss from domestic market of liver and lung organs condemnation at Bahir Dar municipal abattoir was estimated to be 12019.47 USD (Table 7).

DISCUSSION

In the present study, the most commonly encountered abnormalities during antemortem inspection were 5 (1.3%) rough hair coat, 3 (0.78%) lameness, 2 (0.52%) local swelling, 3 (0.78%) hernias, 7 (1.822%) nasal discharges and 4(1.014%) tick infestation. Nasal discharge was the highest encountered antemortem problem followed by tick infestation and the least was local swelling. The nasal discharge is most probably due to lack of feed and water, stress, immune suppression and overcrowding in the holding pens.

Out of 384 cattle slaughtered in Bahir Dar municipal abattoir, 99 (25.78%) lungs, 91 (23.7%) liver and 114 (29.7%) of both liver and lungs were rejected from local market due to their gross pathological lesions in this study. The current study showed that reduced rejection rates of liver at postmortem as compared to previous studies conducted by Manyazewal [24], Shegaw [25] andualem [26], Berihanu [27] and Sirak [28] who reported a rejection rate of 35.2%, 43.7%, 36%, 35% and 58% of liver at Mekele, Kombolcha, Addis Ababa and Bahir Dar, respectively. The rejection rate of lung in this study was comparable with that of Mezgebu [29] who reported a rejection rate of 26.4% but lower than the report by Dechasa *et al*. [30-31] of 42.2% at Nazareth abbatoir. This may probably be due to the differences in the prevalence of disease conditions at the different study sites and it may also be due to the decrease in disease conditions causing liver condemnation in the study area these days.

Among disease conditions encountered during postmortem examination, fasciolosis (22.9%), hydatidosis (12%) and calcification (10.2% were the major causes of liver condemnation while hydatidosis (35.7%) and calcification (8.9%) were the major causes of lung condemnation. In Ethiopia and other countries, many studies have been undertaken to identify the major disease conditions encountered during antemortem and postmortem examination. Fasciolosis and hydatidosis have been reported to be the major disease problems of livestock industry. The current study was in agreement with the previous studies conducted by Jembere [14], Mezegbu [29], Seid [32], Fitsum [33] and Marta [34] at Nazareth, Gondar, Ambo, Hawassa and Sebeta abattoirs, respectively and revealed that liver and lung were highly rejected organs and fasciolosis and hydatidosis were the major causes of rejection. The findings of Teka [35] andualem [26] and Shegaw [25] also stated that liver flukes in the liver and hydatid cyst in the lungs were among the major causes of organ condemnation during postmortem examination.

In cattle more than 90% hydatid cysts are usually found in the liver. The lung is the organ mostly affected by hydatidosis because at old age, the liver capillaries dilated and most cysts passed directly to the lungs and secondly the cyst passes to the lungs through thoracic duct without involving the liver as stated by Gracey *et al*. [21].

The current finding (22.9% of bovine fasciolosis) seems to be relatively lower than the findings by Tilahun [36], Yohannes [11], Sirak [28], Yehenew [37], Fitsum [33] andualem [26], Marta [34] who reported higher prevalences than this study and this could be due to differences in environments and ecological conditions of the study areas.

In the current study, higher prevalence of bovine hydatidosis (35.7%) found in lung as compared to the previous studies by Shegaw [25] andualem [26], Seid [32], Marta [34] who reported 25.2%, 26.7%, 32.8%, 22.7% but lower than the reports of Fitsum [33] which was 38.8% and 66.9%, respectively. These variations may be due to the difference in the origin of the cattle brought from and also due to differences in the environment and epidemiological factors which could affect the rate of transmission of echinococcosis/ hydatidosis.

In the current study, condemnation of organs (liver, lungs and both liver and lungs) were recorded in adult cattle and in young adults at comparable rates and the result did not show a significant difference (χ^2= 0.578, $p< 0.05$) between the two age categories. This shows that both ages were affected by disease conditions similarly. However, body condition of animals showed a statistically significant difference ($P<0.05$) for the rate of organ condemnation showing that disease conditions that cause organ condemnation are highly associated with body condition scores.

Other factors considered in this study including source of animals (Bahir Dar vs outside Bahirdar) and breed (local vs cross) did not show statistical significant differences ($P>0.05$) in rejection rates of organs in the present study.

The average annual estimated economic loss per annum due to condemnation of organs (liver and lung) in this study was 170, 676 ETB which was equivalent to 9, 865.66 USD per annum based on the current exchange rate. This figure in the current study was higher than the report of economic loss in abattoirs by Marta [34] and Fitsum [33] who reported 81,480 ETB and 130,718.49 ETB, respectively. However, the current result found was lower than the economic loss report by Yetnayet [38] who reported 470, 239.12 ETB from condemnation of organs. The variations of these studies could be attributed to the differences in the prevalences of parasitic infestations and pathological conditions in the study areas.

CONCLUSIONS

According to the result of this study hydatidosis and fasciolosis were the most and major causes of lung and liver condemnation respectively. Factors considered including age, source and breed of animals did not show significant association with the rate of organ condemnation but body condition showed a significant difference in this study. The annual financial loss from international and local market organ condemnation was also estimated high.

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