

*Full Length Research Paper*

## **Major causes of lung and liver condemnation and associated risk factors in cattle slaughtered at Hawassa Municipal abattoir, Southern Ethiopia**

**Kassaye Shiferaw<sup>1</sup>, Ayichew Teshale<sup>2\*</sup>, Alemu Aylate<sup>2</sup>, Alebachew Tilahun<sup>2</sup> and Ashenafi Kiros<sup>2</sup>**

<sup>1</sup>Debre Birhane Agricultural Research Center, Ethiopia.

<sup>2</sup>Wolaita Sodo University, School of Veterinary Medicine, Ethiopia.

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The study was conducted from November, 2013 to March, 2014 at Hawassa municipal abattoir, Southern Ethiopia with the aim of identifying the major causes of liver and lung condemnation and assessing possible risk factors associated with organ condemnation. Standard ante-mortem and post-mortem procedures were followed throughout the study and abnormalities were recorded. A total of 399 cattle were considered for ante mortem and post-mortem examination by systematic random sampling technique. In ante mortem inspection the most commonly encountered abnormalities were 3 (0.75%) lameness, 4 (1%) nasal discharge, 2 (0.5%) skin lesions and 4 (1%) rough hair coat. During post mortem inspection, 224 (56.1%) of lungs were condemned due to hydatidosis, calcification, emphysema and marbling and 207 (51.8%) of livers were condemned due to fasciolosis, hydatidosis, calcification, hardening and haemorrhage. The condemnation rate of lung with respect to each risk factor was found to be 35.3, 0.78, 9.7 and 10% for hydatidosis, calcification, emphysema and marbling, respectively. The condemnation rate of liver with respect to each risk factor was also found to be 20.5, 17.2, 4.2, 10.2 and 0.5% for fasciolosis, hydatidosis, hardening, calcification and hemorrhage, respectively. The study indicated that hydatidosis (35.5%) for lung and fasciolosis (20.7%) for liver were the major cause of condemnation, respectively. Many risk factors such as age, body condition, origin and breed of animal determined liver and lung condemnation rate. But among these only body condition showed statistically significant difference ( $\chi^2= 11.524$ ,  $P=0.003$ ) with condemnation rate of each organ. The results of this study showed that condemnation of liver and lungs at the abattoir is very high, thereby preventive measure need to be designed to overcome further loss by applying appropriate treatment control and preventive measures of slaughter animals.

**Key words:** Abattoir, cattle, condemnation, Hawassa, liver, lungs, municipal.

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### **INTRODUCTION**

Ethiopia has the largest live-stock population in Africa with an estimated population of 44,318,877 cattle, 23,619,720 sheep and 23,325,113 of goats, 6 million

equines, 2.3 million camels and 43 million poultry (CSA, 2008). But this great live-stock potential is not properly used due to different factors such as traditional

management system, limited genetic potential, lack of appropriate veterinary services. Each year a significant loss results from death of animals, inferior weight gain, condemnation of edible organs and carcass at slaughter (Gryseal, 1988).

In developing countries, abattoir plays a major role in providing and serving source of information and reference center for disease prevalence. Meat inspection is conducted in the abattoir for the purpose of screening animal products with abnormal pathological lesions that are unsafe for human consumption. These efforts help in reduction of food borne parasitic zoonoses (Chhabra and Singla, 2009). It assists to detect certain diseases of live-stock and prevent the distribution of infected meat that could give rise to diseases in animal and human being and to ensure competitiveness of products in the local market (Hinton and Green, 1993). Animals showing signs of abnormality during ante mortem inspection should not be allowed to enter the abattoir for slaughter. After animals entered into slaughter, routine post mortem inspection of carcass and organs should be carried out as soon as possible (Teka, 1997).

Although various investigations have been conducted through abattoir survey to determine the cause, prevalence and economic losses resulting from organ condemnation in Ethiopia, there is shortage of study especially about the major causes and possible factors of organ condemnation in Hawassa municipal abattoir. Therefore this study was aimed to fill this gap. Generally the objective of this study was: (i) to identify the major causes of organ condemnation in cattle slaughtered at Hawassa Municipal abattoir and (2) to assess the possible risk factors associated with organ condemnation.

## MATERIALS AND METHODS

### Study area

The study was conducted at Hawassa municipal abattoir, which is found in Hawassa town, the Capital city of South Nations Nationalities and Peoples Regional State, at a distance of 273 km south of Addis Ababa. Geographically, the area lies 1680 m above sea level and has an average annual rain fall and temperature of 953 mm and 25°C, respectively (Community Supported Agriculture (CSA), 2008).

### Study population

The study animals were cattle (local, cross and exotic) breeds presented to Hawassa municipal abattoir for slaughter. These breeds were brought from different source areas: Harar, Nazereth,

Arsi Negele, Shashemene and Hawassa Zuria as informed by responsible individuals. The study animals were transported to the abattoir using vehicles or on foot depending on the site of collection. Antemortem and post mortem examinations were carried out for every animal. Data were recorded and animals were grouped into adult (2 TO 8 years) and old (above 8 years) age categories by using eruption of incisor teeth according to Pace and Wakeman (2003).

### Sample size and sampling methods

Systematic random sampling technique was employed for selection of individual animal (local, cross and exotic) breeds. The sample size was determined by the formula given by Thrusfield (2007) considering expected prevalence being 50% with the desired precision level of 5%. Adding a few more sample to increase accuracy, a total of 399 cattle (local, cross and exotic) breeds were considered in the study.

### Study design and study methodology

A cross sectional study design was followed and the study was conducted from November, 2013 to March, 2014 at Hawassa municipal abattoir to determine major causes of liver and lung condemnation.

### Antemortem inspection

Before slaughter, examination of cattle was conducted at lairage with various risk factors: age, body condition score, breed and origin of each study animal being recorded simultaneously on specially designed data recording sheet. Animals were inspected looking for their gait, structure, conformation and any disease abnormality detected by physical examination and the findings were registered according to the standard of ante mortem inspection procedure (Gracey et al., 1999). Accordingly, judgments were passed based on Food and Agricultural Organization (FAO) (2007).

### Post mortem inspection

All animals that had been examined by ante mortem inspection were subjected to post mortem examination. The post mortem examination was performed by visual inspection, palpation and systematic incisions for the presence of cysts, adult parasites and other abnormalities. The results were recorded and decisions were classified as fit for human consumption and then approved, totally condemned as unfit for human consumption or partially condemned as fit for human consumption after processing of each which is determined by looking at the percentage of lesions existing on the organ (FAO, 2007).

### Data management and analysis

The raw data collected during inspection were entered into excel spread sheet (Microsoft Excel 2000) and filtered. Descriptive

\*Corresponding author. E-mail: tayichew25@gmail.com. Tel: +251945009555.

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**Table 1.** Abnormal conditions encountered during ant mortem inspection.

Abnormality	Adult (274)	Old (125)	Total (399)(%)
Lameness	1	2	3 (0.75%)
Nasal discharge	2	2	4 (1%)
Rough hair coat	1	3	4 (1%)
Skin lesion	1	1	2 (0.5)
<b>Total</b>	<b>5</b>	<b>8</b>	<b>13 (3.25%)</b>

**Table 2.** Major causes of liver condemnation and frequency of lesions.

Causes of condemnation	Frequency of lesions and % of condemned organs	
	Frequency	Percent (%)
Fasciolosis	82	20.5
Hydatidosis	69	17.2
Hardening	17	4.2
Calcification	41	10.2
Hemorrhage	2	0.5
<b>Total</b>	<b>211</b>	<b>52.6</b>

statistics was used to determine organ condemnation rates and defined as proportion of condemned organs to the total number of organs examined. The variability between condemnation rates of specific organs by risk factors of age, origin, body condition and breed were evaluated by Pearson's chi square ( $\chi^2$ ) and differences were regarded statistically significant if p-value was less than 0.05 using statistical package for social sciences (SPSS) version 20.0 for windows.

## RESULTS

### Antemortem examination

Out of the total of 399 cattle examined during ante mortem inspection, 13 (3.25%) were found to have abnormalities of lameness, mouth discharge, rough hair coat and skin lesions (Table 1).

### Post mortem examination

All cattle that had been examined in ante mortem inspection were subjected to post mortem examination. From the total organs examined, 211 (55.5%) livers (Table 2) and 223 (56.4%) lungs (Table 3) were totally condemned from local market due to various gross pathological abnormalities such as fasciolosis, hydatidosis, calcification, marbling, emphysema, hardening and hemorrhage. Association among many risk factors such as age, body condition, origin and breed of animals was computed against liver and lung condemnation rate. But

among these only body condition showed statistically significant difference ( $\chi^2 = 11.524$ ,  $P = 0.003$ ) with condemnation rate of each organ (Table 4). The result indicated that rate of liver and lung condemnation has no statistically significant difference in animals coming from different origin (Table 5).

## DISCUSSION

In this study, routine ante mortem and post mortem inspection was carried out to detect abnormalities encountered in Hawassa Municipal Abattoir. The most commonly encountered abnormalities during ante mortem inspection were 3 (0.75%) lameness, 4 (1%) nasal discharge, 2 (0.5%) skin lesions and 4 (1%) rough hair coat. Both the nasal discharge and rough hair coat were the highest encountered ante mortem problems followed by lameness and skin lesion. All of these ante mortem findings may be associated with stress following transport of animals from the source areas and also lameness and skin lesions may be partly contributed by traumatic effect of transport vehicles.

Out of 399 cattle slaughtered and examined in the abattoir, 224 (56.1%) lungs and 207 (51.8%) liver were rejected from local market due to their gross abnormalities (Table 6). The current study showed very high rejection rates of liver at post mortem as compared to previous studies conducted by Asmare et al. (2012) and Yifat et al. (2011) who reported rejection rates of 23.7 and 31.1% of liver at Bahir Dar and Gondar, respectively.

**Table 3.** Major causes of lung condemnation and frequency of lesions.

Cause of Condemnation	Frequency of lesions and % condemned	
	Frequency	Percent
Hydatidosis	141	35.3
Calcification	3	0.78
Emphysema	39	9.7
Marbling	40	10
<b>Total</b>	<b>223</b>	<b>55.78</b>

**Table 4.** Condemnation rate of liver and lung based on age and body condition score.

Variable		Frequency of lesion and % of condemned organ		
		Total No. examined	Lung condemnation (%)	Liver condemnation (%)
Age	Adult	274	150(54.7)	138(50.3)
	Old	125	74(59.2)	69(55.2)
Body condition score	Good	269	144(53.5)	124(46.1)
	Medium	108	67(62)	71(65.7)
	Poor	22	13(59.1)	12(54.5)

$\chi^2=0.445$ ,  $p=0.514$ , and  $\chi^2=11.524$ ,  $p=0.003$ .

**Table 5.** Condemnation rate of liver and lung based on origin of cattle in this study.

Variable	Municipal	Frequency of lesion and % of condemned organ		
		Total No. examined	Lung condemned (%)	Liver condemned (%)
Origin	Tula	308	170 (50.7)	165 (49.2)
	Hawassa	45	23 (54.7)	19 (45.2)
	Harar	5	3 (60)	2 (40)
	Negele	22	20 (57.1)	15 (42.8)
	Shashemene	12	7 (46.6)	5 (33.3)
	Nazereth	7	1 (50)	1 (50)

$\chi^2=0.586$ ,  $p=0.44$ .

Lung rejection rate in this study (56.1%) was also increased as compared to Amene et al. (2012), Yifat et al. (2011) and Asmare et al. (2012) who reported prevalence of 46.22, 29.4 and 25.78% in Jimma Municipal, Gonder ELFORA and Bahir Dar Municipal abattoirs, respectively. This difference may be due to difference in agro-ecological conditions from where the slaughter animals are originated and prevalence of diseases in different areas. The post mortem examination of the study also showed fasciolosis (20.5%), hydatidosis (17.2%) and calcification (10.2%) as major and hardening (4.2%) and hemorrhage (0.5%) as minor causes of liver condemnation; whereas hydatidosis (35.3%) as major and calcification (0.78%), marbling (10%) and emphysema

(9.7%) as minor causes of lung condemnation. Such variation in the degree of different factors as a cause for organ condemnation may be related with difference in the prevalence of these conditions from different geographic areas and in different animals in animals from the same geographic area.

In this study both fasciolosis and hydatidosis accounted for greater proportion of organ condemnation. This agrees with what was reported by different reports from studies by different researchers even though variation is still visible. The rejection rate of liver due to fasciolosis (20.5%) was high when compared with the rejection rate of 12.7 and 8.6% by Fufa et al. (2010) at WolaitaSodo and Mellau et al (2011) at Tanzania, respectively. On the

**Table 6.** Condemnation rates of organs in association with breed of cattle.

Organ Examined	N (% condemned)	Breed of cattle		
		Local (%)	Exotic (%)	Cross (%)
Lung	224 (56.1)	216 (51.6)	3 (75)	5 (55.5)
Liver	207 (51.8)	202 (48.3)	1 (25)	4 (44.4)
Total	431	418	4	9

other hand it was low when compared to 24.32% in Mekelle (Geberetsadik et al., 2009) and 68.7% in kombolcha (Andualem, 2007). This could be due to differences in environments and ecological conditions of the study areas from where the study animals are originated.

In this study the prevalence of hydatidosis in lungs (35.5%) was higher than that found in the liver (17.2%). This was in line with the findings of Asmare et al. (2012) and Fitsum (2009) who reported a prevalence of 35.7 and 38.8%, respectively; but is greater than that reported by Shegaw (2008), Andualem (2007), Marta (2010) who reported a prevalence of 25.2, 26.7, 32.8, 22.7%, respectively. Such variation may be attributed to the difference in the geographic origin and agro ecological conditions of slaughter animals.

The findings of the study depending on the age, origin and breed of the slaughter animals did not show a significant difference ( $P > 0.05$ ) indicating that cattle in each category in all variable types are prone for factors causing organ condemnation and this was in line with the findings of the study by Asmare et al. (2012) who reported the presence of no significant difference in these risk factors.

However, body condition of animals showed a statistically significant difference ( $p < 0.05$ ) for the rate of liver and lung condemnation. This finding agreed with the result of Asmare et al. (2012) who reported the presence of a statistically significant difference in the rate of organ condemnation in different body condition of animals. This indicated that disease conditions that cause organ condemnation are highly associated with body condition score of animals.

## Conclusion

The study showed that fasciolosis and hydatidosis are the major causes of liver and lung condemnation, respectively. The age, breed and origin of the animals did not show a significant difference whereas the body condition score of the animal did show a significant difference on the rejection rate of organs. Therefore, this study avails information to take appropriate actions to reduce the factors that contribute for greater condemnation rate of organs.

## Conflict of Interests

The authors have not declared any conflict of interest.

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