Study on major causes of organ condemnation and financial loss in sheep slaughtered at Jimma municipal abattoir, south-western Ethiopia

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Abstract

Parasitic disease and pathological lesion were the major causes of organ condemnation and responsible for extent financial loss from the local and international market. A cross sectional study was carried out on sheep slaughtered at Jimma municipal abattoir between November 2016 to April 2017 with the aim of determining the major causes of organ condemnation and condemnation rate with estimating associated financial loss. A total of 384 randomly selected sheep using systematic random sampling method were managed through ante-mortem and post-mortem examinations. Among the total of sheep inspected at ante-mortem examination 69(18%) were found affected with different abnormal physical conditions. Majority of pathological lesions rendering organ condemnation in the abattoir were attributed to miscellaneous lesion accounting for 120 (31.25%) of major causes of organ condemnation followed by parasitic disease contributing for 22 (5.7%) of losses. the study revealed that 28 (7.3%) muscles,62 (16.15%) livers, 29 (7.55%) lungs,13 (3.4%) kidneys and10 (2.64%) hearts were rejected due to various causes. On the basis of organ condemnation rate recorded during the study period an estimated annual financial loss of 55603.08 Ethiopian Birr per year was inevitably incurred due to rejection of the visceral organs. Conclusively miscellaneous lesion and parasitic disease were the common causes of organ condemnation at Jimma municipal abattoir indicating that sheep owners should get awareness on management of parasitic diseases to decrease its burden and associated loss in their animals. Regular deworming of dogs and elimination of stray dogs should be practiced.

Key words: *abattoir, financial loss, organ condemnation, Jimma, Sheep*

1. INTRODUCTION

The purpose of meat inspection is to remove gross abnormalities from meat and its products, prevention of distribution of contaminated meat that could result to disease risk in man and animals and assisting in detecting and eradication of certain disease of livestock (Van Longtestijn, 1993).

Post mortem 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. Studies conducted in different abattoirs of Ethiopia revealed that parasitic infection of liver, lung and pericardium are the cause of organs condemnation (Asmara *et al.,* 2012). Echinococcosis also known as hydatid disease or hydatidosis is a near-cosmopolitan zoonosis caused by adult or larval stages of tapeworms (*cestodes*) belonging to the genus *Echinococcus* (family *Taeniidae*).

Cysticercus tenuicollis is the larval stage of *Taenia hydatigena* tapeworm that considered as the most important parasite of sheep and goats (Bayu *et al.,* 2012). The adult *Taenia hydatigena* lives in the small intestines of dogs and other carnivores, segments containing numerous eggs passed in the feces which are caused by *Taenia hydatigena larvae*. Another important parasitic disease that causes organ condemnation in most of abattoir was fasciolosis which is caused by two digenetic trematodes of the *Fasciola hepatica* and *Fasciola gigantic* in sheep, goat and cattle. *Fasciola hepatica* occurs in liver of definitive host and its life cycle is in direct. It occasionally affects humans hence considered as a zoonotic disease (Andrews, 1999).

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 Bekele and Butako (2011). 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 financial loss in ovine slaughtered at Jimma municipal abattoir. Therefore, the objectives of this study were;

- To identify the organs condemnation rate in Jimma municipal abattoir,
- To estimate the major causes of organs condemnation and
- To assess the direct financial losses from condemnation of organs in the abattoir

3. MATERIALS AND METHODS

3.1. Sample Size Determination

The sample size was calculated according to Thrusfield (2005) by taking 50 % of expected prevalence and 5% accepted error at 95% confidence interval. The formula used to calculate the sample size was given as:

$$N = 1.96 * \frac{Pexp\ (1-Pexp)}{d^2}$$

Where; n= numbers of individuals to be sampled

P exp = expected prevalence

D^2= desired absolute precision

Accordingly, the sample size was 384.

3.2. Sampling Method

During the study, animals were grouped in to young (below 15 months) and adult those having two pairs and above permanent teeth (15 months above) based on eruption of one or more incisor teeth (Vatta *et al*.,2006). Body condition scoring also was carried out based on the hand book given by Ethiopian Sheep and Goat Productivity Improvement Program (ESGPIP, 2008). Animals belonging to a group of young and adult were randomly sampled using systematic random sampling method. This was based on giving an equal chance or probability of selecting each unit from within the population with corresponding to their identification (ID) numbers. Conveniently, two slaughtering days per week were selected to visits the abattoir. Accordingly,

the Identification number was given for each animal to examine after evisceration and the average numbers of sheep that were examined were 15 per days.

3.5. Study Design

A cross-sectional study was conducted in sheep slaughtered in Jimma municipal abattoir to identify the major causes of organ condemnation including, fasciolosis, hydatidosis, *cystcercus tenuicollosis* and other visceral abnormalities like Calcification, Cirrhosis, pneumonia and pericarditis by ante mortem and post mortem examination using standard examination procedures.

3.6. Study Methodology

3.6.1. Abattoir survey

Ante mortem inspection

Pre-slaughter examination of sheep was conducted in the lairage by grouping the animals based on, age, body condition and place of origin. Ante mortem inspections ware conducted on individual animals, while the animals were come into the lairage. Both sides of the animals were inspected at rest and in motion. Moreover, the general behavior of the animals, cleanliness, and sign of diseases and abnormality of any type was registered according to the standard ante mortem inspection procedures (Cadmus *et al*., 2009).

Postmortem examination

During postmortem inspection muscle, liver, lungs, heart and kidney were thoroughly inspected by visualization, palpation and by making incisions into the organs. Pathological lesions are differentiated and the results were recorded. The decisions at postmortem inspection is classified

in to the following categories of judgment such as approved, as fit for human consumption, totally condemned, as unfit for human consumption and partially condemned, as fit for human consumption after treatment (FAO, 1994).

3.7. Assessment of financial loss

To calculate the cost of the condemned edible organs, eight different butcher houses and ten residents or households in the Jimma town were interviewed randomly to establish the price per unit organ. The average organ price was determined and this price index was used to calculate the financial loss. Accordingly the mean retail market price of condemned organs such as muscle, liver, lung, heart, and kidney, were used for calculation. The Information obtained was subjected to mathematical computation by modifying the formula of Ogunrinade and Ogunrinade (1980).

Annual financial loss due to organ condemnation = Annual number of sheep slaughtered at the abattoir multiplied by the average price of organs multiplied by Condemnation rates of each organs.

3.8. Data Management and Statistical Analysis

The data were analyzed by using SPSS version 20 software of the computer programmed for the statistical analysis.

4. RESULT

Calcification was the major causes of organ condemnation encountered in the liver, which was 30 (7.8%) followed by fasciolosis 15 (3.9%), cirrhosis 10 (2.6%) and *cysticercus tenuicollis* 7(1.8%), (Table 1).

Organs inspected	Major lesion	Number of Organs Affected (%)	Rate of rejection for each organ In percent (%)
Muscle	Abnormal bleeding	28 (7.3%)	28 (7.3%)
Liver	Calcification	30 (7.8%)	62 (1 6.15%)
	Cirrhosis	10 (2.6%)	
	Fasciola	15 (3.9%)	
	C.tenuicollis	7 (1.8%)	
	Total	62(16.15%)	
Lung	Calcification	5 (1.3%)	29 (7.55%)
	Pneumonia	16 (4.2%)	
	C.tenuicollis	1 (0.3%)	
	H.cyst	7 (1.8%)	
	Total	29 (7.55%)	
Kidney	Nephritis	10 (2.6%)	13 (3.4%)
	Adhesion	3 (0.8%)	
	Total	13 (3.4%)	
Heart	Adhesion	6 (1.6%)	10 (2.64%)
	Pericarditis	4 (1.04%)	
	Total	10 (2.64%)	

Table 1: Summary of major causes of organ condemnation in sheep slaughtered at Jimma municipal abattoir and rejection rate.

Assessment of annual financial loss was based on slaughter capacity of the abattoir, the market demand, average market price of each organ in Jimma town and rejection rate of each organ. Average market price was determined by interviewing personnel of house hold and butcher houses due to the absence of retrospective data. The mean current price of visceral organs at Jimma town for muscle per kilogram, liver, lung, heart and kidney was 120, 12, 10, 8 and 6 Ethiopian birr respectively.

Organs	Rate of rejection for Each Organ (%)	Unit price (ETB)	Total estimated annual financial loss(ETB)
Muscle	28 (7.3%)	120	3360
Liver	62 (16.15%)	12	744
Lung	29 (7.55%)	10	290
Kidney	13 (3.4%)	8	104
Heart	10 (2.6%)	6	60
Total	142 (31.3%)	156	4558

Table 2: Summary of rate of rejection organs and total estimated financial loss during the study period.

The average numbers of sheep slaughtered were 15 per days and the numbers of slaughtering days per week were six days (6 days). Therefore the numbers of animals slaughtered per week were ninety (90). Accordingly, the average slaughtering capacity of the abattoir per year was estimated to be 4680 sheep (90 multiplies by 52 weeks). The condemnation rate of muscle, liver, lung, heart and kidney were 7.3%, 16.15%, 7.55%, 3.4%, and 2.6% respectively as indicated in table 2.

Accordingly, the total estimated annual financial loss due to organ condemnation was estimated by substituting all the above values in to the following formula. Annual economic loss due to organ condemnation = Annual number of sheep slaughtered at the abattoir multiplied by Average price of organ multiplied by condemnation rates of each organs (Ogunrinade and Ogunrinade, 1980).

Therefore annual financial loss due to organ condemnation for the **muscle** were calculated as, 4680 multiplied by 120 Ethiopian Birr multiplied by 7.3% gives us 40996.8 Ethiopian Birr. Similar annual financial loss for liver, lung, kidney and heart were calculated which gives; 9069.84 EB, 3533.4 EB, 1272.96 EB and 730.08 EB, respectively. Therefore the total estimated annual financial loss were, 40996.8EB + 9069.84EB + 3533.4EB + 1272.96 EB + 730.8 EB, which was equals to **55603.08** EB.

5. DISCUSSION

In the present study 69 (18%) head of sheep were found with different forms of abnormality at ante-mortem examination. This finding was lower than 81 (21.09%) which was recorded in Elfora meat Export abattoir (Aynalem *et al*., 2015). During postmortem inspection all visceral organs and associated structure were examined for the presence of abnormalities or different parasitic diseases and other pathological lesion that causes organs to be rejected from the local market.

In the present finding cysticercus tenuicollis was occurred in the liver 7(1.8%), causing liver condemnation. This finding was lower than the result from Bishoftu Elfora Export abattoir (5.73%) which was reported by Aynalem *et al.* (2015) and that of (4.33%) which was recorded in Addis Ababa Abattoir Enterprise, by Assefa *et al.*(2017). However, (Bekele *et al*., 1988) have reported 37.1% prevalence for *Cysticercus tenuicollis* in sheep slaughtered at Addis Ababa Abattoir.

In the current finding, liver condemnation due to fasciolosis in Jimma municipal abattoir 15 (3.9%) was lower than that of Addis Ababa Abattoir Enterprise (11.67%) recorded by Assefa *et al.*, (2017). however the present report of liver condemnation due to fasciolosis in Jimma municipal abattoir was slightly higher than 19 (2.24%) which was reported in Hashim's Ethiopian Livestock and Meat Export abattoir at Debre Zait (Sisay Dejene, *et al*., 2013).

These variations in the rejection rate of organs could be due to differences in agro-ecological conditions that favorable to the parasites, livestock management system and the prevalence of diseases at the different study sites. In present finding, hydatid cysts were more frequently observed in lung contributing 7 (1.8%) than the liver of sheep. similar findings were reported by Daryani *et al*., (2007).

There was another report on the presence of hydatidosis in small ruminant at slaughter houses which has been documented in Ethiopia (Yitbarek *et al*., 2012). Liver condemnation due to hydatic cyst 18 (8.5%) was recorded in Elfore meat Export abattoir in Bishoftu (Usman and Belay 2016) and the average prevalence expressed as a proportion of the numbers of livers condemned due to hydatidosis to the total number of slaughtered animals were (3.4%) in Eritrean Keren slaughterhouse, Anseba zone (Ghebremariam *et al*.,2014). Another report also reveals that the percentage of hydatid cysts in different visceral organs was observed as 48.8% and 6.98%, in lung and liver respectively which was conducted in Addis Ababa Abattoir and reported by Helina Getachew,*et al.*(2012). This finding was also still higher than the finding from Jimma municipal abattoir, 7 (1.8%). These variation may be associated with the 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.

The principal pathological lesion that causes liver to be rejected was calcification, contributing, 30 (7.8%), followed by cirrhosis 10 (2.6%). The pathological lesion that causes heart to be condemned was found to be adhesion and pericarditis. 10 (2.6%) hearts condemned due to

gross abnormalities, Adhesion were accounts 6 (1.6%) whereas pericarditis contributes 4 (1.04%) as shown in table 1. According to the current finding the major causes of heart condemnation due to gross abnormalities, both, adhesion and pericarditis in sheep was lower than the report recorded in Elfora meat Export abattoir in Bishoftu which was 2 (3.57%) and 7 (12.5%) (Usman and Belay 2016).

The present study showed that the parasites and pathological lesion were the major causes of organ condemnation. Out of the total examined organs 28(7.3%) muscle, 62 (16.15%) liver, 29 (7.55%) lung, 10 (2.6%) heart and 13 (3.4%) kidney were condemned due to various reasons.

The total financial loss calculated in this current study, due to the condemnation of muscle, liver, lungs, heart, kidneys was estimated to be 55603.08 Ethiopian birr per year. This finding is in agreement with the studies conducted in Elfora export abattoir which was 159791.6 Ethiopian birr per year reported by Aynalem *et al*. (2015) from the small ruminants. However, the current finding is higher than that of the total annual loss analysis conducted in Addis Ababa abattoir which was 27,691.34 Ethiopian birr per year due to hydatidosis, reported by Helina Getachew, *et al.* (2012).

6. CONCLUSION

Abnormal bleeding, calcification, fasciolosis, pneumonia, pericarditis, nephritis, hydatic cyst and cysticercus tenuicollis are the most and major causes for the respective organs condemnation in sheep slaughtered at Jimma municipal abattoir. In view of this study an estimated annual financial loss from organ condemnation was estimated 55603.08 Ethiopia Birr per year. This study was limited to study on the abattoir, therefore further study needed for the public awareness about the disease causing organ condemnation.

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