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The Cause, Rate and Economic Implication of Organ Condemnation of Cattle Slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopia

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Abstract: A cross sectional study was conducted from November 2010 to March 2011 to identify the major causes of organ condemnation in cattle slaughtered at Jimma municipal abattoir. An attempt was also made to estimate the direct economic loss due to condemnation of edible organs during meat inspection. A total of 900 cattle were examined by ante mortem and post mortem inspections using standard inspection procedures. During ante mortem inspection, the abnormities encountered were blindness (0.11%), depression (0.55%), edema (0.11%), alopecia (0.11%), lameness (0.11%), leech infestation (0.22%), tick infestation (2.44%) and respiratory signs (0.11%). In the post mortem inspection, 580(64.44%) of Livers, 416 (46.22) % of Lungs, 11(1.22%) of Hearts and 18(2.00%) of Kidneys were condemned due to gross abnormalities. An estimated annual loss of 172,664.09 ETB (US$10464.5) was incurred due to condemnation of these organs. Fasciolosis was found to account 92.7% of all the losses. The findings showed that the rate of organ condemnation at the abattoir is very high which signifies the need for prompt disease control programs to be implemented.

Key words: Organ · Condemnation · Ante Mortem · Post Mortem · Cattle

INTRODUCTION

The world human population is growing at faster rate than food production and this increase is mainly in developing counties, which are unable to assure adequate food for their people. Developing countries have nearly 2/3rd of the world's livestock population, but produce less than a third of the worlds meat and fifth of its milk [1]. Monitoring and other conditions at slaughter has been recognized as one way of assessing the disease status of herd, however this source of information is not fully exploited worldwide [2]. Abattoirs played an important role in surveillance of various diseases of human and animal health importance. Surveillance at the abattoir allows for all animals passing in to human food chain to be examined for unusual signs, lesions or specific disease [3]. The main causes of organ condemnation during post mortem inspection are diseases originated by parasites, bacteria and viruses. Flukes in liver and hydatid cyst in lung, liver and kidney, are mainly involved [4,5,6]. Parasites in the tropics are responsible for far greater loss to meat industry than any other disease [7]. Similarly like many other tropical countries in Africa, it's well known that parasitic diseases are the major factors responsible for low productivity in live stock in Ethiopia [8, 7]. Although various investigations have been conducted through abattoir survey to determine the prevalence and economic loss resulting from organ condemnation in Ethiopia, most of the surveys were focusing only on parasitic cases such as hydatidosis and fasciolosis. Therefore, this study was designed to quantify the rate, causes and economic loss of organ condemnation in a holistic manner at Jimma municipal abattoir.

MATERIALS AND METHODS

Study Area: The study was conducted in Jimma zone, South Western part of Ethiopia at Jimma Municipal Abattoir. Jimma town is located in Oromia regional Administration, 346km South West of Addis Abeba at altitude of about 7°13´-8 °56´N and longitude of about 35°51´-37 °37´E and an elevation ranging from 880m to 3360 m.a.s.l [9].

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Study Population: A total of 900 Cattles destined for slaughter were inspected during ante mortem and post mortem inspections.

During ante mortem inspection, each of study animals was identified by making numbers on their body with a color marker. Age, sex and body condition scoring of animals were recorded. Estimation of age was carried out by dentition according to De Nahunta and Habel [10]. 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 were registered [11]. Judgment was done based on the procedure given by FAO [12].

During Post mortem inspection, Liver, lung, heart, kidney were thoroughly inspected by visualization, palpation and making systemic incisions where necessary for the presence of cyst, parasite and other abnormalities. Pathological lesions were differentiated and judged according to guidelines on meat inspection for developing countries and classified into the following categories of judgment namely: approved as fit for human consumption, conditionally approved as fit for human consumption, totally condemned as unfit for human consumption and partially condemned as unfit for human consumption [13].

Assessment of Economic Loss: The analysis was based on annual slaughter capacity of the abattoir considering 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 the abattoir and butchers. The economic loss due to condemnation was estimated by the formula set by Ogunrinade and Ogunrinade [14] as follows:

$$EL = \Sigma\, srx \times Coy \times Roz$$

Where:

EL = Annual economic loss estimated due to organ condemnation
Σ 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 Statistical Analysis: Data generated from ante mortem and post mortem meat inspection were recorded. Descriptive statistics using the STATA 9 [15] was used to determine the level of organ condemnation defined as the proportion of condemned organs to the total number of organs examined.

RESULTS

Ante Mortem Examination: The abnormalities found during ante mortem examination of a total of 900 animals presented in Table 1. Abnormalities were detected in 46 (5.1%) animals which include: blindness, depression, edema, alopecia, lameness, leech infestation, tick infestation and respiratory signs.

Table 1: Percent abnormalities encountered during ante mortem inspection of total 900 animals

Abnormalities	Number with disease condition	Percentage (%)
Blindness	1	0.11
Depression	5	0.55
Edema	1	0.11
Fungal like lesion	1	0.11
Lameness	14	1.55
Leech infestation	2	0.22
Tick infestation	22	2.44
Respiratory signs	10	1.11

Table 2: Annual rate of organ condemnation and economic losses analysis

Organ	Disease condition	Rejection rates	Loss of money (ETB*)
Liver	Calcification	3.3%	4490.5
	Abscessation	0.3%	445.0
	Cirrhosis	3.4%	9277.7
	Fasciolosis	46.7%	125842.0
	Hydatid cyst	10.2%	18852.0
	Hepatitis	0.4%	1186.7
	Total	64.4%	160,093.9
Lung	Congestion	2.33%	401.9
	Emphysema	6.77%	1092.3
	Hydatid cyst	35.88%	8058.6
	Pneumonia	1.11%	229.4
	Abscessation	0.11%	14.8
	Total	46.22%	9,797.0
Heart	Cysticercus bovis	0.22%	296.7
	Hydatid cyst	0.44%	296.7
	Pericarditis	0.44%	593.3
	Others	0.11%	74.2
	Total	1.22%	1,260.8
Kidney	Atrophy	0.22%	118.7
	Calcification	0.22%	118.7
	Hydronephrosis	0.88%	681.7
	Nephritis	0.22%	118.7
	Renal calculi	0.11%	118.7
	Abscessation	0.22%	237.3
	Others	0.11%	118.7
	Total	2.00%	1,512.4
Overall			172, 664.0

*1 US$= 16.5 ETB when the study was conducted

Post Mortem Examination: Out of 900 inspected livers, 64.44% of them were condemned due of various abnormalities. Faciolosis was found to be the main cause of liver condemnation followed by hydatid cyst and calcifications. About 46.2% of inspected lungs were condemned. Hydatid cyst was the major cause of lung condemnation. Also, emphysema was an important cause of lung condemnation where it was traced in 6.77% of the examined lungs.

Hydatid cyst, *Cysticercus bovis* and Pericarditis were the major cause of heart rejection which accounted for 11(1.22%), 2(0.22%) and 4(0.44%), respectively. Hydronephrosis found to be the main causes of kidney rejection followed by calcification, abscessation, nephritis and atrophy (Table 2).

Assessment of Direct Economic Loss: The annual slaughter rate of the abattoir was estimated to be 13,485 cattle based on the data result of retrospective study of Jimma Municipal Abattoir. The annual estimated economic loss was found to be 172, 664.09 ETB per annum (Table 2). Liver condemination takes the higher proportion of all the losses accounting for 92.7% of all the losses followed by lungs, heart and kidney which constitute 5.7%, 0.7% and 0.9% of all the direct economic losses.

DISCUSSION

Out of the total of 900 cattle slaughtered, 64.44% liver, 46.22% lung, 1.22% heart and 2.00% kidney were rejected due of various types of lesions. Liver was condemend due to fasciolosis, calcification, abessesation, cirrhosis, hydatid cyst and hepatitis. The rate of liver condemnation in this study was 64.44% which is much higher than the report of Denberga *et al*. [16] in Gondar ELFORA abattoir which was 31.1%. Lower fasciola prevalence (39.8%) was reported by Abdulhakim and Addis [17] at Hashim Nur's export abattoir in Debre Zeit. The variation could be attributed to differences in ecological and management settings. Losses from liver condemnation are generally associated with infection of public health importance and aesthetic reasons [18]. Different researchers indicated that fasciolosis was the most common cause of organ condemnation [19-22]. Liver condemnation due to cirrhosis (3.44%) which is found in the present study relatively higher than report by Denberga *et al*. [16] who reported 1.1% rate of rejection for cattle slaughtered in Gondar ELFORA abattoir but lower than report by Alawa *et al*. [23] in which 12.8% rate of rejection was found from cattle slaughtered in Nigeria abattoir.

The present study revealed that the lungs were condemned due to congestion, emphysema, hydatid cyst, pneumonia and abscessation. Hydatid cyst found to be the main cause of lung condemnation with rate of 35.85% which is relatively higher than report by Mewcha [24, 16]. The lung is the most frequently having hydatidosis due to its size, blood supply and availability of oxygen supply [25].

The Lung condemnation due to congestion according to the present finding was 2.33% which is relatively lower than the reported by Tham and Sheilka-Omar (17.7%) [26]. The congestion was mostly attributed to improper stunning and bleeding methods [27, 28]. Other causes of lung condemnations were emphysema and pneumonia. In the present study, emphysema was observed at a rate of 6.77% which is higher than the report by Fasil [29] with 1.2% rate of rejection but lower than report by Kambarage *et al.* [30] with 22% in Tanzania and Abayneh [31] who reported 16.53% in cattle slaughtered from Assela Municipal Abattoir. Seboka [32] reported a much higher rate of condemnation (43.75%) for cattle slaughtered in Addis Abeba Municipal Abattoir. Pneumonia which was another pathological condition attributed to 1.11% of rejection rate. A more or less consistent report showed a rejection rate of 3.33% in cattle slaughtered in Tanzania [30]. Whereas, a higher rejection rate of 31.02% rate was reported for cattle slaughtered in Nigeria by Cadamus and Adesokan [33]. Emphysema and pneumonia could be due to exposure of cattle to bacterial or viral origin infections, stressor factors including exposure to dust and starvation. Moreover, penetration of lung by foreign body, adverse weather condition or accidental inhalation of liquid may cause pneumonia [33].

The present study also showed that the heart was condemned due to hydatid cyst and pericardtis. Fasil [29] reported that hydatid cyst was the most common cause of heart condemenation followed by *Cysticercus bovis* and pericarditis at Gonder abattoir. Teresa *et al*. [34] reported a consistent prevalence of 1.5% for *Cysticercus bovis* on heart at Jimma abattoir. However, a higher rejection rate of pericarditis (36%) was reported by Kambarage *et al.* [30] from cattle slaughtered in Tanzania. According to the report by Fasil, [29] the main cause of kidney rejection like 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. In comparison with the present findings, nephritis was slightly lower where as hydronephrosis was slightly higher than the report of Fasil [29]. According to Kambrage *et al.* [30] the rejection rate of kidney due to

hydronephrosis and nephritis in Tanzania was 19% and 14%, respectively which is much higher than the present finding. The differences in the rejections rates could be attributed to the differences in the prevalence of different pathogens in different countries, their virulence and variation in animal management systems.

An estimated average amount of 172,664.09 ETB (US$10464.5) was lost annually due to organ condemnation of cattle at the abattoir. Similar economic loss analysis by Fasil [29] showed annual economic loss of 150,048.98 ETB at Gondar Municipal abattoir. Another report in cattle slaughtered at Mekele municipal abattoir revealed an estimated annual economic loss of 222,884.58 ETB. According to Regassa *et al.* [35] losses due to hydatidosis was estimated to be 1,791,625.89 ETB annually. Similarly the annual economic loss in Ambo and Sodo Municipal Abattoir was estimated to be 160,032.23 and 4000 USD as reported by Zewdu *et al*. [36] and Abunna *et al*. [37]. Fasciolosis, hydatid cyst, pericaditis and hydronephrosis were the major causes of organ condemenation of cattle slaughtered at the abattoir. Differences in the amount of money lost in various abattoirs could be attributed to differences in the prevalence of diseases, differences in the rejection rate of organs, difference in the slaughtering capacity of abattoirs and also variations in the management of animals in different parts of the country. The greater economic loss (92.7%) was due to condemnation of liver. Higher price of liver in the market combined with frequent infestation of animals with fasciolosis (46.7%) in the area is observed to be an attributing factor for much of the economic losses to occur through condemnation of liver. As a conclusion, the study showed that a considerable amount of money was lost due to diseases and abnormalities. Thus, attention should be paid for strategic disease control programs to avoid risk of contracting of zoonotic diseases and minimize economic losses.

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