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Major Causes of Organs Condemnation and its Economic Significance in Cattle Slaughtered at Jimma Municipal Abattoir

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Abstract: A cross-sectional study was conducted from October 2010 to March 2011 to determine the major causes and rate of organ condemnation and to estimate the associated direct financial losses in cattle slaughtered in Jimma abattoir based on routine meat inspection. Out of the total 485 animals randomly selected and included in the study, one or more of the organs of 332 (68.5%) animals were condemned due to one or more problems. Out of the 485 cattle examined, 227 (46.8%) liver, 162 (33.4%) lung, 16 ((3.3%) kidneys and 9 (1.85%) hearts were condemned due to one or more abnormalities. Age and body condition score of the animals were not found to have significant influence on the organ condemnation rate ($P > 0.05$). Hydatidosis, fasciolosis and bruising with respective prevalence of 33.4%, 28.5% and 80 (16.5%) were found to be the major disease conditions that affected different organs of the cattle examined during the study. Total annual financial loss due to organ condemnation was estimated to be 137, 496.97 ETB. The result of the current work warrants immediate need for prevention and control of the causes of organ condemnations.

Key words: Organ · Abattoir Condemnation · Hydatidosis · Fasciolosis · Cattle · Jimma

INTRODUCTION

Livestock potential in Ethiopia has not been properly exploited due to prevailing socio cultural, values and attitudes, or traditional management system, limited genetic potential, governmental policies and rampant diseases [1].

The most commonly effected organ being liver and lung mainly to fasciolosis and hydatidosis [2]. Each year significant loss results from death of animals, inferior weight gain, Condemnation of edible organs and carcasses at slaughtered. This production loss to the livestock industry is estimated at more than 900 million USD annually [3].

A through meat inspection procedure requires two-steps namely antemortem and postmortem inspection. The importance of ante mortem inspection in the abattoir has long been recognized in an attempt to avoid the introduction of clinically diseased animals into the slaughter horse. Ante mortem inspection should be done within 24 hours of slaughter and repeated in slaughter has been delayed over a day [2, 4].

Postmortem inspection is screening or sorting process to separate the normal from abnormal. It is the center around which meat hygiene revolves since it provides information indispensable from the scientific evolution of clinical signs and pathological process that affect wholesomeness of meat. All gross lesions should be carried out as soon as possible after completion of dressing [1].

The final judgment as to the action to be taken with an organ and carcass or parts of a carcass is based on the total evidence produced by observation, palpation, incision, smell and any antemortem signs [2]. It is necessary to be aware the extent to which the public is exposed to certain zoonotic diseases detected in abattoirs and financial losses trough condemnation of affected organs and carcass [5]. As meat is the main source of particular importance to the public such as Tuberculosis, hydatidosis, cysticercosis and fasciolosis [6].

The major causes of organ condemnation during postmortem inspection are diseases caused by parasites, bacteria, viruses. Of these disease liver fluke in the liver and hydatid cyst in the liver, lung and kidney are mainly involved [2].

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Parasites in the tropics are responsible for greater losses to the meat industry than any other diseases [7]. Similarly like many other tropical counties of Africa, it is well known that parasitic diseases are among the major factors responsible for the low productivity of livestock in Ethiopia [3,7].

Cystic echinococcosis / Hydatidosis are a parasitic infection caused by larval stage of *Echinococcus granulosus*, which is small tape worm, for which dogs and other canids are typical definitive hosts. The adult parasite is found in small intestine of carnivores while the metacestode (Hydatid cyst) is found in different organs of a wide variety of herbivorous including (sheep, goats and cattle), pig, horse and man [8]. The majority of the studies conducted on abattoir survey were concentrated only to some diseases particularly parasitic disease like Fasciolosis, Hydatidosis, Cysticercosis [7-10].

Moreover, there is no citable information regarding the causes of organs and carcass condemnation and associated financial loss in cattle slaughtered at Jimma Municipal abattoir. Therefore, the objective of this study was to identify the major causes of organ condemnation in cattle slaughtered in Jimma municipal abattoir and to estimate the magnitude of direct economic losses due to condemnation of edible organs during postmortem inspection.

MATERIALS AND METHODS

Study Area: The study was conducted from November 2010 to march 2011 in Jimma municipal abattoir. Jimma is located south west part of Ethiopia 346km far from Addis Ababa at latitude of about 7°13'-8°56'N and longitude of about 35052'-37037'E and an elevation ranging form 880m to 3360m above seal level. The study area receives a mean annual rain fall of about 1530mm which come from the long and short rainy seasons. The annual mean minimum and maximum temperature is 14.4°c and 26.7°c respectively. Ruminants destined for slaughter in Jimma municipal abattoir originated from different local markets in the surrounding Woreda towns.

Study Animals: The study animals were cattle slaughtered in Jimma municipal abattoir. It was difficult to precisely indicate the geographical origin of all animals slaughtered at Jimma municipal abattoir. However, the animals slaughtered were brought from different local markets in the surrounding *Woreda* towns likes, Seka, Dedo, Asendabo, Agaro and Kersa.

Sample Size and Sampling Method: The desired sample size for this study was calculated by using the formula given by Thrusfield [11] with 95% confidence interval, 5% absolute precision and at 50% expected prevalence. Accordingly, a total of 485 cattle were selected by simple random sampling method using lottery system.

Study Design: A cross-sectional study was designed to study the major causes of organs condemnation and their economic significance.

Study Methodology

Postmortem Inspection: During postmortem inspection liver, lungs, kidneys, heart and carcass were examined by visualization, palpation and making incisions and for the presence of cysts, adult parasites, pathological lesions and other abnormality. The abnormalities on organs were judged according to FAO [12] guideline on meat inspection for developing countries. The judgment passed by the meat inspectors was such that any organs and carcass with any pathology is condemnable and the results were recorded.

Assessment of Direct Economic Loss: To evaluate the economic loses, only the direct economic loss due to condemnation of the organs (liver, lungs, kidneys and heart) were considered. The analysis was based on animal slaughter capacity of the abattoir considering market demands, average market price of each organ in Jimma town and the rejection rates of specific organs. Average market price of each organ was determined from interviews made with personnel in the abattoir and butchers (Annex 4). The annual slaughter rate was estimated form retrospective data recorded in the past two years from abattoir record office. Financial losses were then computed mathematically by adapting the formula of Ogurinade, Bola and Ogurinade [13] as follows:

$$EL = \Sigma Srx * Coy * Roz$$

Where

EL = estimated annual economic loss due to organs condemnation from domestic market

Σ Srx = annual cattle slaughter rate of the abattoir

Coy = average cost of each cattle liver/ lung/ heart /kidney

Roz = condemnation rate of cattle liver /lung/ kidney heart

Data Management and Statistical Analysis: Data collected during inspection were entered into Microsoft excel spreadsheet 2003. Descriptive statistics

were used to determine organ condemnation rates, defined as proportion of organs condemned to the total number of organs examined. The variability between condemnation rates of specific organs, by risk factors of age group, body condition score and abnormalities were evaluated by Pearson's chi-square (χ^2) and difference were regarded statistically significant if P-value was less than 0.05 using SPSS version 16.0.

RESULTS

Postmortem Finding: From the total 485 cattle examined during the study, one or more of organs of 68.5% (n= 332) of them were condemned due to one or more abnormalities encountered during the study period. Hydatidosis, fasciolosis, bruising, emphysema and liver cirrhosis with respective prevalence of 33.4%, 28.5%, 16.5%, 7.6% and 4.5% were found to be the major disease conditions or abnormalities that affected different organs and carcasses of the cattle examined during the study (Table 1).

Overall prevalence of organ condemnation was compared for cattle in different age groups and with different body condition scores and significance difference was not observed (Table 2).

Out of 485 animal organs examined 227 (46.8%) livers, 162 (33.4 %) lungs, 16 (3.3%) kidneys and 9 (1.85%) hearts were condemned due to one or more abnormalities. Attempt was also made to determine causes of condemnation for different specific organs. From the total of 227 liver rejected, fasciolosis and hydatidosis were recorded in 60.8% (138) and 52.9% (120) of them, respectively alone or together with other abnormalities. From the 162 affected lungs by one or more of the abnormalities, hydatidosis and emphysema were encountered in 71.6% and 22.8% of the lungs condemned, respectively. Similarly, hydatidosis was also recorded in high proportion of condemned kidneys (56.3%) and hearts (55.6%) followed by atrophy (37.5%) in kidney, but next to pericarditis (66.7%) in rejected hearts. Summary of the different organs condemned and reasons of condemnation is given in (Table 3).

Out of total 414 condemnations regardless of organ difference, 64.5% were observed in cattle under age category of greater than 5 years. In terms of specific organ examination, of 227 liver condemned, 66.1% were documented in cattle in age category of greater than 5 years (Table 4).

Assessment of Direct Economic Loss: The estimated direct economic loss of Jimma municipal abattoir was calculated using condemnation rate of liver (46.8%), lung (33.4%), heart (1.85%) and kidney (3.3%). The average annual slaughter rate was calculated to be 12, 743 cattle and the average market price of organs

Table 1: Major disease conditions observed in cattle slaughtered at Jimma abattoir (N = 485)

Disease condition	Number with disease/abnormality	percentage
Hydatidosis	162	33.4
Fasciolosis	138	28.5
Bruising	80	16.5
Emphysema	37	7.6
Liver cirrhosis	22	4.5
Liver calcification	20	4.1
Lung congestion	18	3.7
Pericarditis	6	1.2
Atrophy (kidney)	6	1.2
Abscess	4	0.8
Hydronephrosis	4	0.8
Nephritis	4	0.8
Unknown (others)	2	0.4
C. bovis	1	0.2

Table 2: Prevalence of organ condemnation as influenced by age and body condition score

Variable	No examined	No affected	Relative prevalence	χ^2	P -value
Age (years)					
< or = 5	186	119	64.0	2.798	0.094
> 5	299	213	71.2		
BCS					
Medium	400	278	69.5	1.157	0.282
Fat	85	54	63.5		
Total	485	332	68.5		

Table 3: Organs condemned and reason for condemnation

Reason for condemnation	Organs condemned: Type	Organs condemned: No (relative percentage)
Hydatidosis	Liver	120 (52.9)
	Lung	116 (71.6)
	Kidney	9 (56.3)
	Heart	5 (55.6)
Fasciolosis	Liver	138 (60.8)
Cirrhosis	Liver	22 (9.7)
Calcification	Liver	20 (8.8)
Emphysema	Lung	37 (22.8)
Congestion	Lung	18 (11.1)
Abscess	Lung	3 (1.9)
	Liver	1 (0.4)
Pericarditis	Heart	6 (66.7)
Hydronephrosis	Kidney	4 (25)
Nephritis	Kidney	4 (25)
Atrophy	Kidney	6 (37.5)

Table 4: Number and percent of specific organ condemnation as influenced by age

Organ	Age category and number of organs condemned (%): ≤ 5 years	> 5 years	Total
Liver	77 (33.9)	150 (66.1)	227
Lung	60 (37.0)	102 (63.0)	162
Heart	2 (22.2)	7 (77.8)	9
Kidney	8 (50)	8 (50)	16
Total	147 (35.5)	267 (64.5)	414

condemned were the result of market surveyed during the study period. Accordingly, the economic loss due to the condemnation of edible organs from the local market was 137, 496.97 ETB annually.

DISCUSSION

Out 485 cattle organs examined, 227 (46.8%) liver, 162 (33.4%) lungs, 16 (3.3%) kidneys and 9 (1.85%) hearts were condemned due to one or more abnormalities in this study.

Fasciolosis is main causes of liver condemnation during postmortem inspection of liver of cattle slaughtered. This study revealed that 28.5% livers were condemned due to *Fasciola* in the total 485 cattle slaughtered in Jimma municipal abattoir. Further inspection of liver also revealed that hydatidosis, cirrhosis, calcification, abscess and unknown causes as causes of condemnation. Among liver condemned fasciolosis 138 (60.8%) and hydatidosis 120(52.8%) were recorded as the major causes of liver condemnation. In different parts of Ethiopia, fasciolosis has been reported to be one of the major disease problems of livestock industry [14]. Accordingly, Rahmato [15] obtained 35% in Walisso, Adem [16] 30% in Ziway region, Wassei [17] 13.4% in Nekemte, Beyazen [18] 53.3% in eastern Gojjam, Wakuma [19] 31.5% Bedelle municipal abattoir.

Hydatidosis is an important disease that leads to considerable economic losses in the abattoir due to condemnation of edible offal's primarily liver and lung as it is recorded in this study. Many researcher reported that livers and lungs were most commonly affected by hydatid cyst [1,4, 6,7, 8,20,21] is that lung and liver contain the highest capillary bed in the body and therefore the majority of the onchosphere are filtered out and trapped in the fine blood capillary and only small number of onchospheres reached the remaining organs. It was also suggested that particularly the lung is organ most affected by hydatidosis because an old age the liver capillaries are altered and most cysts passed directly to the lung, secondly the cyst passed to the liver via the thoracic duct without involving liver [1].

A total 162 lungs of bovine were condemned and the major causes of condemnation were hydatid cyst and emphysema comprising 116 (71.6%) and emphysema 35(21.6%), respectively. In this study there is no much difference in livers and lungs condemned due to hydatidosis, but the affection rate of liver 120 (24.74) is slightly higher than that of the lungs 116 (23.91%) in total number of animal examined.

The principal pathological lesions that cause kidneys to be condemned or unfit for human consumption were hydatid cyst 9(56.3%) and atrophy 6(37.5%). Similarly hydatidosis was recorded in high proportion of condemned hearts (55.6%) but next to pericarditis (66.7%) in condemned hearts.

During this study the major causes of carcass condemnation was bruising 80(16.5%). It is stated that bruising of animals during transport is the major causes of economic loss in Africa and Asia [22]. In Jimma municipal abattoir the bruised part of the carcass is trimmed and the other part is passed for human consumption. Apart from affecting carcass value, bruising has also an implication in welfare as excessive use of sticks while driving animal to the abattoir is greatly responsible for this phenomenon [23]. The result indicated that, direct economic loss encountered due to condemnation of organs: livers, lungs, kidneys and hearts was estimated to be 137, 496.97 Ethiopian Birr (ETB) per annum. Studies by Wakuma [19] have reported a loss 316, 915 ETB in Bedelle municipal abattoir and Tadele and Worku [24] 53,046.67 ETB due to condemnation of livers by fasciolosis.

CONCLUSION

In conclusion, parasitic diseases, bruising and emphysema were the major causes of condemnation and financial losses in cattle slaughtered at Jimma abattoir. Lung and liver were found to be the leading organs condemned for different reasons. The finding indicated the economic and possible public health implications of the different parasitic and pathological abnormalities to the country in general and in the study area in particular. The study also indicated the amount work to be done by the veterinary sector of the ministry of agriculture and other responsible stakeholders on the prevention and control activities of these problems.

Based on the finding of this study the following recommendations are forwarded:

- Detail studies on causes and true economic impact of the diseases and abnormalities all cattle slaughtered in the abattoir should be performed
- Proper disposal of offal, prohibition of backyard slaughter, prevention of dogs from eating unsafe offal and regular deworming of dogs are highly recommended
- Enhancing animal welfare and training of abattoir workers on the slaughter operations are also suggested

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