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Major Causes of Liver Condemnation and Associated Direct Financial Losses in Bovine Saughtered at Assela Municipal Abattoir Arsi, South Eastern Ethiopia

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Abstract- A study was conducted from October, 2013 to March, 2014 on cattle slaughtered at Assela municipal abattoir with the aim of determining major causes of liver condemnation and to estimate the direct financial losses attributed to the condemned liver. Ante mortem and post mortem inspection procedures were followed throughout the study and abnormalities encountered were recorded. A total of 384 cattle were examined at ante mortem and 9 animals were found to have abnormalities/conditions like lameness, blindness, rough hair, amputated tail and branding. Out of 384 cattle slaughtered, 274 (71.4%) livers were totally condemned. The major causes of liver condemnation were due to hydatidosis (64.6%), fascilosis (20.8%), calcification (7.7%), coinfection of hydatid cyst with fasciola (4.7%), cirrhosis (1.5%) and abscess (0.7%). Comparison of liver condemnation rate was carried out for different age, animal origin and body condition however, statistically significant difference was observed only between age groups.

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Major Causes of Liver Condemnation and Associated Direct Financial Losses in Bovine Saughtered at Assela Municipal Abattoir Arsi, South Eastern Ethiopia

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Keywords: abattoir, assela, cattle, condemnation, financial loss, liver.

I. Introduction

One of the losses from endemic disease is expressed in terms of organ condemnation. The most commonly affected organs are liver and lung due to fasciolosis (for liver) and hydatidosis (for both) (Teka, 1997). Each year significant loss results from death of animals, inferior weigth 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 (Abebe, 1995).

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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 slaughterhouse. Ante mortem inspection should be done within 24 hours of slaughter and repeated when slaughter has been delayed over a day (Teka, 1997; Mezgebu, 2003).

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 wholesomenesss of meat. Routine post mortem inspection of carcass and organs should be carried out as soon as possible after completion of dressing (Gracey, 1986).

The final judgment 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 ante mortem signs (Teka, 1997). It is necessary to be aware the extent to which the public is exposed to certain zoon otic diseases detected in abattoirs and financial losses attributed to condemnation of affected organs and carcass (Nfi and Alonge, 1987). This is due to the fact that, meat is the main source of particular importance to the public such as hydatidosis, fasciolosis, tuberculosis and cysticercosis (Sirak, 1991).

Bovine liver is one of the largest visceral organs in the animal body which performs numerous functions and very reach sources of vitamins and minerals (Radostitis *et al.,* 2007). The tissue is much sought by consumers due to its palatability and easy to consumption. However, it is one of the most commonly condemned visceral organs during routine meat inspection (Phiri, 2006).

Parasites in the tropics are responsible for greater losses to the meat industry than any other diseases (Jobre *et al,* 1996). Similarly like many other tropical countries of Africa, it is well known that parasitic diseases are among the major factors responsible for

the low productivity of livestock in Ethiopia (Abebe, 1995; Jobre *et al.,* 1996).

Cystic echinococcosis/Hydatidosis is a parasitic infection caused by larval stage of Echinococcus granulosus, which is small tapeworm, for which dogs and other canids are typical definitive hosts. The adult parasite found in small intestine of carnivours while the metacestode (hydatid cyst) is found in different organs of a wide varities of herbivours including (sheep, goats and cattle), pig, horse and man (Soulsby, 1982).

Fasciolosis in cattle is chronic wasting disease caused by the presence in the liver and bile ducts respectively of immature and adult Trematode of the genus fasciola. The disease is found in vast areas of the world with the smaller fasciola hepatica (3.5x1cm) in temperate countries and the large fasciola gigantic (7.5cm) in tropical regions (Andrews *et al.,* 1999).

Various researchers have undertaken studies at abattoir surveys to determine the prevalence and economic importance and cause of meat condemnation (hydatidosis, Fasciolosis,Cystcercosis) as these are mainly to be of major economic and public health importance in meat inspection (Jobre *et al.,* 1996). Therefore, the objective of this study was to identify the major causes of liver condemnation in cattle slaughtered in Assela municipal abattoir and to estimate the magnitude of direct economic losses attributed to this condemnation.

II. Materials and Methods

a) Study area

The study was conducted at Assela municipal abattoir, from October 2013 to march 2014. Assela is located 175Km South East of Addis Ababa at an altitude of 2350-2400 meters above sea level and has a climatic condition of "Woynadega". The annual average rainfall is 1300-1350mm. A day and night temperature of the area ranges from 10-25^{0}c and 10-20^{0}c respectively. The area has a biomodal rainfall occurring from March to April (short rainy season) and from july to October (long rainy season) with mean annual rain fall of 1300-1350mm with the relative humidity of 43-60^{0}c (CSA, 2009).

b) Study animals

A total of 384 randomly selected cattle were inspected at Assela municipal abattoir. Out of which, 373 (97.14%) were males and only 11 (2.86%) were females. From the total of 384 cattle slaughtered, 348 were old and 36 were adults. Majorities of cattle came to Assela municipal abattoir for slaughters were originated from the market places of Sagure, Kersa and Assela.

c) Study Design

A cross-sectional study was employed to identify the major cause of liver condemnation and to evaluate the direct financial losses. The study animals were selected using simple random sampling method by taking the age, body condition and origin of the animals into consideration. The desired sample size for this study was calculated by using the formula given by Thrusfied (1995) with 95% confidence interval, 5% absolute precision and 50% expected prevalence

d) Study Methodology

i. *Ante-Mortem Examination*

Ante-mortem examination was conducted on individual animals, while the animals were entering in to the lairage and in mass after they entered into the lairage. Both sides of the animals were inspected at rest and in motion. Moreover, the general behavior of the animals, sign of diseases and abnormality of any type were recorded according to the standard antemortem inspection procedures (Gracey, 1986). Following the judgment guideline by (FAO, 2003), animals fit for human consumption were allowed for slaughter.

ii. *Post-mortem Examination*

Post-mortem examination involved visual inspection, palpation and making systemic incision of liver to look for the presences of cysts, adult parasites and other abnormalities. Pathological lesions were differentiated and judged based on (FAO, 2003) guidelines on meat inspection for developing countries.

iii. *Financial Loss Assessment*

The direct financial losses due to liver condemnation from market were considered. The analysis was based on the annual slaughter capacity of the abattoir considering market demand, the current average price of one liver in Assela Butcherhouse and the rejection rate of liver. The direct financial loss incurred due to liver condemnation was estimated by using the formula indicated below (Ogunrinade and Adesoke, 1982).

$$ALC = CSR \times LC \times P$$

Whereas

ALC = Annual loss from liver condemnation
CSR = Mean annual cattle slaughtered at Assela municipal abattoir
LC = Mean cost of one liver at Assela
P = Liver condemnation rate

e) Statistical Data Analysis

Data collected during the study were entered in to Excel spread sheet (Microsoft Excel 2007) and analyzed by statistical methods using SPSS 16.0 version. Descriptive statistics such as percentage was used to determine the level of liver condemnation rate. The association between condemnation rate of liver and the age, sex, body condition and origin of the animal assessed by Pearson chi-square (x^2) and the *p*- value < 0.05 were considered significant.

III. Results

a) Ante-Mortem Examination

Of the total 384 cattle examined at ante-mortem, 9 cattle were found to have the abnormalities listed bellow (Table 1). Some abnormalities encountered during antemortem inspection were rought hair coat, lameness, branding on skin, blindness and amputated tail.

Table 1: Abnormalities encountered during ante mortem examination

Abnormalities	No. of animals with disease condition	Judgment
Lameness	2	Passed for slaughter but with precaution
Blindness	1	Passed for slaughter but with precaution
Rough hair coat	4	Passed for slaughter but with precaution
Branding on skin	1	Passed for slaughter but with precaution
Amputated tail	1	Passed for slaughter but with precaution
Total	9	Passed for slaughter

b) Post-Mortem Examination

Out of 384 cattle slaughtered in Assela municipal abattoir, 274 livers were totally condemned due to various reasons (Table 2). The current study revealed the overall proportion of liver condemnation rate due to various pathological findings was 71.4%. The occurrence of hydatidosis was the highest (64.6%); followed by fasciolosis (20.8%), calcification (7.7%), coinfection of hydatid cyst with fasciolosis (4.7%), cirrhosis (1.5%) and liver abscess (0.7%).

Table 2: Major causes of liver condemnation, Frequency and its proportion

Major cause of liver condemnation	Frequency	proportion
Hydatid cyst	177	64.6
Fasciolosis	57	20.8
Calcification	21	7.7
Coinfection of hydatid cyst with fasciola	13	4.7
Cirrhosis	4	1.5
Abscess	2	0.7
Total	274	100

Comparison of rejection rate of liver was carried out for different age, animal origin and sex groups. From the total of 384 sampled animals, 340 were from sagure while only 44 animals were from (Assela and near surrouinding). The proportion of liver condemnation was 71.8% and 68.2% from sagure and (Assela & near surrounding) respectively. However, no statistically significance difference was observed in the liver condemnation rate between the two areas.

Regarding sex, the overall liver condemnation rate was 71.8% in male and 54.5% in female and no statically significant difference was observed between the two sexes (Table 3). This study also showed that a highest liver condemnation rate in older age groups (> 5 years) than adults (< or = 5 years). The rejection rate was 73.3% in old and 52.8% in adult (Table 3). From the analysis, it was observed that as age increase, the rejection rate was also found to increase. This difference in the rejection rate between the age groups was significant (Table 3).

Table 3: Liver condemnation rate based on Age, Sex, Animal origin and body condition

Variables		No. exam	No. (+)	%	x^2	p-value
Origin	Sagure	340	244	71.8	0. 245	0.621
	A&S	44	30	68.2		
Sex	Male	373	268	71.8	1.565	0.211
	Female	11	6	54.5		
Age	old	348	255	73.3	6.707	0.010
	Young	36	19	52.8		
BCS	Good	250	184	73.6	1.768	0.184
	Medium	134	90	67.2		

A&S = Assela and near surrounding
No. exam = number of animals examined
No. (+) = number of positive animals
BCS = body condition score

c) *Annual Financial Losses Estimation*

The annual slaughter rate of the abattoir for the last three years were 6800, 6900 and 6998 in 2010, 2011 and 2012, respectively. So the direct annual financial loss due to rejection of liver was calculated based on the price of a liver at Assela (Table 4). By using necessary information and formula, the annual direct financial loss incurred due to condemnation of liver was calculated to be 418,761 ETB or 22,040 US$ per annum.

Table 4: Average annual estimated financial loss due to liver condemnation

Annual slaughter rate	Cause of liver condemnation	Annual rejection rate of liver	Average price of one liver
6900	Hydatid cyst	3181	85 ETB
	Fasciola	1024	
	Calcification	377	
	Hydatid cyst with fasciola	234	
	Cirrhosis	72	
	Abscess	36	

IV. Discussion

In the present study, routine ante-mortem and post-mortem inspection was carried out to detect any abnormalities encountered in Assela municipal abattoir. Branding, lameness, rough hair, blindness and amputated tail were found in some animals during ante mortem examination and animals with such abnormalities were passed for slaughter by considering that the problems were localized and simply related to (rough or low management system) and not due to bad pathological condition.

From the total of 384 cattle slaughtered, 274 (71.4%) liver were condemned due to various causes. This finding is in agreement with one of previous study, where 66.55% liver was condemned in Kombolcha ELFORA industrial abattoir (Nurit *et al.,* 2012). But slightly higher than 53.7% that have been done in Kombolcha (Jemal, 2009) and 51.95% in Mekelle (Shegaw *et. al.,* 2009). On the other hand, it is significantly higher than 31.1% and 17.61% reported by (Yifat *et. al.,* 2011*)* in Gonder and (Mellau *et. al.,* 2011*)* in Tanzania respectivily.

In the present study, the major cause of liver condemnation were hydatidosis (64.6%) followed by fasciolosis (20.8%). In the present study, the rejection rate of liver due to hydatidosis is 64.6%, which is highly greater than the findings of (Nurit *et. al.,* 2012) with 14.2% and (Jemal, 2009) with 9.2% in both are at Kombolcha ELFORA industrial abattoir, 4.2% in Tanzania (Mellau *et. al.,* 2011) and (Yifat *et. al.,* 2011) with 3.7% in Gondar.

The rejection rate due to faciolosis is high when it is compared with the rejection rate of 12.7, 14.05 and 8.6% by (Fufa *et al.*, 2009)] at Welaita Sodo, (Swai and Ulicky, 2009)] at Hawi and (Mellau *et al*., 2011) at Tanzania, respectively. On the other hand it was slightly similar with 24.32% by (Gebretsadik *et al.,* 2009) at Mekelle, but significantly lower than 68.7% in Kombolcha (Jemal, 2009) and 86.4 % in Gondar (Yifat *et. al.,* 2011). This may be due to climate and ecological condition of the study areas considered.

The finding of 1.5% of liver condemnation due to cirrhosis was significantly lower than 16.06% reported by (Nurit *et al.,* 2012) at ELFORA and (Raji, *et al*., 2010) with 10.4% at Zaria abattoir. However, it is almost similar with 1.1% reported by (Yifat *et al*., 2011) at Gondar.

A 0.7% liver condemnation due to abscess was recorded in the present study. This is a little bit smaller than the report by (Cadmus and Adesokan, 2009) with 2.9% condemnation rate of liver due to hepatic abscess in western Nageria and (Ahmedullah *et al.,* 2007), who reported 3.8% liver condemnation rate in Bangladesh. On the other hand it was similar to the report of (Mellau and Nongaond, 2010) with 1.1% at Arusha abattoir.

Calcifications were also among the lesions which significantly contributed to the liver condemnation in the study abattoir. During this study, 7.7% of liver were condemned as a result of calcification, which is relatively higher than the finding of (Mellau and Nongaond, 2010) which is 1.9% at Arusha, Tanzania. On the other hand, it is similar with the finding of (Nurit *et. al.,* 2012) with 8.18% done at ELFORA.

The analysis of the result on the bases of age indicated the total liver rejection rate was higher in older animals and a significant difference was observed between the two age groups. This may be due to most of liver diseases are chronic and the older animals are mostly affected by many diseases.

The direct financial loss incurred as result of condemnation of liver in the present study was 418,761 ETB or 22040 US$ per annum. This is so much higher than 1800 US$ per annum due to fasciolosis liver condemnation reported by (Mwabonimana, 2008) at Arusha abattoir, Tanzania.

V. Conclusion

In general, liver condemnations as have been reported in this study impact negatively on the economic status of the traders and the livestock industry at large. This constituted a substantial loss to the economy of the

slaughter stock owners under study as such an amount of money would have been harnessed into livelihood improvements. Though infected livers were condemned and rendered unfit for human consumption, there exist some public health threats from animals slaughtered at the abattoir due to the possibility of some missed cases as a result of poor cooperation between butchers and meat inspectors and other malpractices including hiding of infected meat from meat inspectors to avoid economic losses on their side. Indeed, the condemnation of cattle livers at slaughterhouse in Assela municipal abattoir represents a significant economic loss. Some of the conditions described however can be prevented. Cases of hydatidosis could be reduced by better control of stray dogs. Since most liver conditions were caused by parasites, deworming programmes coupled with good animal husbandry would likely be effective in lowering their incidence. Some of the limitations, however; encountered in this study included the use of only gross pathology in the diagnosis of the diseases, thus only those diseases with gross pathological lesions that are pathognomonic were likely to be diagnosed. In spite of the limitation mentioned, the public health implications of the quantity of infected livers condemned at Assela municipal abattoir on the consumers and the role which post-mortem inspection plays in safeguarding the health of the public cannot be overemphasized. Therefore, there is a need for adequate meat inspection in Assela municipal abattoir in order to reduce wastages, identify diseases and thereby minimize associated public health risks.

VI. Acknowledgments

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