

## Major Causes of Organ Condemnation and Financial Significance of Cattle Slaughtered at Asella Municipal Abattoir, Central Ethiopia

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**Received:** August 31, 2017; **Published:** September 27, 2017

### Abstract

A cross sectional study was conducted from October 2013 to March 2014 to identify the major causes of organ condemnation in cattle slaughtered at Asella municipal abattoir and to estimate the direct financial loss due to organ condemnation. Out of the total 512 cattle examined by antemortem inspection 227 (44%) having various types of abnormalities: emaciation 45 (8.8%), localized swelling 24 (4.7%), lameness 20 (3.9%), hernia 15 (2.9%), salivation 14 (2.7%) branding 12 (2.4%), blindness 8 (1.6%) and bleeding from mouth 1 (0.19%).

Major diseases and/or pathological conditions that caused a total condemnation were Hydatid cyst 99 (19%), Fasciolosis 73 (14%), cirrhosis 13 (2.5%), calcification 7 (1.4), hepatitis 6 (1.2%), for liver; Hydatid cyst 179 (35%), pneumonia 15 (2.5%), emphysema 8 (1.6%), for lung; pericarditis 4 (0.8%) and Hydatid cyst 2 (0.4%) for heart; hydronephrosis 3 (0.6%) for kidney. An annual direct financial loss of 200448 Ethiopian Birr was estimated in the abattoir due to condemnation of edible organs.

The infection rate of bovine Fasciolosis in this study was significantly associated with age and origin of study animals. The results also showed that higher prevalence of cystic echinococcosis in old than in adult cattle. The result of this abattoir study provided regional information on major causes of organ condemnation in cattle slaughtered at Asella municipal abattoir and direct financial loss due to organ condemnation. 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.

**Keywords:** Organcondemnation; Cattle; Financial loss; Ethiopia

**Abbreviations:** Anti-mortem examination; Arsi Plan and Economic Development Office; Body condition scoring; Food and Agricultural organization; Gastro- intestinal tract; Post-mortem inspection

Volume 1 Issue 4 September 2017

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**Citation:** Teha Meda Nure. "Major Causes of Organ Condemnation and Financial Significance of Cattle Slaughtered at Asella Municipal Abattoir, Central Ethiopia". *Multidisciplinary Advances in Veterinary Science* 1.4 (2017): 123-131.

## **Introduction**

Ethiopia is the leading country by livestock population in Africa with an estimated population of 53.99 million cattle, 25.5 million sheep, 24.06 million Goats, 1.91 million horse, 6.75 million donkey, 0.35 million mule, 0.92 million camel and 50.38 million poultry (CSA, 2013). Ethiopia's great livestock potential is not properly exploited due to different factors such as traditional management system, limited genetic potential, lack of appropriate disease control policy and lack of appropriate veterinary services.

Although livestock production is an important segment of the agricultural practice, Animal diseases are considered as a major health problem and cause a significant economic loss in countries (Amene, *et al.* 2012). Developing countries livestock population about two third of the world's livestock population but produce less than a fifth of the world milk and a third of its meat (FAO, 1995). Every year significant loss results from inferior weight gain, death of animals, condemnation of edible organs and carcass at slaughter.

The objective of ante-mortem and post-mortem meat inspection is to provide safe and risk free products to the society and to protect public health, it also provides information that can be utilized for animal diseases control. For detecting of both economic and public health importance diseases Abattoir data is an excellent option (Abunna, *et al.* 2010), especially in ascertaining the extent to which human is exposed to certain zoonotic diseases in addition to estimating the financial implications of carcass condemnations (Jobre, *et al.* 1996).

The responsibility for achieving this objective lies primarily with the relevant public health authorities who are represented by veterinarians and meat inspectors at the abattoir stage. Usually abattoir studies undertaken in Ethiopia are on prevalence of hydatidosis and Fasciolosis and cysticercosis and their economic impact due to organs condemnation in different parts of the country (Bekele, *et al.* 2010). Most of the studies not included other problems of carcass organ condemnations in different parts of the country.

Specifically there is no information on the major causes of carcass/organ condemnation the associated economic losses at Asella municipal abattoir. Hence, the present study was conducted to investigate the major causes of organ condemnation of cattle slaughtered in Asella municipal abattoirs, and to estimate their prevalence and annual economic losses encountered due to organs condemnation.

## **Material and Methods**

### **Description of the Study Area**

The study was carried out in Asella town municipal abattoir. Asella town is situated at 6°59'-8°49' N latitude and 38°41'-40°44'E longitude in central Ethiopia, 175 km south east of Addis Ababa. The altitude of the area ranges from 1780-3100 m.a.s.l and characterized by mid subtropical temperature ranging from 5°C-28°C, with an annual mean temperature of 12.1°C. The annual average rainfall is 1,200 mm. The area covers 23,674.72 km square and topographically has highland escapement and lowland areas. The high land areas are found centrally and the low lands dominate the periphery of the area (APEDO, 2007).

### **Study Animals**

The study animals were cattle brought to Asella municipal abattoir for slaughter from different districts around Asella town and it includes both sexes weather they are from intensive or extensive farming system. A total of 512 cattle destined for slaughter were sampled and inspected during ante mortem and post mortem inspections.

### **Study Design**

A cross-sectional study design was employed from October, 2013 to March, 2014 to identify the major cause of organ condemnation in Asella town municipal abattoir and to evaluate the direct financial losses incurred due to organ condemnation. The study animals were selected using simple random sampling method and origins of the animals were taken in to consideration.

### **Sample Size Determination**

The desired sample size was calculated using the standard formula described by Thrusfield (2005) for simple random sampling method. Since there was no previous work done on this area, the expected prevalence is guessed to be 50%. Therefore, the sample size in this study was calculated using the following formula.

$$N = \frac{(1.96)^2 \cdot p(1-p)}{d^2}$$

Where;

N = Sample size

p = Expected prevalence (50%)

1.96 = the value of Z at 95% confidence level

d = Desired absolute precision = 5%

Hence, the sample size required as per the above formula was 384 heads of cattle. But to increase the precision of the study the sample size were increased and a total of 512 cattle were included in the current study.

### **Data Collection**

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 score of animals were recorded. Estimation of age was carried out by dentition according to (De Lahunta and Habel, 1988). For ante mortem examination, both sides of the animals were inspected at rest and in motion to detect any obvious sign of diseases and abnormalities and recorded according to the standard ante mortem inspection procedures (FAO, 1994). Moreover, the general behaviour of the animals, nutritional status, cleanliness and signs of disease were registered. Judgment was done based on the procedure given by FAO (1994).

Before conducting the post mortem examination, the identification marks done in the ante mortem examination was transferred to all organs that are going to be examined by postmortem examination (FAO, 1994). During post mortem inspection of the head, carcass, tongue, GIT, spleen, liver, lung, heart and kidneys were thoroughly inspected by visualization, palpation and making systemic incisions where necessary for the presence of 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 (FAO, 1994).

### **Data Management and Analysis**

Collected data were entered and stored in to Microsoft excel spread sheet. The data analysis was done using STATA 11@ (Strata Corporation, 2007). Descriptive statistics were used to determine the level of organ condemnation defined as the proportion of condemned organs to the total number of organs examined. The chi-square test is used to determine the association of some diseases that caused organ condemnations to the origin, sex, and age and body condition of the animals. ap-value of less than 0.05 was taken as significant. The percentage of organs condemned and total annual economic loss was calculated using the following formula.

Total annual loss = Rate of organ condemnation x total animal slaughtered per annum x estimated current price of the organ

### **Result**

Out of 512 cattle destined for slaughter at Asella municipal abattoir 187 (36.5%) of them had various types of abnormalities during antemortem inspection and the detail is shown below in Table 1.

Abnormality	No. of Affected animals	Percentage (%)
Emaciation	45	8.8%
Lacrimation	39	7.5%
Nasal discharge	34	6.6%
Local swelling	24	4.6%
Lameness	20	3.9%
Hernia	15	2.9%
Rough hair coat	15	2.9%
Salivation	14	2.7%
Branding	12	2.3%
Blindness	8	1.6%
Bleeding from mouth	1	0.19%
Total	187*	36.5%

**Table 1:** Abnormalities encountered during ante mortem examination at Asella municipal abattoir.

\*Since some animals are affected by more than one problem, the Total No of animals affected is obtained by avoiding repeated counting for each case

During ante mortem examinations two animals were detained because of mouth bleeding on one animal and salivation and shivering on the other one, thus only 510 animals were slaughtered and subjected for post mortem inspection (PMI)

From the total cattle slaughtered 198 (38.8%) liver, 213 (41.7%) lungs, 13 (2.5%) hearts and 4 (0.8%) kidneys were totally condemned. Localised carcass bruising was also found in 34 (6.7%) animals. The detail of common causes of visceral organs condemnation and the percentage of the condemnation due to the pathological conditions are presented in Table 2.

Information collected from butchery shops on the mean current price of visceral organs at Asella town for liver, lung, heart and kidney was 50, 20, 15 and 10 Ethiopian Birr, respectively. According to the information gained from the abattoir personnel, the mean numbers of cattle slaughtered per annum in Asella municipal abattoir is 7,200. Thus, the total annual direct financial loss incurred due to rejection of visceral organs was 200,880 Ethiopian Birr/year.

Organ	Disease Condition (abnormality)	Rejection rate	Loss of money (ETB)
Liver	Hydatid cyst	19% (99)	4950
	Fasciolosis	14% (73)	3650
	Cirrhosis	2.5% (13)	650
	Calcification	1.4% (7)	350
	Hepatitis	1.2% (6)	300
	Total	38.8% (198)	9900
Lung	Hydatid cyst	35% (179)	3580
	Pneumonia	2.5% (15)	300
	Emphysema	1.6% (8)	160

	Lung worm	2.2% (11)	220
	Total	41.3% (213)	4260
Heart	Hydatid cyst	0.4% (2)	30
	Pericarditis	0.8% (4)	60
	Total	1.2% (6)	90
Kidney	Hydronephrosis	0.6% (3)	30

**Table 2:** Pathological conditions and the proportion of visceral organs condemnation (n = 510).

The major direct economic loss due to organ condemnations occur because of hydatid cyst which caused a 19% liver, 35% lung, 0.4% heart condemnation rate and Fasciolosis which caused a 14% liver condemnation rate.

The prevalence of hydatid cyst in cattle slaughtered in Asella municipal abattoir during the study period was 93.9% (349/510). Similarly, the current study finds that Fasciolosis had a prevalence rate of 55% (282/510). The infection rate of cattle by both diseases has a statistically significant association with age and origin of animals ( $p < 0.05$ ), Table 3 & 4.

Variable		No of animals slaughtered	No. of affected Animals (%)	Chi-Square	P value
Sex	Female	137	131 (95.9)	0.97	0.330
	Male	373	348 (93.9)		
	Total	510	349 (93.9)		
Age	Adult(4-8 years)	323	313 (88.7%)	13.7	0.000
	Old (> 8years)	187	166(96.9%)		
	Total	510	479 (93.9%)		
Origin	Sagure	119	113 (95%)	59	0.000
	Itaya	68	50 (73.6%)		
	Bokoji	119	116 (97.5%)		
	Dera	85	82 (96.4%)		
	Sire	68	67 (98.5%)		
	Karsa	51	51 (100%)		
	Total	510	482 (94.5%)		

**Table 3:** Prevalence of Hydatid cyst on animal slaughtered at Asella municipal abattoir.

Variable		No of animals slaughtered	No. of affected Animals (%)	Chi-Square	P value
Sex	Female	137	67 (48.9%)	3	0.079
	Male	373	215 (57.6%)		
	Total	510	282 (55%)		
Age	Adult(4-8 years)	323	206 (63.8%)	25.6	0.000
	Old (> 8years)	187	76 (40.6%)		
	Total	510	282 (55%)		

Origin	Sagure	119	46 (38.7%)	66.8	0.000
	Itaya	68	25 (36.8%)		
	Bokoji	119	98 (82%)		
	Dera	85	55 (64%)		
	Sire	68	28 (41%)		
	Karsa	51	30 (58.8%)		
	Total	510	282 (55%)		

**Table 4:** Prevalence of Fasciolosis in animal slaughtered at Asella municipal abattoir.

## Discussion

According to the present study, the most encountered abnormalities during antemortem examination (AME) were emaciation, nasal discharge, branding, lameness and localized swelling and hernia. The nasal discharge might be due to stress, immune suppression, overcrowding in the holding pens of the abattoir, during transportation and respiratory diseases. The localized swelling might be due to trauma while being driven to market places and during transportation to the abattoir by inappropriate vehicles.

This study showed that hydatid cyst, Fasciolosis, cirrhosis, pneumonia, emphysema, hepatitis, hydronephrosis, calcification, lung worm and bruising were the causes of organs and carcass condemnation in cattle slaughtered at Asella municipal abattoir. Bruising was observed at a rate of 10.4% from the total cattle examined at slaughter. Ezana (2008) reported that bruising of animals during transport is the major source of economic loss in Africa and Asia. Apart from affecting carcass value, bruising has also an implication for animal welfare as Excessive use of sticks while driving animals to the abattoir is greatly responsible for this phenomenon (Cadmus and Adesokan, 2009).

The present findings indicated that a high number of livers were condemned due to various abnormalities. Of these, Fasciolosis and hydatidosis were found to be the major causes for liver rejection from local market. The rate of liver condemnation in this study was 38.8% which is much higher than the report of Denberga, *et al.* (2011) in Gondar ELFORA abattoir which was 31.1%. The variation could be attributed to differences in ecological and management settings. Losses from liver condemnation were assumed to occur since hepatic pathology is associated to infection that might have public health importance and aesthetic value (Budke, *et al.* 2006). Previous studies have indicated a higher economic loss resulting from condemnation of edible organs and carcass due to parasitic causes (Jibat, 2006) in different abattoirs in the country.

The 2.5% liver condemnation rate due to cirrhosis which is found in the present study is relatively higher than the finding of Denberga, *et al.* (2011) who reported 1.1% rate of rejection for cattle slaughtered in Gondar ELFORA abattoir but lower than report by Alawa, *et al.* (2010) in which 12.8% rate of rejection was found from cattle slaughtered in Nigeria abattoir. The present study indicated that 41.5% of lungs were condemned from the total lungs inspected from being used as pet food due to pneumonia, emphysema and Hydatid cysts.

From the total lung rejected, hydatid cyst accounts for 84.7% as a principal cause of lung condemnation. Pneumonia is the second important disease for lung condemnation in this abattoir during the study period. The prevalence of pneumonia was 2.5%. This finding is lower than the 8.8% rejection rate that was reported by Raji, *et al.* (2010) in cattle slaughtered at Zaria and it was higher than that reported (0.14%) in cattle slaughtered at Zango abattoir (Clement, *et al.* 2010).

The present study also showed that kidneys were condemned only due to hydronephrosis. This result is in agreement with previous studies by Yifat, *et al.* (2011) and Amene, *et al.* (2012) from Gondar and Jimma abattoirs respectively.

The differences in the rejection rate of organs with different causes may be due to the differences in the prevalence of the disease and variation in animal management systems at different study sites. The higher prevalence of cystic echinococcosis in old than adult cattle in our study strengthen the previous findings in Ethiopia (Zewdu., *et al.* 2010).

It is most probably attributed to the greater chance of exposure to more number of infective stages over longer duration of time in adult than young cattle and partially related to the longer period required for cyst to develop. The findings of highest prevalence and largest number of hydatid cysts in the lungs than all the other organs followed by livers in our study are in agreement with several earlier reports (Zewdu., *et al.* 2010).

The prevalence of bovine Fasciolosis was higher in adult than older ones. The prevalence of bovine Fasciolosis in the study sites was significantly ( $p < 0.05$ ) affected by age, however, its prevalence was not significantly ( $p > 0.05$ ) affected by sex. Different works reported similar finding with the present work and clearly justified that the decrease in infection rate (prevalence) as age increase is the result of acquired immunity which is manifested by humeral respond and tissue reaction in bovine liver due to previous challenge (Ogenrinad and Adegoke,1982), and (Dwinger., *et al.* 1982).

They also reported that the increase resistance (low prevalence) as age increase is most likely related to the high level of tissue reaction seen in bovine liver, server fibrosis which impedes the passage of immature fluke, acquired resistance, thickening, stenosis and calcification of bile ducts, assumed unfavourable site for adult parasites and consequently fasten their explosion. Additionally the experimental result by Suolsby (1982) confirmed the occurrence of higher infection rate in younger animals.

## **Conclusion and Recommendations**

The results of the present study revealed that Fasciolosis, hydatidosis, cirrhosis, pneumonia, emphysema, pericarditis, hydronephrosis and bruising were the major causes of partial and total condemnation of organs and carcasses in cattle slaughtered at Asella municipal abattoir. The organs which are affected by these conditions/pathologies are liver, lung, heart, kidney and carcass. These conditions caused an estimated annual loss of 200,880 Ethiopian Birr/year.

Based on the above conclusion the following recommendations are forwarded:

- Fasciolosis, hydatidosis, pneumonia and cirrhosis are the conditions that need serious attention for prevention and control actions.
- Public health education to avoid eating of raw meat, proper disposal of condemned organ and treat animal with anti-helminthes drug
- Detail meat inspection at abattoir by meat inspector also recommended

## **Acknowledgements**

I would like to express my heartfelt thanks to my advisor; Dr. Abebe Agonafir for his suggestion comment, friendly approach and devotion of his time to correct this paper.

I would like to spread out my acknowledgement to my family for their overall moral and financial support throughout my life to achieve this goal.

I, finally, express my thanks to my close friends who shared me love and experience.

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