

Major causes of organ condemnation and its financial loss in cattle in Gondar ELFORA abattoir, Ethiopia

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Abstract: A cross sectional study was conducted from November, 2015 to April, 2016 at Gondar ELFORA abattoir, north western Ethiopia to identify the major causes of organ condemnation of cattle and to estimate their direct financial loss. A total of 519 cattle were examined by antemortem and postmortem inspections using standard meat inspection procedures. During antemortem inspection, the abnormalities encountered were branding 50 (9.63%), nasal discharge 36 (6.93%), lameness 10 (1.93%), lacrimation 7 (1.35%), local swelling 4(0.77%), and abdominal hernia 2(0.39%). In the postmortem inspection, 156 (30.1%) of Livers, 176 (33.9%) of Lungs, 5 (0.96%) of Hearts, 24 (4.6%) of Kidneys and 6 (1.2%) of tongues were condemned due to gross abnormalities. Out of the total 176 lungs and 156 livers condemned 22.7%, 3.46%, 3.85% lungs and 16%, 9.4%, 4.6% livers of cattle were condemned which were originated from low land, midland and highland, respectively. There was statistically significant difference ($P<0.05$) between the origins of the animals and lungs and livers condemnation rates. There was statistically significant difference ($P<0.05$) between the age categories with lungs and livers condemnation rates whereas no significant variation was shown between age groups and kidneys, hearts and tongues condemnations ($P>0.05$). Significant difference ($P<0.05$) was observed between lungs and kidneys condemnations rates with body condition categories whereas the rejection rates of livers, hearts and Tongues with different body condition categories was insignificant ($P>0.05$). Based on the current local price of these organs, the economic loss due to these organs condemnation was estimated at Ethiopian Birrs 123,560 (ETB) (5,688USD) per annum. Considering the percentage of condemnation of organs, the overall economic loss seems to be notable at Gondar ELFORA abattoir.

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Key words: Antemortem, Branding, Cross sectional, *Fasciolosis*, Livers, *Hydatidosis*, Postmortem

Introduction

Ethiopia owns huge number of ruminants having high contribution for meat consumption and generates cash income from export of live animals, meat, edible organs and skin. In spite of the presence of huge ruminant population, Ethiopia fails to optimally exploit these resources due to a number of factors such as recurrent drought, infrastructures problem, rampant animal diseases, poor nutrition, poor husbandry practices, and shortage of trained man power and lack of government policies for disease prevention and control (ILRI, 2009).

The purpose of meat inspection is to protect public health and to provide risk free products to the society. However, Meat is condemned at slaughter to break the chain of some zoonosis which is not transmitted to man directly via meat like hydatidosis and other important diseases of animals such as fasciolosis (Jibat, 2006).

Abattoir data is an excellent option for detecting diseases of both financial and public health importance (Arbabi and Hooshyr, 2006; 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). Surveillance at the abattoir allows for all animals passing in to human food chain to be examined for unusual signs, lesions or specific diseases (Alton *et al.*, 2010). Monitoring all 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 (Mellau *et al.*, 2010).

Each year a significant loss results from death of animals, inferior weight gain and condemnation of edible organs and carcass at slaughter during routine meat inspection. This production loss to the livestock industry is estimated at more than 900 million USD annually (Ezana, 2008; Abebe and Yilma, 2012). In abattoirs of various locations, researchers indicated that hydatidosis is wide spread in Ethiopia with great economic and public health (Kebede *et al.*, 2009; Kebede, 2010).

Major causes of organ condemnation during post mortem inspection are diseases caused by parasite, bacteria and viruses. Of those disease liver fluke in the liver and hydatid cyst in the liver, lung and kidney are mainly involved (Teka, 1997). Major parasitic disease such as fasciolosis, hydatid cyst, cysticercosis and other causes like abscessation and cirrhosis are of great public health concern and cause significant economic losses by lowering productivity of cattle and condemnation of edible organs (Biu and Adindu, 2004; Chhabra and Singla, 2009).

Echinococcosis is a major public health problem in some countries, and it may be emerging or re-emerging in some areas. Approximately 2 to 3 million human cases are thought to occur worldwide (CFSPH, 2011). Cysts or lesions of Echinococcosis multilocularis occur primarily in the liver and grow slowly but with eventual serious liver pathology and high risk of mortality if untreated. As well, the cysts occasionally rupture and cause severe allergic reactions in humans (OIE, 2004).

Bovine Cysticercosis (formerly known as Beef Measles) causes small cysts in the muscles of cattle and their presence can lead to all or part of the carcass being condemned (Mesfin and Nuraddis, 2012).

Fasciolosis is an important parasitic disease of domestic ruminants which is responsible for considerable economic losses in the cattle industry, mainly through mortality, liver condemnation, reduced production of meat, milk, wool, and expenditures for anthelmintic (Rahmeto *et al.*, 2008).

Therefore, the objectives of this study are to identify the major causes of organs condemnation and to estimate financial loss due to organ condemnation at Gondar ELFORA abattoir.

Materials And Methods

Description of study area

The study was conducted in north Gondar zone, North western parts of Ethiopia at Gondar ELFORA abattoir. Gondar town is located in Amhara regional state of Ethiopia, which is located about 740 km far from Addis Ababa. It is located at altitude of 2133meters above sea level and geographically it is located 12°36'N 37°28'E/12.6°N 37.467°E. It receives a mean annual rain fall off 100mm. Average maximum and minimum temperature of the area vary between 22°c-30.7°c and 12.3°c-17.1°c, respectively. The human population of the town is estimated at 214, 000 (CSA, 2008). The livestock population in the area comprises of cattle (8,202), goats (22,590), sheep (2,695), horses (1,065) and donkeys (9,001). The livestock production system in the area is predominantly extensive type.

Study population

The study animals were cattle brought to the abattoir from different districts of Gondar zone.

Study design and sample size determination

A cross sectional study was conducted to assess causes of carcass condemnation at ELFORA industrial abattoir. In this cattle were categorized in to young (<2 years) and adult (2-6 years). Age estimation done based on eruption of one or more incisor teeth according to De Lahunta and Habel (1986). Body condition score was made by the scoring system described by Tennant *et al.* (2002) in cattle. The body condition was scored as 0 to 5 (0 = very thin; 1 = thin, 2 = fair, 3 = good, 4 = fat and 5 = very fat). However, for the purpose of data analysis, body condition 0 to 5 was assigned to three distinct groups: Categories 0, 1 and 2 was grouped as "thin or poor", category 3 was defined as "medium" and body condition scores 4 and 5 was categorized as "good".

The sample size calculated at 24.7% (Yifat *et al.*, 2011) expected prevalence rate with a desired precision of 5% and 95% confidence interval was determined by using the formula given by Thrusfield (2007):

$$n = 1.96^2 \times P_{exp} (1 - P_{exp}) / d^2$$

Where n = required sample size, P_{exp} = expected prevalence, d^2 = desired absolute precision.

The required sample size was 286 cattle but 519 cattle were sampled to increase its accuracy and precision.

Study methodology

Antemortem and postmortem examination

From the total cattle slaughtered, 519 cattle were inspected and examined by antemortem and postmortem examination. Each animal was given identification number during antemortem inspection and the respective abnormalities were found during postmortem examination. The organs were examined by visual inspection, palpation and incision. Organs of each animal infected with hydatid cyst, fasciolosis, cysticercosis, calcification and other causes were identified systematically following the standard routine postmortem inspections procedure. The organs were collected for close examination and then it was registered. Incision was made when necessary to confirm doubtful cases.

Data management and statistical analysis

Data collected during inspection were entered into Microsoft office excel spread sheet 2007. 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 scores and origin of the animal 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 20.

Results

The antemortem examination was carried out on 519 cattle slaughtered for the detection of any abnormalities encountered at Gondar ELFORA abattoir. A total of 84 (16.2%) cattle were found to have the abnormalities. Branding was the most frequently observed followed by nasal discharge (Table 1).

Postmortem inspection result

Out of the 519 cattle, 156 livers (30.5%), 176 lungs (33.91%), 5 hearts (1%), 24 kidneys (4.6%), and 6 (1.16%) tongues were found gross abnormalities with judgment of partially or totally unfit for domestic markets and human consumption. The most frequently condemned organ was lung followed by the liver. The

rate of condemnation due to parasitic causes was higher in the liver (24.42%) than in the lung (22.5%). Hydatid cyst was the most cause of lung condemnation (22.5%) and Fasciola was for liver (15.02%) (Table 2).

Table 1. Abnormalities encountered during antemortem inspection

Condition encountered	N (%)
Branding	50(9.63)
Nasal discharge	36(6.94)
Lameness	10(1.93)
Lacrimation	7(1.35)
Blind	6(1.16)
Local swelling	4(0.77)
Abdominal hernia	2(0.39)
Total	84(16.18)

Table 2. Causes and percentage of organs condemnation at Gondar ELFORA abattoir (n=519).

Causes of condemnations of liver	Frequency of condemnation of liver (%)	Causes of condemnations of lung	Frequency of condemnation of lung (%)	Causes of condemnations of kidney	Frequency of condemnation of kidney (%)	Causes of condemnations of heart	Frequency of condemnation of heart (%)	Causes of condemnations of tongue	Frequency of condemnation of tongue (%)
Hydatid cyst	33 (6.4)	Hydatid cyst	117 (22.5)	Hydatid cyst	1(0.2)	Calcification	2(0.40)	Abscess	4(0.8)
Fasciola	78 (15)	Abscess	6(1.2)	Calculi	15(2.9)	Adhesion	1(0.2)	Fibrosis	1(0.2)
Abscess	3 (0.6)	Calcification	17(3.3)	Hemorrhage	1(0.2)	Pericarditis	1(0.2)	C-bovis	1(0.2)
Fibrosis	6 (1.2)	Emphysema	18(3.5)	H-nephrosis	6(1.2)				
Calcification	34 (6.6)	Pneumonia	11(2.12)	Infarcts	1(0.2)				
Cirrhosis	2 (0.4)	Tuberculosis	1(0.2)						
Total	156 (30.1)	Total	176(33.9)	Total	24 (4.6)	Total	5 (0.96)	Total	6 (1.2)

Table 3. The association between organs condemned and origin of the cattle

Organ condemned	Lowland (%)	Midland (%)	Highland (%)	X ²	P-value
Lung	118(22.7)	18(3.46)	20(3.85)	33.809	0.002
Liver	83(16)	49(9.4)	24(4.6)	36.905	0.014
Kidney	14(2.7)	3(0.58)	3(0.58)	11.002	0.529
Heart	3(0.58)	2(0.11)	0(0)	5.041	0.753
Tongue	2(0.11)	4(0.77)	1(0.19)	8.693	0.369

Table 4. The association between organs condemned and body condition scores

Organ condemned	Poor (%)	Medium (%)	Good (%)	X ²	P-value
Lung	13(22.03)	149(28.7)	14(14)	32.043	0.004
Liver	9(17.34)	140(27)	7(15.5)	9.870	0.627
Kidney	1(0.19)	21(4)	3(0.58)	21.571	0.043
Heart	1(0.19)	4(0.77)	0(0)	14.814	0.063
Tongue	1(0.19)	6(1.16)	0(0)	2.779	0.947

Table 5. The association between organs condemned and age.

Organ condemned	Young (%)	Adult (%)	X ²	P-value
Lung	29(5.6)	147(28.32)	30.362	000
Liver	58(11.17)	98 (18.9)	16.138	0.013
Kidney	4(0.77)	21(4.0)	6.179	0.363
Heart	1(0.19)	3(0.58)	3.770	0.287
Tongue	12(2.3)	48(9.25)	7.036	0.318

Table 6. Direct financial loss due to organs condemnations

Organ	Average rejection rate of organs	Average annual slaughter rates	Average current price for each organ
Liver	26.5%	4000	75ETB
Lung	32.0%	4000	30ETB
Kidney	3.5%	4000	20ETB
Heart	0.9%	4000	35ETB
Tongue	0.8%	4000	50ETB

Out of the total 176 lungs and 156 livers condemned 22.7%, 3.46%, 3.85% lungs and 16%, 9.4%, 4.6% livers of cattle were condemned which were originated from low land, midland and highland, respectively (Table 3). There was statistically significant difference ($P < 0.05$) between the origins of the animals and lungs and livers condemnation rates (Table 3). The other organs which were condemned have no significant variations with origin of the animals ($P > 0.05$).

From the total 176 lungs and 156 livers condemned 22.03%, 28.7% and 14% of lungs condemned from poor, medium and good body conditioned animals, respectively, 17.34%, 27% and 15.5% of livers were condemned from poor, medium and good body conditioned animals, respectively (Table 4). And 0.19%, 4%, 0.58% of kidneys were condemned from poor, medium and good body conditioned animals, respectively. Significant difference ($P < 0.05$) was observed between lung and kidney condemnations rates with body condition categories whereas the rejection rates of liver, heart and Tongue with different body condition categories was insignificant ($P > 0.05$) (Table 4).

Out of the total 176 lungs and 156 livers condemned 5.6% and 28.32% of lungs were condemned in young and adult animals and 11.17% and 18.9% of liver were condemned in young and adult animals, respectively. There was statistically significant difference ($P < 0.05$) between the age categories with lung and liver condemnation rates whereas no significant variation was shown between age groups and kidney, heart and tongue condemnations (Table 5).

Assessment of direct financial loss

An attempt was made to evaluate the financial losses at the abattoir by considering the direct monetary losses due to the rejection of liver, lungs, kidneys, tongue and heart. The analysis was based on the annual rate of cattle slaughter, average prices of rejected organs and rejection rates of specific organs. The direct annual financial loss due to rejection of all organs was calculated using the formula set by Ogunrinade (1980).

$DAL = AC * AP * CR$; Where, DAL = Direct annual financial loss due to organ and carcass condemnation from domestic market.

AC= Annual cattle slaughter rate of the abattoir.

AP= Average price of each organ at the market.

CR= Condemnation rates of each organ. The annual direct economic loss from domestic market of organs condemned at the Gondar ELFORA abattoir was estimated to be 123,560 ETB (5,688.77 USD) per annum (Table 6).

Discussion

In the current study out of 519 cattle physically examined during antemortem inspection in Gondar ELFORA abattoir, different abnormalities were found in 84(16.2%) head of cattle. These abnormalities include branding 50(9.63%), abdominal hernia 2(0.39%), blindness 6(1.2%), local swelling 4(0.77%), lacrimation 7(1.8%), lameness 10(1.93) and nasal discharge 36(6.93%). During the antemortem examinations, it was found that branding and respiratory disorders were relatively the highest abnormalities. This result is greater than the work done by Lati *et al.* (2014) (3.93%) at Nekemit municipal abattoir and Yifat, *et al.* (2011) (1.9%) at Gondar ELFORA abattoir. The reason for increasing number of branding in this study is due to most animals brought from lowland where branding is most common. Lameness was due to physical trauma caused by inappropriate vehicles, loading and off-loading, during transportation to market places and to the abattoir (Regessa *et al.*, 2013). The respiratory signs such as presence of nasal discharge, coughing, sneezing were most probably related to stress due to lack of feed and Water, immune suppression and overcrowding during transportation (Getachew, 2008).

Out of the total cattle slaughtered, 30.1 % livers, 33.9% lung, 4.6% kidney, 0.96% heart, and 1.2% tongue were rejected due to various types of lesions. The study showed that hydatid cyst, fasciolosis, abscess, fibrosis, calcification, emphysema, pneumonia, bovine tuberculosis, hemorrhage, hydronephrosis, infarcts, pericarditis and taeniasis were the major causes of organs condemnation in cattle slaughtered at Gondar ELFORA abattoir. This result is

in line with reports of Lati *et al.* (2014) at Nekemiti municipal abattoir.

The overall prevalence of hydatidosis at Gondar ELFORA abattoir was predominantly occurred both in the lungs (22.5%) and livers (6.4%). Our finding is higher than the report of Elmahdi *et al.* (2004) from Sudan (3%) and Regassa *et al.* (2010) from Wolaita Sodo municipal abattoirs (15.4%), respectively, but it is lower than reported by Moje *et al.* (2014), Regassa *et al.* (2009) and Borji *et al.* (2011) with a prevalence of 50.1%, 48.5% and 52.7% from Shashamane, Adama and Hawassa, respectively. But similar records by Lati *et al.* 2014) (29.96%) and by Yifat *et al.* (2011) (24.7%) at Gondar ELFORA abattoir. This might be due to the abundance and frequent contact between the infected intermediate and final hosts. It could also be associated with backyard slaughtering of animals and provision of infected offal's to pet animals around homesteads. Other factors like difference in culture, social activity and attitude to dog in different regions might have contributed to this variation (Macpherson, 1985).

Fascioliasis was the second leading disease of liver condemnation which was recorded at the abattoir. The animals which were 15% had Liver abnormalities caused by fascioliasis which was lower than that of earlier reports from Jimma abattoir by Tolosa and Tigre (2007) (63.89%), from Gondar by Yifat *et al.* (2011) (26.9%) and from Kombolcha by Mohammed *et al.* (2012) (36.06 %), from Mekelle by Gebretsadik *et al.* (2009) (24.32%). The rejection rate due to fascioliasis was in concord with the rejection rate of 12.7% and 14.05% by Fufa *et al.* (2009) at Welaita Sodo and Swai and Ulicky (2009) (7.4%) slightly higher than at Hawi and 8.6% by Mellau *et al.* (2011) at Tanzania. These differences within the country are attributed mainly to variations in the ecological and climatic conditions such as altitude, rainfall, and temperature, although differences in livestock management system and the ability of the inspector to detect the infection may play a part.

In the current study 11.36% of lungs were condemned from the total lungs inspected and which were with emphysema (3.5%), calcification (3.3%), pneumonia (2.1%), abscess (1.16%) and bovine tuberculosis (0.12%). The problem of pneumonia was lower than compared to 22% by Kambarage *et al.* (2000) in Tanzania. Our result is in line with Mellau *et al.* (2011) and Amuamuta *et al.* (2012) who reported 1% and 1.8% in north Ethiopia. The problem of emphysema was similar with 1.73% reported in Tanzania and 4.4% reported in Northern Ethiopia by Mellau *et al.* (2011) and Amuamuta *et al.* (2012). Our result is strongly lower than (43.75%) by Seboka at Addis Ababa municipal abattoir. 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 (Cadamus *et al.*, 2010).

In our study 8.8% of livers were condemned due to abscess (0.6%), calcification (6.6%), fibrosis (1.2%) and cirrhosis (0.4%). It is higher than 3.8% Yifat (2011) from Gondar, 7.4% Amanuel *et al.* (2011) from Jimma municipal abattoir and lower than 28.73% Abraham and Haylegebrel (2012) from Adigrat municipal abattoir. Livers (6.6%) were condemned as a result of calcification, which is relatively higher than the finding of Mellau *et al.*, (2011) which is 1.9% at Arusha Tanzania, Yifat (2011) 0.8% from Gondar, Abraham and Haylegebrel, (2012) 0.13% from Adigrat municipal abattoir. This variation is due to the pathological conditions of the organ caused by bacteria, virus and parasites. The abscess record was higher than 0.3% by Amen *et al.* (2013) at Jimma municipal abattoir, 0.4% by Abraham and Haylegebrel, (2012) at Adigrat municipal abattoir. But lower than 0.74% by Lati *et al.* (2014) at Nekemiti municipal abattoir. The cause of cirrhosis more or less similarly reported with 0.13% by Abraham and Haylegebrel (2012) at Adigrat municipal abattoir and lower than 1.1% by Yifat *et al.* (2011) at Gondar ELFORA abattoir. Liver abscess are bacterial based and the infection occurs due to migrating intestinal parasites which preoptimize the conditions for a secondary bacterial infection and commonly associated with liver enlargement (Rosa *et al.*, 1989).

The present study also showed that the condemnation rate of kidney, heart and tongue was 4.4%, 0.77% and 1.16%, respectively. The condemnation rate of kidney is slightly higher than 0.56% by Lati *et al.* (2014) at Nekemiti municipal abattoir and lower than 18% by Amene *et al.* (2012) at Jimma municipal abattoir. However, almost similarly reported with 5.77% by Shagaw *et al.* (2009) at Mekelle municipal abattoir. The rejection rate of heart was lower than the rejection rate of 11% reported by Amene *et al.* (2012) at Jimma municipal abattoir and 3.71% by Shagaw *et al.* (2011) at Mekelle abattoir. And the rejection rate of tongue was a little higher than 0.56% by Lati *et al.* (2014) at Nekemiti municipal abattoir. Variations in the rejection rate of organs probably due to differences in agro-ecological conditions that favorable to the parasites, livestock management system and prevalence of diseases at the different study sites.

The direct financial loss incurred during this study as a result of condemnation of different organs of cattle was estimated about 123,560ETB (5,688.77 USD) per annum. Liver condemnation takes the higher proportion of all the losses accounting for 64.34% of

the total followed by lung, kidney tongue and heart which constitute 31.07%, 2.27%, 1.3% and 1.02% of all the direct financial losses, respectively. Similarly the annual financial lose in Ambo abattoir was estimated to be 160,032.23 as reported by Zewdu *et al.* (2000). The difference in the financial loss estimated in various abattoirs and/or parts of Ethiopia would be due to number of cattle slaughtered in the different abattoirs and also the variation in the retail market price of organs. This is probably due to the ecological and climatic difference between those localities.

Conclusion And Recommendations

The study identified the major causes of organ condemnation. Accordingly, hydatidosis, fasciolosis, abscesses, calcification, pneumonia, emphysema, fibrosis, pericarditis, and hydronephrosis were the major causes of condemnation of organs in cattle. Hydatidosis and fasciolosis were the major causes of condemnation resulting in considerable financial loss. Generally parasitic diseases and pathological conditions were the major causes of financial loss at Gondar elfora abattoir which may also reflect the same scenario in other slaughter-houses in Ethiopia. Therefore:-

- ❖ Awareness should be created for the animal attendants, farmers, customers, abattoir workers and butchers regarding to the public health significance of diseases of animal origin and the related losses.

- ❖ Furthermore, Proper disposal of the condemned offal's should be carried out so that it is easier to break the cycle of pathogens.

- ❖ Regular deworming of ruminants and dogs and elimination of stray dogs should be practiced.

- ❖ Immediate, safe and controlled elimination of all condemned abattoir materials and the sale of contaminated offal as pet's feed should be prohibited by law.

References

1. Abebe, F, Yilma, J. (2012): Estimated annual economic loss from organ condemnation, decreased carcass weight and milk yield due to bovine hydatidosis (*Echinococcus granulosus*, Batsch, 1786) in Ethiopia. *Ethiopia. Veterinary Journal*, 16 (2):1-14.
2. Abraham, A. and Haylegebriel, T. (2012): Major causes of organ condemnation and economic loss in cattle slaughtered at Adigrat municipal abattoir, northern Ethiopia. *Veterinary World*, *EISSN*.6: 916-2231.
3. Abunna, F., Asfaw. L., Megersa, B. and Regassa, A. (2010): Bovine fasciolosis: carpological, Abattoir survey and its economic impact due to liver condemnation at Soddo Municipal Abattoir. *Tropical Animal Health and Production*, 42: 289-292.
4. Alton, G. D., Lpeah, D., Bateman, K. J., McNab, W. B. and Berk, O. (2010): Factors associated with whole condemnation rates in provincially inspected abattoir in Ontario, (2001-2007): Implication for food animal syndrome surveillance. *BMC Veterinary Research*, 6: 42.1746-6148.
5. Amene, F., Eskindir, L. and Dawit, T. (2012): Cause, of Organ Condemnation of Cattle Slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopia. *Global Veterinarian*, 9 (4): 396-400.
6. Amuamuta, A., Akalu, B. and Chanie, M. (2012): Major causes of lung and liver condemnation and financial impact in cattle slaughter at Bahir Dar Municipal Abattoir. *African. Journal Basic Applied Science.*, 4: 165-171.
7. Arbabi, M. and Hooshyar, H. (2006): Survey of Echinococcosis and Hydatidosis in Kashun Region, Central Iran. *Iranian Journal Public Health*, 35: 75-81.
8. Biu A., Adindu, J. (2004): The prevalence of bovine hydatidosis in Maiduguri, Nigeria. *J. Life Environtal Scince*, 6(2):360-362.
9. Borji, H., M. Azizzadeh and A. Afsai, (2011): An abattoir-based study of hydatidosis in the dromedary (*Camelus dromedarius*) in Mashhad. *Iranian Journal of Helminthology*, pp: 1-2.
10. CFSPH. (2011): Echinococcosis. Iowa State of University, College of Veterinary Medicine, Lowapp pp. 1-14.
11. Chhabra, MB., Singla, L. D. (2009): Food-borne parasitic zoonoses in India: Review of recent reports of human infections. *Journal Veterinary. Parasitology*, 23(2):103-110.
12. De luata, A. and Habel. R. E. (1986): Teeth applied veterinary anatomy. W. B. shoulders company: U. S. A, p.4-16.
13. Elmahdi, I., Q. Ali, Magzoub, A. Ibrahim, Saad, M. and Romig, T. (2004): Cystic echinococcosis of livestock and humans in central Sudan. *Annals of Tropical Medicine and Parasitology*, 98: 473-479.
14. Ezana, G. (2008): Major diseases of export orintd livestock in export abattoirs in around Adalben woreda, Faculty of veterinary medicine, Haramya Univeristy, Haramya Ethiopia. GAO (Gondar Town Agricultural office). (2006 annual report).
15. Gebretsadik, B., Kassahun, B. and Gebrehiwot, T. (2009): Prevalence and economic significance of fasciolosis in cattle in Mekelle Area of Ethiopia. *Tropical Animal Health and Production*, 41(7): 1503-1504.

16. Getachew, E. W. (2008): Major disease of export oriented livestock in export Abattoir in and around Ada Liben Woreda, Debere Zeit, Faculty of Veterinary Medicine and Haramaya University, Ethiopia. DVM Thesis. pp32.
17. ILRI. (2009): Management of vertisols in Sub-Saharan Africa, Proceedings of a Conference Post-mortem differential parasite counts FAO corporate document repository.
18. Jibat, T. (2006): Causes of Organ and Carcass Condemnation in small ruminants slaughtered at HELMEX Abattoir. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Debrezeit, Ethiopia, pp. 9–11.
19. Jobre, Y., Lobago, F., Tiruneh, R., Abebe, G and Dorchie, P. H (1996): Hydatidosis in three selected regions of Ethiopia: An assessment trial on the prevalence, economic and public health importance. *Revue de medicine. Veterinaries*, 147: 797-804.
20. Kamarage, D. M., Kimera, S. I., Kazwala, R. R and Mafwere, B. M. (2000): Disease conditions responsible for condemnation of carcass and organs in shorthorn Zebu Cattle slaughtered in Tanzania. *Preventive Veterinary Medicine*, 22: 249-255.
21. Kebede, N. (2010): A retrospective survey of bovine hydatidosis in three abattoirs of Amhara National Regional State, northwestern Ethiopia. *Tropical Animal Health Production*, 42 (3):323-325.
22. Kebede, N., Abuhay, A., Tilahun, G. and Wossene, A. (2009): Financial loss estimation, prevalence and characterization of hydatidosis of cattle slaughtered at Debre Markos municipality abattoir. Ethiopia. *Tropical Animal Health and Production*, 41: 1787-1789.
23. Macpherson, N. C. (1985): Epidemiology of hydatid disease in Kenya, a study of the domestic intermediate Hosts in Masuil. *Trans. RSci. Trop. Med. Hyg.* 79:209-217.
24. Mellau, B. L., Nonga, H. E. and Karimuribo, E. D. (2010): Slaughter stock abattoir survey of carcasses and organ/offal condemnations in Arusha Region, northern Tanzania. *Tropical Animal Health and Production*, 43: 857-864.
25. Mellau, B. L., Nongaond, H. E and Karimuribo, E. D. (2011): Slaughter stock abattoir survey of carcasses and organ/offal condemnations in Arusha Region, northern Tanzania. *Tropical Animal Health and Production*, 43: 857-864.
26. Mesfin, B. and Nuraddis, I. (2012): Prevalence of *Cysticercus Bovis* in Hawassa Municipal Abattoir and its Public Health Implication. *Am. Eurasian J. Sci. Res.* 7(6):238-245.
27. Mohammed, N., Hailemariam, Z. and Mindaye, S. (2012). Major cause of liver condemnation and associated financial loss at Kombolcha elfora abattoir, South Wollo, Ethiopia. *European Journal of Applied. Science*.4: 140-145.
28. Moje, N., Z. Demeke, B. Belachew and R. Alemayehu (2014): Metacestodes in Cattle Slaughtered at Shashemene Municipal Abattoir, Southern Ethiopia: Prevalence, Cyst Viability, Organ Distribution and Financial Losses. *Global Veterinaria*, 12(1): 129-139.
29. Ogunrinade, A. and B. I. Ogunrinade, 1980.
30. Economic importance of bovine fasciolosis in Nigeria. *Trop. Anim. Hlth. Prod.*, 12: 155-160.
31. OIE. (2004): Chapter 2.10.1, Cysticercosis. In: OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Fifth Edition, and Paris, France.
32. Rahmeto A, Fufa A, Mulugeta B, Solomon M, Bekele M, Alemayehu R (2008): Fasciolosis: Prevalence, financial losses due to liver condemnation and evaluation of a simple sedimentation diagnostic technique in cattle slaughtered at Hawassa Municipal abattoir, southern Ethiopia. Hawassa University, Faculty of Veterinary Medicine.
33. Regassa, A., Abunna, F., Mulugeta, A. and Megersa. B. (2009): Major Metacestodes in cattle at Wolaita Soddo municipal abattoir, Southern Ethiopia Prevalence, cyst viability, organ distribution and socio-economic implications. *Tropical Animal Health and Production*, 41: 1495-1502.
34. Regassa, A., Moje, N., Megersaa, B., Beyene, D., Sheferaw, D., Debela, D., Abunna, F., Skjerved, E (2013): Major causes of organs and carcass condemnation in small ruminants slaughtered at Luna Export Abattoir, Oromia Regional State, Ethiopia. *Preventive Veterinary Medicine*, 110: 139–148.
35. Regassa, F., A. Molla and Bekele, J. (2010): Study on the prevalence of cystic Ethiopia Hydatidosis and its economic significance in cattle slaughtered at Hawassa Municipal abattoir. *Tropical Animal Health and Production*, 42:977-984.
36. Rosa, J. S., Johnson, E. H., Alves, F. S and Santos, L. F. (1989): A retrospective study of hepatic abscesses in goats: Pathological and microbiological findings. *British Veterinary Journal* 145: 73-76.
37. Swai, E. S. and E. Ulicky. (2009): An evaluation of the economic losses resulting from condemnation of cattle livers and loss of carcass weight due to fasciolosis: A case study from Hai town abattoir, Kilimanjaro region, Tanzania.

- Tanzania. *Research Journal of Veterinary Sciences*, 3: 179-188.
38. Teka, G. (1997): Meat hygiene. In food hygiene principles and methods of food borne diseases control with special reference to Ethiopia. pp 99-113.
 39. Tennant C. J., Spitzer W. C., Bridges Jr., and Hampton J. H. (2002): Weight necessary to change body condition scores in Angus cows. *J. Anim. Sci.*, 80: 2031–2035.
 40. Thrusfield, M. (2007): *Veterinary Epidemiology*. 2nd ed. UK: Black Well Science. P. 180.
 41. Tolosa, T. and Tigre, W. (2014): Prevalence and economic significance of bovine fasciolosis at Jimma abattoir, Ethiopia. *Internet. Veterinary Med.* 3: 15.
 42. Yifat, D., Gedefaw, D and Desie, S. (2011): major causes of organ condemnation and financial significance of cattle slaughtered at Gondar elfora abattoir, northern Ethiopia. *Global Veterinaria*, 7 (5): 487-490.
 43. Zewdu, E., Teshome, Y. and A. Makaoya (2008): Bovine hydatidosis in Ambo Municipal Abattoir, West Shoa, Ethiopia. *Ethiopian Veterinary Journal*, 11: 1-14.

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