Major Causes and Rates of Organ Condemnation and its Economic Losses of Cattle Slaughtered at Bishoftu Municipal Abattoir, Central Ethiopia

[1]Addisu Ephrem, [2]Firaol Bekele, [3]Abdissa Lemma and [4]Tolosa Shane

[1]South East Showa Zone, AmeyaWoreda Livestock Fishery Office, Oromia, Ethiopia
[2]College of Veterinary Medicine, Haramaya University, Ethiopia
[3]Arsi Zone, Digelu and TijoWoreda Livestock Fishery Office, Oromia, Ethiopia
[4]Arsi Zone, Livestock Fishery Office, Oromia, Ethiopia

Abstract: To identify the major causes of organs condemnation and estimate the direct financial loss attributed to the condemned organs in cattle slaughtered at Bishoftu municipal abattoir the current cross-sectional study was conducted from November 2019 to March 2020. Standard antemortem and postmortem inspection procedures were followed throughout the study. The estimation of financial losses is based on the annual slaughter capacity of the abattoir and considering the market average price of each organ. Using 50% expected prevalence, 95% confidence interval and 5% desired absolute precision the sample size was determined to be 384 and maximized to be 545 cattle to increase precision. SPSS version 20 was used for chi-square test and P-values < 0.05 was taken as statistically significant. The study revealed that from 545 slaughtered animals, 72(13.21 %) was found to have signs of detectable abnormalities in the antemortem inspection. Postmortem examination revealed that 225(46.80%) of livers, 220(40.46%) of lungs, 16(3.93%) of hearts and 45(8.26%) of kidneys were totally condemned or rejected due to gross abnormalities as unfit for human consumption. The major causes responsible for organ rejection included Fasciolosis 97 (17.08%), hydatidosis 79(14.49%) and calcification 50(9.17%). There was statically insignificant difference observed between the two age categories of cattle for all causes of liver ($P> 0.05$), Kidney ($P> 0.05$) and heart ($P>0.05$) condemnation. The average annual economic losses was calculated and found 464, 201.588 ETB. Therefore, to alleviate these, further studies and preventive measures should be carried out to reduce unnecessary financial losses encountered in the industry and to prevent the public from acquiring zoonotic disease like hydatidosis.

Key words: Abattoir · Antemortem · Bishoftu · Carcass · Condemnation · Organ

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 two third (2/3) of the world's livestock population, but produce less than a third of the worlds meat and fifth of its milk [1]. Ethiopia has large livestock population in Africa with an estimated of 50.8 million cattle, 25.9 million sheep and 21.9 million goats and 0.8 million camels [2]. However, there are constraints that hindered the potential of livestock production include;

traditional management system, limited genetic potential, lack of appropriate disease control policy and veterinary services. Due to these and related factors, each year significant economic losses result from condemnation of edible organs and carcass were estimated from different abattoirs of the country [3, 4].

Monitoring and other conditions at slaughter house have been recognized as one way of assessing the disease status of livestock and 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

---

Corresponding Author: Firaol Bekele, College of Veterinary Medicine, Haramaya University, Ethiopia.

disease [5]. The main causes of organ condemnation during postmortem inspection are diseases originated by parasites, bacteria and viruses. Flukes in liver and hydatid cyst in lung, liver, heart and kidney are mainly involved [6, 7]. Parasites in the tropics are responsible for far greater loss to meat industry than any other disease [8]. Similarly like many other tropical countries in Africa parasitic diseases are the major factors responsible for low productivity in livestock in Ethiopia [9]. 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.

Through meat inspection procedure involves two steps, namely ante-mortem and postmortem inspections [7]. The importance of ante mortem inspection in the abattoir has long been recognized in attempt to avoid the introduction of clinically diseased animals in to slaughter house. Ante mortem inspection should be done within 24 hours of slaughter and repeated if slaughter has been delayed over one day. Inspection before slaughter also enables to obtain information that will be useful in making sound postmortem inspection [10]. Postmortem inspection is a screening of sorting process to separate the normal from abnormal, postmortem is the center around which meat hygiene revolves since it provide information indispensable for scientific evolution of clinical sign and pathological process that affect the wholesomeness of meat [10-12]. The primary reason for postmortem examination of carcass at the slaughterhouse is for protection of public health [13].

In Ethiopia many studies have been undertaken to identify the major disease condition encountered during ante-mortem and postmortem inspection and to determine the economic importance of organs condemnation. However, there was no detail information on the major causes of organs condemnation in Bishoftu municipal abattoir. Therefore, the objectives of study were to identify the major causes of organs condemnation and estimate the direct financial loss attributed to the condemned organs in cattle slaughtered at Bishoftu municipal abattoir, Ethiopia.

MATERIALS AND METHODS

Study Area: The study was conducted in Bishoftu, from October 2019 to March 2020. Bishoftu is located 45kms south east of Addis Ababa. The area is located at 9°N latitude and 40°E longitudes at an altitude of 1850 meters above sea level in central high land of Ethiopia. It has an annual rainfall of 866 mm of which 84% is in the long rainy season (June to September). The dry season extends from October to February. The mean annual maximum and minimum temperatures are 26°C and 14°C respectively, with mean relatively humidity of 61.3% [14].

Farmers in the vicinity of Bishoftu town use a mixed crop and live stock farming system. Moreover, Bishoftu and its surrounding have variable and yet representative agro-ecologies of the country. These agro-climatic zones are inhabited with different plant and animal species [15]. The overall hygiene of the abattoir, including the drainage, water, lightening and condemned carcass and organ disposal system is poor. Animals from different origin of the surrounding district and other places are the source for slaughtering.

Study Animals: The study included 545 indigenous male Cattle that were destined for slaughter at Bishoftu municipal abattoir from different areas mainly from Arsi, Bale, Adulala, Harar, Modjo, Bishoftu itself and the surrounding areas. The altitudes of these areas also vary from lowland to highland with different agro ecological conditions. On average 45 cattle were slaughtered at the abattoir per day. Animals were of different age groups by their detention formula [16]. Based on their dental eruption patterns, two conventional age groups were formed as young-adult (2 to 6 years) and adult (>6 years) [17].

Study Design: A cross- sectional study design was used to determine the major abnormal conditions of organs and to estimate the direct financial loss in cattle slaughtered at the abattoir. Simple random sampling method was used to select study animals by taking the age and sex.

Active Abattoir Surveys: During each visit to the abattoir procedure involving both ante-mortem and postmortem inspection was performed with their specific identification numbers and recorded accordingly on formats prepared for these purposes.

Antemortem Inspection: Ante-mortem inspection was conducted on the cattle during and after they entered into lairage within 24 hours of arrival at the slaughter house. During examination each of study animal was identified based on the enumerate marks on their body marked before slaughter and their general behavior, signs of disease, nutritional status, cleanliness and any type of abnormalities were recorded [11].

Postmortem Inspection: Postmortem examination was conducted through visualization inspection, palpation and systematic incision of each visceral organ particularly the liver, lung, heart and kidney for the presence of cysts, various adult parasites and other abnormalities [18]. Pathological lesions were differentiated and judged according to guidelines on meat inspection for developing [2].

Sample Size and Sampling Method: The sample size was calculated using the formula given [19] for simple random sampling with 50% expected prevalence, 95% confidence interval and 5% desired absolute precision. Accordingly, the sample size was determined to be 384. However, large numbers of animals were slaughtered at the abattoir and thus, the sample size was maximized to be 545 cattle to increase precision.

Assessment of Direct Economic Loss: The analysis was based on annual slaughter capacity of the abattoir considering the market demand, average market price of each organ in Bishoftu 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 [20] as follows:

EL = Σsrx X Coy X Rozs

where,
EL = Annual economic loss estimated due to organ from local market.
Σsrk = Annual cattle slaughter rate of the abattoir
Coy = Average cost of each liver/ lung/ heart/ kidney/
Roz = Condemnation rates of each/liver/lung/heart/kidney/

Data Management and Statistical Analysis: Data generated from ante-mortem and postmortem meat inspection was recorded on standardized data sheets. Then the recorded data were interred to Microsoft Excel sheet and then analyzed by using statistical Package for Social Sciences (SPSS) for window version 20. Descriptive statistics were used to determine organs condemnation rates, defined as proportion of condemned organs to the total number of organs examined. The variability between condemnation rates of specific organs, risk factors of abnormalities and age were evaluated by Pearson's chi-square and the difference were regarded statistically significant if P-value was less than 0.05.[21]

RESULTS

Ante-Mortem Examination: Of the total 545 cattle's examined at ante-mortem 72(13.21%) cattle's were found to have the abnormalities listed below (Table 1). The most common abnormalities encountered during ante mortem inspection were local swelling (15.30%), coughing (26.40) and tick infestation (16.67%) were the major abnormalities observed.

Postmortem Examination
Rate of Organ Condemnation: All animals that had been examined by antemortem inspection were subjected to postmortem examination. From the total organs examined 225(46.80%) livers, 220(40.46%) lungs, 16(3.93%) hearts and 45(8.26%) kidneys were totally condemned or rejected due to gross abnormalities as unfit for human consumption (Table 2).

Causes Resulting in Liver Condemnation: From the total 545 examined cattle at slaughter, 225 (46.80%) livers were totally condemned as unfit for human consumption because of various abnormalities. Of these condemned livers, fasciolosis was responsible for 97 (17.08%) liver condemnation followed by hydatidosis 79(14.49%) and calcification 50(9.17%). Hepatitis, abscess, cirrhosis, fatty infiltration and hepatomegally were also cause for the Rejection. There were no statistical significant difference ($P<0.05$) among the two age categories and frequencies of causes for liver rejection (Table 3).

Causes Resulting in Kidney Condemnation: Hydronephrosis, atrophy and hydatidosis were found to be the major principal causes for kidney condemnation, accounting 2.20, 2.38 and 2.02% respectively. There was no statistical significant difference (p-value > 0.05) between the two age categories and frequencies of causes for kidney condemned (Table 4).

Causes Resulting in Heart Condemnation: The causes of heart condemnation were pericarditis, hydropericardium, hydatidosis and congestion. Of these, the major pathological lesions encountered were pericarditis and hydatidosis each account (0.92%). Hydropericardium and congestion accounted for 0.73% and 0.37% heart condemnation, respectively. There was no statistical significant difference in all cases (p-value > 0.05) between the two age categories and frequencies of causes of heart condemned (Table 5).

Table 1: Disease conditions or abnormal conditions encountered during antemortem inspection

Abnormal conditions	No(%) of animal affected		Total no (%) Abnormality
	Young-adult	Adult	
Blindness	0(0%)	2(0.36%)	2(0.36%)
Local swelling	0(0%)	11(2.02%)	11(2.02%)
Edema	1(0.18%)	4(0.73%)	5(0.91%)
Lameness	0(0%)	4(0.73%)	4(0.73%)
Tick infestation	1(0.18%)	11(2.02%)	12(2.20%)
Coughing	0(0%)	19(3.50%)	19(3.50%)
Nasal discharge	0(0%)	4(0.73%)	4(0.73%)
Wound	2(0.36%)	6(1.10%)	8(1.46%)
Diarrhea	0(0%)	7(1.28%)	7(1.28%)
Total	4(0.73%)	68(12.48)	72(13.21%)

Table 2: Distribution of numbers and age of cattle slaughtered and organ rejection rates

Age	Total number of cattle slaughtered	No(%) of organ condemned			
		Liver	Kidney	Heart	Lung
Young-adult	50	14(28.00%)	3(6.00%)	1(2.00%)	22(44.00%)
Adult	495	241(48.68%)	42(8.48%)	15(3.03%)	198(40.00%)
Total	545	255(46.78%)	45(8.26%)	16(2.93%)	220(40.36%)

Table 3: Distribution of causes of liver condemnations based on age categories

Disease condition	No(%) of liver condemned			P-value
	Young	Adult	Total	
Fasciolosis	8(1.47%)	89(16.33%)	97(17.80 %)	0.727
Calcification	1(0.18%)	49(8.99%)	50(9.17%)	0.650
Abscessation	1(0.18%)	7(1.28%)	8(1.47 %)	0.743
Hepatitis	0(0%)	15(6.22%)	15(2.75%)	0.212
Hydatid cyst	4(0.73%)	75(13.76%)	79(14.49%)	0.171
Cirrhosis	0(0%)	3(0.55%)	3(0.55%)	0.581
Fatty infiltration	0(0%)	2(0.37%)	2(0.37%)	0.652
Hepatomegally	0(0%)	1(0.18%)	1(0.18 %)	0.750
Total	14(2.56%)	241(44.22%)	255(46.80%)	

Table 4: Distribution of cause of kidney condemnation based on age categories

Disease condition	No(%) of kidney condemned			P-value
	Young	Adult	Total	
Hydatid cyst	1(0.18%)	10(1.83%)	11(2.02%)	0.521
Calcification	0(0%)	5(0.92%)	5(0.92%)	0.231
Abscessation	0(0%)	2(0.37%)	2(0.37%)	0.423
Atrophy	1(0.18%)	12(2.20%)	13(2.38%)	0.650
Hydronephrosis	1(0.18%)	11(2.02%)	12(2.20%)	0.153
Nephritis	0(0%)	2(0.37%)	2(0.37%)	0.715
Total	3(0.55%)	42(7.71%)	45(8.26%)	

Table 5: Distribution of cause of heart condemnation based on age categories

Disease condition	No(%) of heart condemned			P-value
	Young-adult	Adult	Total	
Hydatid cyst	0(0%)	5(0.92%)	5(0.92%)	0.994
Congestion	1(0.18%)	1(0.18%)	2(0.37%)	0.455
Pericarditis	0(0%)	5(0.92%)	5(0.92%)	0.094
Hydropericardium	0(0%)	4(0.73%)	4(0.73%)	0.672
Total	1(0.18%)	15(2.75%)	16(2.93%)	

Table 6: Distribution of causes of lung condemnation based on age categories

| Disease condition | No(%) of lung condemned | | | P-value |
	Young	Adult	Total	
Hydatid cyst	17(3.1 2%)	157(28.81%)	174(31.92%)	0.058
Calcification	1(0.18%)	13(2.38%)	14(2.56%)	0.098
Abscessation	0(0%)	2(0.37%)	2(0.37%)	0.674
Emphycema	2(0.37%)	4(0.73)	6(1.10%)	0.887
Pneumonia	2(0.37%)	22(4.03%)	24(4.40%)	0.521
Total	22(4.04%)	198(36.33%)	220(40.36%)	

Table 7: Findings of the study used in the direct financial loss assessment

Type of organs	Rejection rate of organs (%)	Average price of organs at local market (ETB)	Average annual slaughter capacity of the abattoir	Annual loss estimation (ETB)
Liver	46.80	100	7972	373, 089.60
Kidney	8.26	30		19, 754.616
Heart	2.93	30		7, 007.388
lung	40.36	20		64, 349.984
Total Estimated Loss (ETB)	464, 201.588			

Causes Resulting in Lung Condemnation: The major gross pathological conditions observed in lung were hydatid cyst and pneumonia accounting for 31.92% and 4.40%, respectively. The rejection due to other causes such as; calcification, emphysema and abscess were 6.36, 2.73 and 0.91% respectively. There was no statistical significant difference between ($P >0.05$) between the two age categories and frequencies of causes for lung condemned (Table 6).

Assessment of Direct Economic Loss: The average annual slaughter capacity of the abattoir was estimated to be 7972 cattle. Hence the direct annual economic loss due to rejection of organs was calculated based on the average current market price per organ at the study area. Using all the necessary information and the formula given by Ogunrinade and Ogunrinade (1980).

The annual direct economic loss only due to rejection of edible organs at Bishoftu Municipality abattoir was calculated to be 464, 201.588 (ETB) or 23, 829.65USD ($1 = 19.48 ETB).

Prevalence Study: Out of 545 heads of cattle slaughtered at Bishoftu municipality abattoir, 79(14.49%), 11(2.02%), 5(0.92%) and 174(31.72%) were harbored hydatid cyst in their liver, kidney, heart and lung respectively.

DISCUSSION

Meat inspection is conducted in the abattoir for the purpose of screening and removing animals with abnormal pathological lesions unsafe for human consumption and having poor aesthetic value. An important function of meat inspection is to assist in monitoring diseases in the national herd and flock by providing feedback information to the veterinary service to control or eradicate disease and to produce wholesome products and to protect the public from zoonotic hazards [22].

In the present study from the total organs examined, 225(46.78%) livers, 220(40.36%) lungs, 16(3.93%) hearts and 45(8.26%) kidneys were totally condemned or rejected due to gross abnormalities as unfit for human consumption. Among disease conditions encountered during postmortem examination are fasciolosis and hydatidosis that were found to be the major causes for liver rejection from local market, while hydatid cyst and pneumonia were the major causes for lung condemnation. However, the disease conditions or abnormalities detected in the heart and kidneys have lower contribution for the condemnation of the organs. Losses from liver condemnation were assumed to occur since hepatic pathology is associated to infection that might have public health importance and aesthetic value [23, 24]. Previous studies have indicated a higher economic loss resulting from condemnation of edible organs due to parasitic causes [25, 26]in different abattoirs in the country.

From the total 545 examined cattle at slaughter, 225 (46.78%) livers were totally condemned as unfit for human consumption because of various abnormalities. Of these condemned livers, fasciolosis was responsible for 97/255 (38.04%) liver condemnation followed by hydatidosis 79/255 (30.98%) and calcification 50/255 (19.61%). Rejection rate due to, hepatitis, abscess, cirrhosis, fatty infiltration and hepatomegally was 5.88%, 3.1455%, 1.18%, 0.78% and 0.40%, respectively. Hydatid cyst (31.92%) and

pneumonia (4.40%) contributed for lung condemnation during the study period. Similarly, it is reported that liver, lung, heart and kidneys are among the, main organs subjected to condemnation due to different causes [27].

In Ethiopia, fasciolosis has been reported to be one of the major diseases problems of livestock industry [28]. Moreover, an annual loss of approximately 64 million USD was estimated to be lost due to reduced production of cattle by fasciolosis [29]. In the same manner, researches conducted by different authors of the country indicated the wide distribution of the disease in the country with its prevalence reaching up to 84%. In the current abattoir survey, 17.79% of the animals' liver abnormalities were found to be caused by fasciolosis. This finding is comparable with the value reported with the prevalence of 16.64% [4] and relatively higher than the reports with a prevalence of 14% and 14.04 % in Hai, Tanzania and Wolaita Sodo, Ethiopia, municipal abattoirs, respectively [30, 31]. However, this result was higher than the value reported with a prevalence of 8 and 8.2 %, from Nigeria and Kenya, respectively [32, 33]. On the other hand, this result was lower than reports from Kafue in Zambia, Jimma municipal and Mekelle abattoirs in Ethiopia, respectively as 37%, 46 % and 46.2% [34-36]. These differences can be attributed to the difference in agro-ecological condition and strategic control of internal parasites in the areas. Apart from its veterinary and economic importance throughout the world, Fasciolosis has recently been shown to be a re-emerging and widespread zoonosis affecting a number of human populations [37, 38].

Various reasons could be adduced for the different prevalence observed, ranging from effective control strategies (in case of low prevalence) to favorable local environmental conditions like the presence of biotopes suitable for the development of the snail intermediate host of the parasite (which are usually in abundance during rainy season) which enhances the reproducibility of this parasite. It is possible that this organism has developed resistance to the routine lines of treatment due to drug abuse by farmers. In the same vein, another plausible reason accounting for the high prevalence could be attributed to the failure of farmers to schedule strategic deworming program for their animals. Hence, the timing of treatments can be recommended with the help of detailed epidemiological studies. However, climatic conditions vary from region to region and from year to year and therefore the strategic and economic application of anthelmentics has to be simplified for the farming community. Meanwhile, the economic impact of fasciolosis on the farmers and the livestock industry cannot be over-emphasized. On the other hand, it has indicated that significant economic losses are incurred due to bovine hydatidosis from liver condemnation and carcass weight loss at Bishoftu abattoir [39]. Factors governing the prevalence of hydatidosis in a given locality may be associated with prevailing specific social, cultural, environmental and epidemiological situations [40].

Hydatidosis was another leading disease which was recorded at the abattoir. It affected most of the visceral organs such as lungs, liver, heart and kidney. In study the overall prevalence of bovine hydatidosis was 49.36%, from this 45.42% accounts in adult animals and 4.03% in young-adult animals which occurred predominantly in the lungs (31.92 %) followed by liver (14.49%), kidney (2.02%) and heart (0.92%). This finding is comparable with a prevalence of 46.36, 46.8, 48.5 and 52.7% Bishoftu, Debre-Markos, Adama and Hawassa respectively [8, 18, 41, 42]. This study finding is higher than the report of different scholars (3%) and (15.2%) from Sudan and Wolaita Sodo abattoirs respectively [31, 43], but it is much lower than the report from Greece with a prevalence of 82 % [44].

The present study indicated that 40.36% of lungs were condemned from the total lungs inspected from being used as pet food due to pneumonia, calcification, emphysema, hydatid cysts and abscess. From the total lung rejected, hydatid cyst accounts for 79.09% 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 (4.40%). This finding is lower than rejection rate (8.8%) that was reported in cattle slaughtered at Zaria [45] and it was higher than that reported (0.14%) in cattle slaughtered at Zango abattoir, Nigeria [46]. A number of factors may explain the high prevalence of pneumonic lungs, including stress factors such as exposure to dust from the environment or exhaustion during long treks of pastoral livestock in search of pasture and water and when animals are taken to livestock markets or abattoirs and parasitism.

In agreement with the present study many researchers reported the liver and lungs to be the most commonly affected organs by hydatid cyst [6, 8, 47]. The reason as explained by Gracey [11] is that lung and liver contain the highest capillary bed in the body. The majority of onchosphers are filtered out and trapped in fine blood capillaries and only as small number of onchosphers reached the remaining organs.

The rejection rate of kidney and heart was however, not as significant as those liver and lung and as such unlikely to produce the pronounced economic effects associated with the first two. The other causes of condemnation in all organs were less frequent and most associated with unspecific pathogenic conditions.

The total financial loss calculated in this study, due to organs condemnation, was 464, 201.588 ETB or 23, 829.65USD /year, of which 141, 886.97ETB or 7283.72 USD and 173, 438.832ETB or 8903.43 USD/year were due to fasciolosis and hydatidosis, respectively. The financial loss encountered due to fasciolosis in this study is lower than those previous published studies Viz. 5, 121, 873 ETB from Gonder ELFORA abattoir [4]*,* 8312.5 USD from Hawassa municipal abattoir [48]. Butthe financial loss encountered in this study is higher than previous studies 4, 674.2 USD from Adwa Municipal Abattoir [49]; 6300 USD from Jimma abattoir [50] and 4000USD from Wolaitasoddo abattoir [31]. The difference in the financial loss estimated in various abattoir and/or parts of Ethiopia would be due to the variations in the prevalence of disease, mean annual number of cattle slaughtered in the different abattoirs and the variation in the retail market price of organs [51].

CONCLUSION AND RECOMENDATIONS

The results of the present study revealed that fasciolosis, hydatidosis, abscesses, pneumonia, pericarditis, hydronephrosis and atrophy were the major causes of total condemnation of organs in cattle in the surveyed abattoir resulting in considerable financial loss in cattle production which remain the most important diseases warranting serious attention for prevention and control actions. Hence, the current study may be valuable locally and nationally by providing data for monitoring disease conditions and management practices of animals that have public health hazard and aesthetic value; to reduce these losses the following recommendations are forwarded:

- Postmortem inspection of organs should be conducted more seriously to prevent the public from acquiring zoonotic disease like hydatidosis commonly detected during *postmortem* inspection.
- Farmers, urban dwellers, abattoir workers, butchers and dog owners should be trained on proper disposal of organs.

- Immediate, safe and controlled elimination of all condemned abattoir materials and the sale of contaminated offal as dogs feed should be prohibited by law.
- The veterinary service in charge of the area should introduce livestock diseases control and prevention measures to reduce the rate of organ condemnation and minimize the resultant incurred economic losses.
- Public health education to build up public awareness about the sources of infection in the area, the government should give attention and building and make accessible slaughter houses to the community with subsequent control over backyard slaughtering should be conducted.
- Further epidemiological studies on the diseases status, public health importance and associated risk factors influencing the occurrence of zoonosis should be conducted in the areas of origin of the animals.

REFERENCES

1. Food and Agriculture Organization, 2007. Manual of meat inspection for developing countries. FAO. Animal and health production papers Food and Agriculture organization of the United Nations: Edited by: Dr. BedruHussen, Mekele University, February 2007, Mekele, Ethiopia.

2. Food and Agriculture Organization, 1995. Manual of meat inspection for developing countries. FAO. Countries. FAO. Production and Health, pp: 119-359.

3. Amene, F., L. Eskindir and T. Dawit, 2012. Cause, Rate and Economic Implication of Organ Condemnation of Cattle Slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopia. Global Veterinarian, 9: 396-400. DOI: 10.5829/idosi.gv.2012. 9.4.6579.

4. Genet, M., G. Tadesse, B. Basaznew and C. Mersha, 2012. Pathological Conditions Causing Organ and Carcass Condemnation and Their Financial Losses in Cattle Slaughtered in Gondar, Northwest Ethiopia. African Journal Basic and Applied Science, 4: 200-208. DOI: 10.5829/idosi.ajbas.2012.4.6.66146.

5. Alton, G., D. Lpeah, K. Bateman, W. Mc Nab and O. Berk, 2010. Factors associated with whole condemnation rates in provincially inspected abattoir in Ontario: Implication for food animal syndromic surveillance. BMC 29. Vet. Res., 6: 42. DOI:10.1186/1746-6148-6-42.

6. Sirak, A., 2013. Cause of organ condemnation in Bahirdar abattoir. Faculty of Veterinary Medicine, Addis Ababa Univrsity, DebreZeit, Ethiopia, DVM Thesis.

7. Teka, G., 1997. Meat hygiene. In: Food hygiene principles and methods of food born disease control with special reference to Ethiopia, pp: 99-113.

8. Jobre, Y., F. Lobago, R. Tiruneh, G. Abebe and P.H. Dorchies, 1996. Hydatidosis in three selected region in Ethiopia: An assessment trial on its prevalence, economic and public health importance, Review on Veterinary Medicine, 147: 797-804.

9. Abebe, G., 1995. Status of veterinary education and health research in Ethiopia In: Veterinary Medicine impact on health and nutrition in Africa. Proceeding of an international conference ILRI, Addis Ababa, pp: 133-138.

10. Herenda, D., P.G. Chambers, A. Ettriqui, P.D.A Seneviratnap and T.J.P. Silvat, 1994. Manual on meat inspection for developing countries, Food and Agriculture of the United Nations (FAO). Rome, Italy, pp: 335.

11. Gracey, I.F., O.S. Collinsand R.J. Huey, 1999. Meat Hygiene 10th ed. London: Baillierotindall, pp: 223-260.

12. Zewdu, E., Y. Teshome and A. Makaoya, 2008. Bovine hydatidosis in Ambo Municipal Abattoir, West Shoa, Ethiopia. Ethiopian Veterinary Journal, 11: 1-14.

13. Department of Agriculture and Rural Development (DARD), 2018. Northern Ireland. Bovine tuberculosis in Northern Ireland. http://darni.gov.uk/indexhtm, (accessed in November 11, 2018).

14. ADARDO, 2017. Ada'a District Agricultural and Rural Development Office.

15. CSA, 2015. Report on livestock and livestock . characteristics. Statistical Bulletin 468: Addis ababa, Ethiopia.

16. Da Launta, A. and R.E. Habel, 1916. Applied Veterinary Anatomy, USA.

17. Pace, J.E. and D.L. Wakeman, 2003. Determining the age of cattle by their teeth animal science department institute of food and agricultural sciences (IFAS), USA: Florida, pp: 11-14.

18. Getaw, A., D. Beyene, D. Ayana, B. Megersa and F. Abunna, 2010. Hydatidosis: prevalence and its economic importance in ruminants slaughtered at Adama municipal abattoir, central Oromia, Ethiopia. ActaTropica,113: 221-225. DOI:10.1016/j.actatropica. 2009.10.019.

19. Thrusfield, M., 2015. Veterinary Epidemiology 3rd ed. UK: Black Well Science, p: 180-181.

20. Ogunrinade, A. and B.I. Ogunrinade, 1980. Economic importance of bovine fasiolosis in Nigeria. Trop. Animal Hea and Pro., 12: 155-160.

21. SPSS (Statistical Package for Social Science), 2007. Statistical Package for Social Science (SPSS) version 20.0.

22. Shegaw, S., K. Ashwani and A. Kassaw, 2009. Organs condemnation and economic loss at Mekelle municipal abattoir, Ethiopia. J. Haryana Veterinarian, 48: 17-22.

23. Budke, C.M., P. Deplazes and P.R. Torgerson, 2006. Global socio economic impacts of cystic echinococosis. Emerging infectious Diseases Journal, 12: 296-302.

24. Radostitis, O.M., C.C. Gay, D.C. Blood and K.W. Hencheliff, 2000. Veterinary Medicine, A text book of diseases of cattle, sheep, goats, pig and horses, 9th ed. London: Bailliereth Tindall, pp: 1378-1383

25. Jembere, S., 2002. A study on causes of organ and carcass condemnation in slaughtered cattle at Nazareth abattoir. DVM thesis. Addis Ababa University, Faculty of Veterinary Medicine, Debre Zeit, Ethiopia, pp: 15-22.

26. Jibat, T., 2006. Cause of organ and carcass condemnation at Asella municipal slaughtered at DebreZeit HELIMEX abattoir. DVM thesis, Addis Health Ababa University, Faculty of Veterinary Medicine, Debre Zeit, Ethiopia, pp: 1-12.

27. Mezegebu, Y., 2003. Major cause of organ condemnation in ruminants slaughtered at Gonder Abattoir, North Western Ethiopia. Faculty of Veterinary Medicine, Addis Ababa Univrsity, DebreZeit, Ethiopia, DVM Thesis.

28. Fistum, A., 2009. Major causes of lung and liver condemnation and its economic importance in Hawassa Municipal Abattoir (Doctor of Veterinary Medicine Thesis). Faculty of Veterinary Medicine, Gonder University Abattoir, Gonder.

29. Gemechu, B. and E. Mammo, 1979. A Preliminary survey of bovine fasiolosis in Ethiopia. Journal of Ethiopia Agricultural Science, 1: 5-12.

30. Swai, E.S. and E. Ulicky, 2012. 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 for Rural Development, 21: 186.

31. Abunna, F., L. Asfaw, B. Megersa and A. Regassa, 2010. Bovine fasciolosis: Coprological, abattoir survey and its economic impact due to liver condemnation at Soddo Municipal Abattoir, Southern Ethiopia. Tropical Animal Health and Production, 42: 289-292.

32. Okoli, I.C., E.C. Agoh, G.C. Okoli, G.C. Idemi and D.O. Umesiobi, 2000. Bovine and CaprineFasciolosis in Enugu State of Nigeria: Retrospective analysis of abattoir records and six-month prevalence study. Bulletin of Animal Health and Production for Africa, 48: 7-11.

33. Kithuka, J.M., N. Maingi and F.M. Njeruh, 2002. The prevalence and economic importance of bovine Fascioliasis in Kenya: an analysis of abattoir data, Ondestepoort, Journal of Veterinary Research, 69: 255-62.

34. Phiri A.M., 2006. Common conditions leading to cattle carcasses and offal condemnations at three abattoirs in Western Province of Zambia and their zoonotic implications to consumers, Journal of South African Veterinary Association, 77: 28-32.

35. Tadelle, T. and T. Worku, 2007. The prevalence and economic significance of bovine fasciolosis at Jimma, Abattoir, Ethiopia, The Internet Journal of Veterinary Medicine, 3: 15-16.

36. Berhe, G., K. Berhane and G. Tadesse, 2009. Prevalence and economic significance of fasciolosis. in cattle in Mekelle area of Ethiopia. Tropical Animal Health and Production, 41: 1503-1504. DOI: 10.1007/s11250-009-9339-2.

37. Esteban, J.G., C.F. Gonzalez, C. Curtale, C. Munoz-Antoli and M.A. Valero, 2003. Hyperendemic fascioliasis associated with schistosomaisis in villages in the Nile delta of Egypt. The American Journal of Tropical Medicine and Hygiene, 69: 429-437.

38. Mas-Coma, S., M.D. Bargues and M.A. Valero, 2005. Fasciolosis and other plant-borne trematode zoonoses. International Journal of Parasitology, 35: 1255-1278.

39. Fisseha, G. and J. Yilama, 2008. Economic importance of bovine fasciolosi. An assessment trial at Debre Ziet abattoir, FVM, AAU, Ethiopia.

40. Macpherson, C.N.L., E. Zeyhle and T. Roming, 2005. An echniococcosis pilot control programme for Northwest Turkan, Kenya. Ann. Trop. Med. Parasitol., 78: 188-192.

41. Kebede, N., 2010. A retrospective survey of bovine Hydatidosis in three abattoirs of Amhara National Regional State, northwestern Ethiopia. Tropical Animal Health and Production, 42: 323-325.

42. Regassa, F., A. Molla and J. Bekele, 2009. Study on the prevalence of cystic Hydatidosis and its economic significance in cattle slaughtered at Hawassa Municipal abattoir, Ethiopia. Tropical Animal Health and Production, 42: 977-984.

43. Elmahdi, I.E., Q.M. Ali, M.M. Magzoub, A.M. Ibrahim, M.B. Saad and T. Romig, 2005. Cystic echinoccosis of livestock and humans in central Sudan. Annals of Tropical Medicine and Parasitology, 98: 473-479.

44. 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. DOI: https://doi.org/10.1017/S0022149X11000228.

45. Raji, M.A., S.O. Salami and J.A. Ameh, 2010. Pathological condition and lesions observed in slaughtered cattle at Zaria abattoir. Journal of Clinical Pathology and Forensic Medicine, 1: 9-12.

46. Clement, B.J., I.J. Alawa and B.L. Joseph, 2008. Six years survey of pathological conditions of slaughtered animals at Zango abattoir in Zaria, Kuduna state, Nigeria. Tropical Animal Health and Production, 43: 127-131. DOI: 10.1007/s11250-010-9664-5.

47. Urquhart, G.M., J. Amour, J.L. Ducon, A.M. Dunn and F.W. Jennings, 1996. Echinococcus: in veterinary parasitology. Longman Scientific and Technical., pp: 123-126.

48. Abebe, R., F. Abunna, M. Berhane, S. Mekuria, B. Megersa and A. Regassa, 2010. 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, EthiopianVeterinary Journal, 14: 39-51.

49. Kele, M., H. Tesfaye and Y. Getachew, 2007. Bovine Fasciolosis: Prevalence and its economic loss due to liver condemnation at Adwa Municipal Abattoir, North Ethiopia. Ethiopian applied Sciences, 1: 39-47.

50. Tolesa, T. and W. Tigre, 2007. The Prevalence and economic significance of bovine fasciolosis at Jimma abattoir, Ethiopia. College of agriculture and Veterinary Medicine, Jimma University.

51. Arbabi, M. and H. Hooshyr, 2006. Survey of Echinococcosis and Hydatidosis in Kashan Region Central Iran. Iranian Journal of Public Health, 35: 75-81.