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Major parasitic causes of organ condemnation in cattle and their financial implication in Ambo town municipal

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ABSTRACT

A cross sectional study was conducted from November 2013 to March 2014 to identify the major parasitic causes of organs condemnation and to estimate the direct financial implication or economic losses due to condemnations of these organs of cattle that were slaughtered at Ambo municipal abattoir. Standard antemortem and postmortem inspections procedures were followed throughout this study period. From the total of 384 cattle examined during standard antemortem inspection, different types of abnormalities were observed on 76 (20.9%) of male and 7 (33.3%) of female out of 363 male and 21 female cattle under gone ante mortem examination. Postmortem inspections of this study revealed that 83 (21.6%) livers, 43 (11.2%) lungs, 12 (3.1%) hearts, 9 (2.3%) tongues, 2 (0.5%) kidneys, 5 (1.3%) masseter muscles (carcass) and 11 (2.9%) spleen were condemned based on the principle meat inspection procedures for developing countries as a result of various causes of major parasitic diseases/lesions including, fasciolosis, hydatidosis and cysticercus bovis. Among parasitic diseases/lesions encountered during present study 16.9% of fasciolosis as the major causes of liver condemnation; 21.1% of hydatidosis from (liver, lung, heart, spleen and kidney) condemnations; 4.9% of bovine cysticercosis as the causes of (tongue, heart and carcass/masseter muscle) condemnation. As observed from postmortem inspection results liver was the most commonly condemned organ (21.6%) due to fasciolosis and hydatidosis followed by lung condemnation (11.2%) hydatidosis as major cause. In this study, organs condemnation rates did not show significant difference (P>0.05) among age, sex and body condition groups. The average annual economic losses due to rejection of liver, lung, heart, tongue and kidney was estimated to be 29810.16 ETB. In this study, higher economic losses were encountered from liver condemnation

20741.60 ETB, and followed by economic losses from lung condemnation 7259.56 ETB. In general, the economic losses encountered as a result of organs condemnation leads to the drawback of livestock industry and national economy of the country. Therefore, attention should be paid for strategic zoonotic diseases (parasitic diseases) control programs and to minimize economic losses at different abattoirs in the country.

Key words: *Ambo, Abattoir, Cattle, Organs, Condemnation, Economic loss, Causes, Ante mortem examination, postmortem inspection*

INTRODUCTION

Developing countries have about two third of the world's livestock population but their meat and milk production is less than a third of the world. Ethiopia has large livestock population in Africa with an estimated of 44,318,877 cattle, 23,619,720 sheep and 23,325,113 of goats. However, there are constraints that hindered the potential of livestock production including; 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 [2].

Beef is one of the main components of human diet in Ethiopia. Therefore, available beef should be produced. In the meat industries (abattoirs), a significant loss results from inferior weight gain, condemnation of edible organs and carcasses at slaughter and death of animals. Information that is available from municipal abattoirs in Ethiopia reveals that there are several causes of organ condemnation. The economic loss to the livestock industry due to these reasons is estimated at more than 900 million USD annually [25].

Meat inspection as part of the veterinary public health activities ensures the delivery of hygienically processed meat for public consumption while preventing the transmission of infectious and zoonotic diseases to humans [8]. The detailed meat inspection procedure involves two steps, namely ante mortem and postmortem inspection. The purpose of meat inspection is to protect public health and to provide risk free products to the society and also it provides information that can be utilized for animal diseases control [29].

Parasitic diseases constitute a major impediment to livestock production in Sub-Saharan Africa owing to the direct and indirect losses they cause [24]. A major parasitic disease such as: fasciolosis, Hydatid cyst, and *Cysticercus bovis* causes a

significant economic loss by lowering the productivity of cattle and condemnation of edible organs. Several studies have been conducted through abattoir survey to determine the prevalence and economic loss resulting from organ condemnation in many abattoirs of Ethiopia including Oromia region. Furthermore, economic loss due to various diseases/causes was estimated in some abattoirs of the country [2].

Abattoirs played an important role in surveillance of various diseases of humans and animals importance. Surveillance at the abattoirs allows for all animals passing into human food chain to be examined for unusual signs, lesions or specific disease. The main causes of organ condemnation during post inspection are diseases originated by parasites, bacteria and viruses. Flukes in liver and Hydatid cyst in liver, lung and kidney, are mainly involved [6].

Most of the abattoir studies undertaken on prevalence of fasciolosis and hydatidosis and the extent of loss from organs condemnation in different parts of Ethiopia [29]. A thorough meat inspection procedure requires two steps; these are ante mortem and postmortem inspections. The importance of ante mortem inspection in the abattoir has long been recognized in an attempt to avoid the introduction of clinically diseased animals into the slaughter hall and should be done within 24 hours of slaughter and repeated if slaughter has been delayed over a day. The purposes of meat inspection are to remove gross abnormalities from meat and its products, prevention of distribution of contaminated meat that could result to disease risk in man and animals and assisting in detecting and eradication of certain diseases of livestock. It is necessary to be aware of the extent to which the public is exposed to certain zoonotic diseases detected in abattoirs and the financial losses through condemnation of affected organs and carcass [14]. Therefore, the objectives of this study were to identify the parasitic major causes of organs/carcass condemnation and to estimate direct financial implication or economic loss due to condemnation of edible organs at Ambo municipal abattoir.

MATERIALS AND METHODS

Study Area

The present study was conducted in Ambo municipal abattoir from November 2013 to March 2014. Ambo is a town in central Ethiopia, located in the West Shoa Zone of the Oromia Regional State. This town is located at 114Km from Addis Ababa and it

has a latitude and longitude of 8°59′N 37°51′E and an elevation of 1380 to 3300 m.a.s.l. This area receives 800mm to 1000mm of annual rainfall, which is 70% (long term) rainfall from June to September and 30% (short term) rainfall from February to April. The monthly minimum and maximum temperature are 15 degree Celsius and 29 degree Celsius respectively. The Ambo area constitutes 35.3% highland, 14.7% lowland and 50% midland from the total coverage. The livestock populations of the area are estimated as 144243 cattle, 65652 sheep, 30009 goats, 10130 horses, 13130 donkeys, 282 mules, and 92030 poultry. [30].

Study Animals

The study animals were including cattle that were brought to the Ambo municipal abattoir from different districts of this town for slaughtering purpose, during the period of this study.

Study Design and Sampling Method

A cross sectional study were conducted from November 2013 to March 2014 to determine the major parasitic causes of organs condemnation and to estimate the direct financial implication or economic losses due to condemnation of different organs of cattle that were slaughtered at Ambo municipal abattoir, and there were three days of abattoir visit per each week. In this study, cattle were sampled randomly using systemic random sampling methods. The total cattle of 384 designed for slaughtered at Ambo municipal abattoir during this study were undergone to standard ante mortem and postmortem inspections and all observations and findings were recorded as source of data for individual animals. During this study, age categorization of cattle was done as young adult and adult according to Pace and Wakeman [23]. Thus, young adult age groups were (2-6) years while adult age groups were (> 6) years. This age estimation was based on eruption of one or more incisor teeth.

Abattoir Survey

Ante-mortem examination

Each week, three days visit was made for ante mortem inspection on individual animals, while the animals were entering in to the lairage and in mass after they entered into the lairage within 24 hours of their arrival at slaughter house/abattoir. Both sides of the animals were inspected at rest and in motion. Moreover, the general behavior of the animals, cleanness, and sign of diseases and abnormality of any type were recorded according to the standard

ante mortem inspection procedures and animals fit for slaughter were passed following the judgment guideline of meat inspection procedures for developing countries [15].

Postmortem examination

Postmortem examination involved visual inspection, palpation and making systemic incision of visceral organs particularly liver, lung, heart, tongue and kidney to look for the presences of cysts such as Hydatid cyst, *Cysticercus bovis* and adult parasite, for example Fasciola. Pathological lesions or disease condition of these parasites were differentiated and judgedments were given based on guidelines on meat inspection for developing countries [15].

Assessment of Direct Economic Loss

During assessing of the direct economic losses only the direct economic losses due to condemnations of the organs from the market were considered. To evaluate the direct economic losses, only the direct monetary losses due to rejection of liver, lung, heart, tongue and kidneys were included. The analysis of these direct economic losses was based on the annual slaughter capacity of the abattoir considering market demand, average market price of each organ on that specific area and the rejection rates of each specific organ. The annual slaughter rates were estimated from retrospective abattoir records of the past three years, and average market prices for each organ was determined from interviews made with personnel of the abattoir and butcher men, and the annual rejection rates each organ was obtained from the result analyzed data of this present-day study. Then, the financial implication/ economic losses were computed mathematically from the above three information by modifying formula set by Ogunrinade and Ogunrinade [31] for liver rejection. This formula is given as follows:

$EL = \Sigma Srx * Coy * Roz$

Where:

EL = Annual economic loss estimated due to organ condemnation

ΣSrx = Annual cattle slaughter rate of the abattoir

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

Roz = Condemnation/rejection rates of cattle liver/lung/heart/kidney

Data Management and Statistical Analysis

Data collected during ante mortem and postmortem inspection this present-day study was recorded in Microsoft excel 2007

program, then it was subjected to IBM-SPSS version 20 software for statistical analysis. Descriptive statistics was used to determine the level of organs and carcass condemnation rates, defined as proportion of condemned organs and the total number of organs examined. The variability/association between condemnation rates of specific organs and risk factors such as age, sex and body condition were evaluated by Pearson's chi-square and the difference were recorded as statistically significant or not significant if p-value was less than 0.05 and if p-value was greater than 0.05 respectively.

RESULTS

Abattoir Survey

Ante mortem examination

It was carried out on 384 of cattle slaughtered at Ambo municipality abattoir, in order to detect any grossly visible abnormalities and to identify the condition of vital parameters. From the 384 cattle inspected during ante mortem examination, different types of abnormalities were found on 76 (20.9%) of male and 7 (33.3%) of female out of 363 male and 21 female cattle under gone ante mortem examination. Out of these abnormalities detected: pale mucus membrane 35 (9.1%), rough hair coat 10 (2.6%), depression 8 (2.1%), blindness 6 (1.6%), skin injury 4 (1.0%) and local swellings 4 (1.0%) were found frequently as compared with the rest abnormalities as described in (table 1) below. The highest percentage of cattle brought to Ambo municipality abattoir for slaughter had medium body condition 216 (59.5%) followed by good and poor body condition 83 (22.9%) and 64 (17.6%) respectively. During AME one pregnant female and two male with bloody urine were suspended from slaughter.

Postmortem inspection

Animals that have passed ante mortem inspection were subjected to PMI. A total of 384 of cattle slaughtered at Ambo municipality abattoir, which were 363 (94.5%) males and 21 (5.5%) females (Table.2) were thoroughly and carefully inspected by following standard postmortem procedures. From the total of organs examined during postmortem inspection, 83 (21.6%) livers, 12 (3.1%) hearts, 9 (2.3%) tongues, 2 (0.5%) kidneys and 5 (1.3%) masseter muscles (carcass) were condemned/ rejected as unfit for human consumption. In the same way 43 (11.2%) lungs and 11 (2.9%) spleen were rejected as not allowed to sell for food of pet animals (table 4) based the principle meat inspection

procedures for developing countries. As summarized in (table 5) the rate condemnation of liver as a result fasciolosis was relatively higher in cattle with poor body condition 31 (47.7%) followed by liver of cattle with medium body condition 30 (46.2%) while the rate rejection of liver due to Hydatid cyst was higher in cattle with medium body condition 10 (55.6%) than cattle with poor body condition 8 (44.4%). Similarly, the rate condemnation of lung as a result of Hydatid cyst, carcass (masseter muscle) due to *Cysticercus bovis* and spleen due to Hydatid cyst were correspondingly higher in cattle with medium body condition than that poor body condition, 28 (65.1%) and 15 (34.9%), 4 (80%) and 1 (20%), and 9 (81.8%) and 2 (18.2%) respectively.

Liver and Lung rejection rates: The principal causes of liver condemnation were fasciolosis and Hydatid cyst, while that of lung was Hydatid cyst. Out of 384 cattle slaughtered and inspected livers at Ambo municipality abattoir during postmortem inspection 65 (16.9%) livers were condemned or rejected due to gross finding of fasciolosis and 18 (4.7%) livers were condemned due to gross identification of Hydatid cyst on the liver tissue. The overall liver condemnation due to gross findings these parasitic diseases or lesions were 83 (21.6%), which was the most common rejected organ in this present-day study (table 4). The rate rejection of liver due to fasciolosis is 63 (96.9%) in male and 2 (3.1%) in females as described in (table 3) above. With the same way of postmortem findings 43 (11.2%) lungs were rejected as a result of Hydatid cyst detection on the lung tissue during postmortem inspection of slaughtered cattle (table 4). The rate rejection of lung due to gross identification of Hydatid cyst in males and females were 41 (95.3%) and 2 (4.7%) respectively as described in (table 3) above. As indicated in this table, both the rate rejection of liver due to fasciolosis and lung due to Hydatid cyst were higher in males than females. There was no significant difference in rejection rates of liver between male and female or sex due to fasciolosis and Hydatid cyst, because p-value>0.05, that is Pearson's chi-square value and p-value are equal to 0.568 and 0.451respectively, and there is also no significant association between liver condemnation and body condition the cattle presented for slaughter (Pearson's chi-square value is 1.398 and p-value is 0.497), which means p-value is greater than 0.05.

Rejection rates of Heart and Tongue: The principal causes of condemnation for heart and tongue were Hydatid cyst and *Cysticercus bovis*, which was Hydatid cyst for heart and *Cysticercus bovis* in both organs. A total of 12 (3.1%) cattle hearts were rejected due to gross abnormalities caused from Hydatid cyst and *Cysticercus bovis*. The rate rejection of heart as a result of Hydatid cyst and *Cysticercus bovis* were 7 (1.8%) and 5 (1.3%) respectively (table 3). The corresponding the rejection rate of heart due to *Cysticercus bovis* was 4 (80.0%) in males and 1 (20.0%) as indicated in (table 3). The condemnation rate of tongue due to *Cysticercus bovis* was 9 (2.3%); it was identified only male cattle slaughtered. There was no significant difference in rejection rate of heart between males and females or sex due to Hydatid cyst and *Cysticercus bovis*, respectively (p-value > 0.05), that is Pearson's chi-square value and p-value are equal to 1.527 and 0.217 respectively.

Rejection rates of Kidney and Spleen: Out of the total number of cattle slaughtered in Ambo municipality abattoir during the study period 2 (0.5%) and 11 (2.9%) of kidney and spleen were rejected respectively due to gross postmortem finding of Hydatid cyst in both cases of organs (Table 4). The condemnation of kidney and spleen were found only slaughtered male cattle (Table 3).

This table 5 shows that in present study, the overall prevalence of bovine fasciolosis from liver condemnation, and total prevalence of bovine hydatidosis from rejection of liver, lung, heart, kidney and spleen; the overall prevalence of bovine cysticercosis due to rejection of tongue, heart and masseter muscle/carcass were 16.9%, 21.1% and 4.9% respectively.

Table 2: Distributions of numbers, age, sex and rates of cattle slaughtered that were recorded during postmortem inspections.

	Age		**Sex**	
	Young- adult	Adult	Males	Females
No. of animals slaughtered	43	41	363	21

Rates of slaughtered animals	11.2%	88.8%	94.5%	5.5%
Total	**43 (11.2%)**	**341 (88.8%)**	**363 (94.5%)**	**21(5.5%)**

Table 1: Abnormalities encountered during AME on cattle slaughtered at Ambo municipality abattoir.

Abnormalities identified	**Number of affected Animals**		**Total (n=384)**
	Male (n=363)	Female (n=21)	Percentage
Local swelling	4 (1.0%)	0	4 (1.0%)
Pale mucus membrane	33 (9.0%)	2 (9.5%)	35 (9.1%)
Hernia	2 (0.6%)	0	2 (0.5%)
Rough hair coat	9 (2.5%)	1 (4.8%)	10 (2.6%)
Depression	6 (1.7%)	2(9.5%)	8 (2.1%)
Blindness	6 (1.7%)	0	6 (1.6%)
Nasal discharge	3 (0.8%)	0	3 (0.9%)
Excessive salivation	1 (0.3%)	0	1(0.3%)
Lacrimation	1 (0.3%)	0	1 (0.3%)
Leech infestation	3 (0.8%)	0	3 (0.9%)
Skin injury	4 (1.0%)	0	4 (1.0%)
Pregnancy	0	1 (4.8%)	1 (0.3%)
Bloody urine	2 (0.6%)	0	2 (0.5%)
Horn fracture	2 (0.6%)	1 (4.8%)	3 (0.9%)
Total	**76 (20.9)**	**7 (33.3)**	**83 (21.6)**

Key: (n= represent number of animals affected)

Table 3: Distributions of sex of cattle, causes of organs condemnation and rates of rejection

organs	Causes organs of condemnation	sex	
		Male	Female
liver	Fasciolosis(n=65)	63(96.9%)	2(3.1%)
	Hydatid cyst(n=18)	18(100.0%)	0
lung	Hydatid cyst(n=43)	41(95.3%)	2(4.7%)
heart	Cysticercus bovis(n=5)	4(80.0%)	1(20.0%)
	Hydatid cyst(n=7)	7(100.0%)	0
tongue	Cysticercus bovis(n=9)	9(100.0%)	0
carcass	Cysticercus bovis(n=5)	4(80.0%)	1(20.0%)
kidney	Hydatid cyst(n=2)	2(100.0%)	0
spleen	Hydatid cyst(n=11)	11(100.0%)	0

Key: (n= represent frequency of lesions occurrence).

Table 4: Distributions of lesions/diseases, numbers and rates of organ rejections

Lesions/ Diseases	**Organs**						
	Liver	Lung	Tongue	Heart	Kidney	Carcass	Spleen
Fasciolosis	65 (16.9)	0	0	0	0	0	0
Hydatid-cyst	18 (4.7)	43 (11.2)	0	7 (1.8)	2 (0.5)	0	11 (2.9)
Cysticercus-bovis	0	0	9 (2.3)	5 (1.3)	0	5 (1.3)	0
Total	**83 (21.6)**	**43 (11.20**	**9 (2.3)**	**12 (3.1)**	**2 (0.5)**	**5 (1.3)**	**11 (2.9)**

Key: the parenthesis "()" represent percent (%)

Table 5: Distribution of body conditions, lesions and frequency or percentage of organ condemnation.

		Body condition		
		Good	Medium	poor
Organs	**Lesions/diseases**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
Live	Fasciolosis (n=65)	4 (6.1)	30 (46.2)	31 (47.7)
Lung	Hydatid cyst (n=18)	0	10 (55.6)	8 (44.4)
	Hydatid cyst (n=43)	0	28 (65.1)	15 (34.9)
Heart	Hydatid cyst (n=7)	0	7 (100)	0
	Cysticercus bovis (n=5)	0	5 (100)	0
Tongue	*Cysticercus bovis* (n=9)	0	9 (100)	0
Carcass	*Cysticercus bovis* (n=5)	0	4 (80)	1 (20)
Kidney	Hydatid cyst (n=2)	0	2 (100)	0
Spleen	Hydatid cyst (n=11)	0	9 (81.8)	2 (18.2)

Key: (n= represent frequency of lesions occurrences).

Assessment of direct economic loss

The annual slaughter rate of abattoir was estimated to be 2357 cattle (obtained from retrospective abattoir records of the past three years). Therefore, the direct annual economic loss due to condemnation of organs was calculated based on the current average market price per organ at the local area, Ambo town as indicated in (Table 6) below.

Table 6: Distribution of organs, causes of condemnation, total rejection rates, average current market price and money losses due to rejection of these organs.

Organs	**Total rejection of each organ**	**Average current market price**	**Annual slaughter rates of cattle**	**Money losses in ETB**
Liver	21.6%	40.00 birr	2357	20741.60
Lung	11.2%	27.50 birr	2357	7259.56
Heart	3.1%	10.00 birr	2357	730.67
Tongue	2.3%	15.00 birr	2357	813.17
Kidney(pairs)	0.5%	22.50 birr	2357	265.16
Total				**29810.16 ETB**

Finally, using all the above essential information, which were recorded during data collection period and the formula specified by Ogunrinade and Ogunrinade [31], the total direct annual economic losses due to rejection of liver, lung, heart, tongue and kidney at Ambo municipal abattoir was estimated to be 29810.16 Ethiopian Birr. In this study, higher economic losses were encountered from liver condemnation 20741.60 Ethiopian Birr (due to fasciolosis and Hydatid cyst), and followed by economic losses from lung condemnation 7259.56 Ethiopian Birr due to Hydatid cyst (table 6).

DISCUSSION

Meat inspection is conducted in the abattoir for the purpose of screening and removing animal products with abnormal pathological lesions unsafe for human consumption and having poor aesthetic value. The main 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 diseases and to produce wholesome products and to protect the public from zoonotic hazards. Diseased animals that show signs of abnormality during ante mortem inspection should not be allowed to enter the abattoir for slaughter [14].

In this present day study, the most commonly encountered abnormalities during ante mortem inspection were pale mucus membrane 35 (9.1%), followed by rough hair coat 10 (2.6%), depression 8 (2.1%) and blindness 6 (1.6%).pale mucus membrane was the highest encountered ante mortem inspection problem and the least encountered abnormalities were excessive salivation, lacrimation and pregnancy. During this present-day study one pregnant female and two males were suspended from slaughter. During the period of present study, from the total of 384 slaughtered cattle organs examined during postmortem inspection, 83 (21.6%) livers, 12 (3.1%) hearts, 9 (2.3%) tongues, 2 (0.5%) kidneys and 5 (1.3%) masseter muscles (carcass) were condemned/ rejected as unfit for human consumption. Here, losses from liver condemnation were assumed to occur since hepatic pathology is associated to infection that might have public health importance and aesthetic value [18]. In the same way 43 (11.2%) lungs and 11 (2.9%) spleen were rejected as not allowed for eat of pet animals. In the case of this study, the condemnation/ rejection of organs were due to macroscopic pathologic lesions of major

parasitic causes such as: fasciolosis, Hydatid cyst and *Cysticercus bovis*. Thus, liver was condemned due to fasciolosis and hydatid cyst; lung, kidney and spleen were condemned due to hydatid cyst; the heart was rejected as unfit for human consumption as a result of Hydatid cyst and *Cysticercus bovi*s parasitic lesions detection while tongue and carcass/masseter muscle were condemned from food of human due to *Cysticercus bovis* identifications. The total prevalence of bovine fasciolosis, hydatidosis and cysticercosis were 16.9%, 21.1% and 4.9% respectively.

In Ethiopia bovine fasciolosis has been reported to be one of the major causes/diseases problems of livestock's industries/abattoirs and annual economic losses of approximately 64 million USD was estimated due to reduced production of by fasciola parasite [26] and it is found almost in all regions of this country, but the prevalence, epidemiology and species of fasciola present significantly vary with locality. This is attributed mainly due to the variation in the climate and ecological conditions such as altitude, rain fall, temperature and livestock management systems [7]. Similarly, researches conducted by different authors of the country indicated that the wide distribution of fasciolosis or the disease in the country with its prevalence reaching up to 84% [20].

In the present day study, a prevalence of 16.9% bovine fasiolosis was obtained in cattle slaughtered at Ambo municipality abattoir, which was relatively a lower prevalence when compared with the findings with previous studies such as, [4] at Debre Markos, [20] at Nekemte municipality abattoir, [9] at Addis Ababa abattoir enterprises, [7] at Kombolcha Elfora meat factory abattoir, [29] at Gonder Elfora abattoir, [25] at Mekelle municipality abattoir, [6] at Jimma municipality abattoir, [26] at Nazareth abattoir and [8] Bahir Dar municipality abattoir with a prevalence of bovine fasciolosis 46.4%, 23.4%, 36%, 37.2%, 86.4%,35.22%, 46.7%, 20.2% and 22.9% respectively. However, the present-day prevalence of bovine fasciolosis is higher when compared with previous findings of Miruk [22] at Asella municipality abattoir and [2] at Adigrat municipality abattoir, that they obtained the prevalence of 3.82% and 9.26% bovine fasciolosis respectively. This variation of bovine fasciolosis prevalence from different meat industries/abattoirs of the countries is probably due to ecological and climatic variation among different areas, and

moreover, due to the management systems variation practiced in that specified area [6] and also various reasons could be offered for different prevalence findings of bovine fasciolosis. Thus, effective control strategies (in case of low prevalence area) to favorable the local environment conditions like the presence of biotopes suitable for the development of the snail intermediate host of the parasite (abundant in rainy season), which enhances the reproducibility of this parasite and the failure of farmers to schedule strategic deworming programmes for their animals (in case of high prevalence area).

Therefore, the timing of treatment can be recommended with the help of detailed epidemiological studies. However, the climatic conditions vary among areas and years; the strategic and economic application of antihelmintics has to be simplified for the farming community. 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 [18].

Hydatidosis is an important major economic and public health significance in many countries of the world and the factors governing the prevalence of in a given locality may be associated with the prevailing specific social, cultural, environmental and epidemiological situations, and similarly certain deeply rooted traditional activities could be commonly described as substantiating the spread and high prevalence rates of bovine hydatidosis in Ethiopia in general. These includes the wide spreads of backyard animal slaughtering practice, the corresponding absence of rigorous meat inspection procedures and the standing habits of most Ethiopian people to feed their dogs with condemned offal, which in consequence facilitates the maintenance of the perfect life of hydatidosis [10].

In this present study, the total of prevalence of 21.1% of bovine hydatidosis was obtained from (4.7% liver, 11.2% lung, 1.8% heart, 0.5% kidney and 2.9% spleen) condemnation out of 384 cattle slaughtered at Ambo municipality abattoir. In the present study, bovine hydatidosis prevalence is a relatively lower when compared with the prevalence of previous findings of bovine hydatidosis in Ethiopia; for instance [28], at Assella municipal abattoir, [27] at Addis Ababa abattoir, [8] at Bahir Dar municipality abattoir, [29] at Gonder Elfora,

[13] at Ambo municipality abattoir, and [22] at Asella municipality abattoir, [26] at Nazareth abattoir and [12] at Gonder Elfora abattoir with the prevalence of 62.38%, 23.7%, 35.7%, 24.7%, 29.69%, 52.75%, 54% and 28% respectively. On the other hand, the present day study finding of bovine hydatidosis is higher when compared with a previous findings of different studies on bovine hydatidosis, including Genet *et al.* [18] cattle slaughtered in Gondar abattoir, [17] at Kombolcha Elfora abattoir, [5] at Arbaminch municipality abattoir, [21] at Dire Dawa municipality abattoir and [3] at Adigrat municipality abattoir with the prevalence of 19.87, 12.17%, 20.5%, 20.1% and 18.6% bovine hydatidosis which were lower prevalence than the present day study. This variation in prevalence of bovine hydatidosis is more probably as a result of the difference in origin of animal for slaughter, change in environmental and epidemiological factors, which could affect the rate transmission of hydatidosis. In addition, the age of animals brought for slaughter and difference in socio-cultural structure and the degree of association among the society, livestock and dogs are also contribute to difference in prevalence of bovine hydatidosis.

In agreement with different researchers reported that liver and lung were the commonly affected organs by hydatid cyst [10]. The reseason is explained by Gracey [19] in that liver and lung contain the highest capillary bed in the body and the majority of onchospheres are filtered out and trapped in the fine blood capillies of these organs and small number of onchospheres reached the remaining organs.

The total prevalence of bovine cysticercosis in the present study is 4.9%(2.3% tongue, 1.3% heart and 1.3% carcass/masseter muscle), which is relatively higher as compared with the previous findings of Shiferaw [26] at Nazareth abattoir, [22] at Asella municipality abattoir, [1] at South West Shoa Zone of Oromia region and [16] at Jimma municipality abattoir and [11] at Wolaita Soddo municipal abattoir with prevalence of 0.9%, 2.29%, 4.6%, 4.4% and 2.59% of bovine cysticercosis prevalence respectively, but the present day prevalence of bovine cysticercosis is lower when compared with the previous finding by Shegaw *et al.* [25] at Mekelle municipality abattoir with the prevalence of 7.3%, which was higher than the prevalence of present study finding. These variations in reported prevalence of bovine cysticercosis may be

due to several factors such as: variation in the habit of raw meat consumption, variation in personnel and environmental hygiene, presence of control and eradication programs to the area. Therefore, the prevalence rate of bovine cysticercosis probably as a result of personnel awareness and environmental hygiene through proper use of latrine, which may contribute for less contamination grazing land by human excreta containing Taenia saginata eggs that lead to subsequent reduction of chance of infection the intermediate host, cattle.

The direct abattoir loss due to condemnation of liver, lung, heart, tongue and kidney, in the present-day study was calculated using the formula specified by (Ogunrinade, 1980), which was 29810.16 ETB of the total direct economic abattoir annually in average (table 6). In general, this much of economic loss for this is too much high. However, the average annual economic loss encountered in this study area is relatively lower than the different previous studies of economic loss findings. The differences in the amount of money lost in various meat industries could be attributed to differences in the prevalence of diseases, difference in the rejection rate of organs, difference in the slaughtering capacity of abattoirs and also variations in the management of animals in different part of the country [6].

In this present day study, liver condemnation takes the higher proportion of all losses accounting for 69.6% of all losses followed by lungs, tongue, heart and kidney, which constitutes 24.4%, 2.7%, 2.5%, and 0.9 of the all direct economic losses as a result of condemnation of the above organs due to major parasites diseases including, fasciolosis, hydatidosis and cysticercosis encountered on the cattle slaughtered at Ambo municipality abattoir.

CONCLUSION AND RECOMMENDATIONS

It is progressively more evident that parasitism represents a major drawback to livestock development and production in tropical countries like Ethiopia. Major parasites of livestock industry or abattoirs needs great concern; hence they cause extensive financial losses. However, a proper evaluation of the economic losses from parasitic diseases is lacking, the assessment of losses due to parasitic disease is of great economic importance for many tropical countries. During this present study, postmortem inspection of visceral organs revealed that a significant number of organs

were condemned from the cattle slaughtered at Ambo municipal abattoir as a result of gross pathological lesions caused by parasitic diseases, such as bovine fasciolosis, hydatidosis and cysticercosis. According to the result of this study, fasciolosis and hydatidosis were the most and major causes of liver and lung condemnation respectively. Therefore, it is important to paid attention for strategic zoonotic diseases (parasitic diseases) control programs and to minimize economic losses at different abattoirs in the country. Based on the present study finding postmortem inspection of meat conducted seriously, for instance introduction of meat inspection policy in the country, veterinary professional provide public health education about the zoonotic hazards of eating raw and undercooked beef and impact of feeding practice of dogs with infected and condemned organs/carcass and strategic epidemiological survey on bovine fasciolosis, hydatidosis and cysticercosis conducted in different regions of the country for the purpose of introducing effective control should be recommended.

Conflict of interests

The authors have no conflict of interest regarding the publication of this paper

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