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Major Causes of Organ and Carcass Condemnation in Cattle and Sheep Slaughtered at Bahir-Dar Municipal Abattoir, Amhara Regional State, Ethiopia

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Abstract: The study was conducted to identify and determine the major problems that cause carcass and organs condemnation and to estimate the magnitude of direct financial losses attributed to the condemned carcass and organs from Ovine and Bovine slaughtered at Bahir-Dar municipal abattoir. A cross-sectional study, which involves both ante mortem and post mortem examination, was conducted from October 2015 to March 2016. A total of 236 cattle and 148 sheep slaughtered in the abattoir were included in the study. During ante mortem examination diarrhea 58(15.10%), respiratory disorder 44(11.46%), lameness 29(7.60%) and localized swelling 17 (4.43%) were observed. Postmortem examination revealed that 222(57.8%) lungs, 171 (44.5%) livers, 29 (7.6%) carcass, 28(7.3%) hearts and 23(5.9%) kidneys were condemned due to various causes. 63(16.4%) and 46(12.0%) lungs were condemned due to lung worm and emphysema respectively. The major causes of liver condemnation were fasciolosis 36(9.4%), general calcification 36(9.4%) and local calcification 30(7.8%). On the other hand, Pericarditis 19(4.9%), nephritis 15(3.9%) and bruise 28(%) were the major causes for condemnation of heart, kidney and carcass respectively. The chi-square analysis of potential risk factors showed that there was statistically significant difference in post mortem findings with respect to species, age and body condition of examined animals from different origin ($x^2 > 3.481$ and $P < 0.05$). The total direct financial loss from organ and carcass condemnation during the study time was estimated to be 70, 070 ETB (3383.39 USD). The result of this study revealed that tuberculosis was the major disease causing higher financial losses in the study area followed by calcification, bruise and fasciolosis. Therefore, the government should propose strategic disease control programs to alleviate financial losses, improve meat quality and quantity and to avoid risk of contracting zoonotic diseases.

Key words: Abattoir · Bahir-Dar · Carcass · Cattle · Condemnation · Financial loss · Organ · Sheep

INTRODUCTION

The livestock sector globally is highly dynamic, contributes 40% of the global value of agricultural output and support the livelihoods and food security of almost a billion people [1]. In Ethiopia, livestock production is an integral part of the agricultural system. It also contributes 20% of the total GDP without considering other contribution like traction power, fertilizers and mean of transport [2]. The livestock subsector accounts for about 45 percent of the agricultural GDP and about 18 percent of the total GDP [3].

Beyond their direct role in generating food and income, livestock are a valuable asset, serving as a store of wealth, collateral for credit and an essential safety net during times of crisis [4, 5].

Currently the overall livestock production constraints in Ethiopia are feed shortages, livestock diseases, low genetic potential of indigenous livestock and lack of marketing infrastructure and water shortages [6, 7]. Additionally, 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 [8, 9].

In abattoirs of various locations, researchers indicated that hydatidosis is widespread in Ethiopia with great economic and public health significance [10-12]. Major parasitic disease such as fasciolosis, hydatid cyst, cysticercosis and other causes like abscessation and cirrhosis are of great public health concern and cause

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significant economic losses by lowering productivity of cattle and condemnation of edible organs [13, 14]. Among the major causes of organ condemnation in Ethiopia are hydatidosis as discussed by Yifat *et al*. [15], Alemu *et al*. [16] and Alembrhan and Haylegebriel [17], Fasciolosis Mulat *et al*. [18] and Bekele *et al*. [19], cysticercosis Bekele *et al*. [20] and Mesfin and Nuradddis [21] and other causes of organ condemnation by Alemayehu *et al*. [22]. Studies conducted in different abattoirs of Ethiopia revealed that parasitic infection of liver, lungs (pneumonia), pericarditis and pyelonephritis are the major cause of organs condemnation [23]. The activity also provides vital data and valuable information on the incidences and prevalence of animal diseases and conditions within the country [24-26].

Parasites in the tropics are responsible for far greater losses to meat industry than other diseases. Similarly like many other tropical countries of Africa, it is well known that parasitic diseases are among the major factors responsible for the low productivity of livestock in Ethiopia [27]. Echinococcosis is a major public health problem in some countries and it may be emerging or re-emerging in some areas. Approximately 2 up to 3 million human cases are thought to be occurs worldwide [28]. Cysts or lesions of *Echinococcus 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 [29]. Tissue damage and organ dysfunction results mainly from this gradual process of space occupying displacement of vital host tissues, vessels or parts of organs. Accidental rupture of cysts can be followed by a massive release of cyst fluid and hematogenose or dissemination of protoscolices [30].

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. Cattle get *Cysticercus bovis* from ingesting foodstuffs contaminated with eggs passed from humans. Sometimes the tapeworm affects human health, but often it goes undetected. In rare cases the cystic intermediate stage can lodge in the brain of people and cause serious disease [31]. Factors that increase the risk of cattle being infected with *C. bovis* include grazing on land that has human fecal contamination, over flowing domestic sewage systems, irrigation with inadequately treated reclaimed sewage water, bird movements to and from a nearby sewage treatment works [32].

Fascioliosis is an important parasitic disease of domestic ruminants caused by two liver fluke species: *Fasciola hepatica and Fasciola gigantica* (Trematoda). *Fasciola hepatica* has a cosmopolitan distribution, mainly in temperate zones, while *Fasciola gigantica* is found in tropical regions of Africa and Asia. The disease is responsible for considerable economic losses in the cattle industry, mainly through mortality, liver condemnation, reduced production of meat, milk and wool and expenditures for anthelmintics [33].

Abattoir data is an excellent option for detecting diseases of both economic and public health importance [34, 35]. Recently, several modern abattoirs like Helimex, Elfora, Metehara, Modjo and Luna have been established in Ethiopia. This increase number of abattoirs shows that increase in demand of carcass and organs supply, but the supply is decreasing due to disease and production problems. In view of this, proper evaluation of economic losses due to organ condemnation resulting from various diseases at abattoirs is needed [36]. Therefore, the objectives of this study were to identify the major causes of organs and carcass condemnation and to assess the direct financial losses due to partial and total condemnation of organ and carcass at Bahir Dar municipal abattoir.

MATERIALS AND METHODS

Study Area: The study was conducted from November 2015 to March 2016 at Bahir dar municipal abattoir. Bahir- Dar is located in North- western of the capital Addis Ababa at adistance of 570 km on altitude between 1500-2300 m.a.s.l at latitude of 11°29'N and 3729'E longitude. It has an annual rain fall of 1200-1600 mm and annual average temperature of 29.5°C. The landscape is marked by the presence of Lake Tana, which drains a water shed of about 3, 000 km and areas adjacent to Lake Tana and Abay River have poor drainage and annual over flooding during the dry months. Crop livestock farming is the main farming system of the area and cattle are the dominant species followed by sheep and goat.

Study Animals: In the active abattoir survey, the animals included in the study were male sheep and cattle, female animals were not slaughtered at the abattoir. These animals were brought from different parts of the country including Gaint, Debre-Tabour, Metema, Este and Wereta to the abattoir for slaughtering. Animals were also categorized based on their body condition score as described by Nicolson and Butterworth [37] into three categories: good, medium and poor. Age of those animals was divided into young, adult and old.

Sample Size Determination: The sample size for this study was determined based on 50% expected prevalence, 5% precision and 95% confidence level according to Thrusfield [38].

$$n = \frac{1.96^2 p_{ex}(1-P_{ex})}{d_2}$$

where, n = sample size, P = expected prevalence, D = desired level of precision (5%).

1.96 = the value of z at 95% confidence level.

Accordingly, 384 animals (cattle 236 and sheep 148) were included in this study.

Study Design: A cross sectional study design with systematic sampling technique was conducted from October 2015 to April 2016 to identify the major causes of organ condemnation and estimate the direct financial loss due to organ condemnation in cattle and sheep slaughtered at Bahir Dar municipal abattoir. Active abattoir survey (ante mortem and post mortem examination) were carried out on 236 cattle and 148 sheep in accordance with the procedures of Meat Inspection for Developing Countries by FAO, [39].

Financial Loss Assessment: In this study, a five months active abattoir data were used to determine the direct financial loss due to organ and carcass condemnation in slaughtered cattle and sheep at Bahir-Dar municipal abattoir by taking the condemned organs and carcasses due to different abnormalities.

Data Management and Analysis: Data generated from ante mortem and postmortem meat inspection was entered in Microsoft excel computer programme and analyzed by using SPSS version 20.00 software. Descriptive statistics was used to determine the level of organs and carcass condemnation rates defined as proportion of condemned organs and carcass to the total number of organs and carcasses examined. Chi-square statistics were used to test the association between variables. At $p<0.05$ was taken as statically significant.

RESULT

Ante Mortem Examination: A total of 384 animals (236 cattle and 148 sheep) were slaughtered at Bahir-Dar municipal abattoir in the period of five months from November 2015 to March 2016. During the ante mortem examination different abnormalities were found in 148(38.54%) heads of cattle and sheep. The most commonly encountered abnormalities during ante mortem inspection were diarrhea (39.19%), respiratory disorder (29.73%), lameness (19.59%) and localized swelling (11.49%) as indicated in Table 1.

Post-Mortem Findings: Lung and liver were the most frequent condemned organs. Parasitic and pathological conditions were the major causes of organs and carcasses condemnation. Fasciolosis, 36 (9.4%) and generalized calcification 36(9.4%) were found to be the main causes of liver 171(44. %) condemnation followed by local calcification 30 (7.8%), abscess 25(%), adhesion 24 (25.03%), cirhosiss 12(3.1%) and hydatidosis 8(2.1%). Totally, 222(57.8%) lungs were condemned from human consumption due to lung worm (16.4%), emphysema (12.0%), pneumonia (10.2%), hydatidosis (7.3%), adhesion (5.2%), abscess (4.2%) and hepatization (2.6%). The causes of carcass condemnation were tuberculosis 1(0.03%) and bruise 28(%). Pericarditis 19(4.9%) and evisceration problem 9 (2.3%) were found as the main cause of heart condemnation. On the other hands kidney was condemned due to nephritis (%), atrophy (%) and caluculi (%) as shown in Table 5.

Association of Post Mortem Findings with Different Risk Factors: As indicated in Table 2, the result of post mortem findings in relation to species and age groups of animals had a significant difference ($p<0.05$). Higher prevalence was recorded in bovine (86.9%) and lower in ovine (78.4%). The current study revealed that higher and lower result was recorded in poor and good body condition scores of animals 88.6% and 80.2% respectively. With respect to origin, Metema (91.7%) was the higher and Gaint was the lower (81.0%) followed by Este and Debre-Tabour (87.5%) and Wereta (83.9%) respectively. Similarly, higher prevalence of post mortem finding was recorded in older animals (89.2%) and the lower was in young (74.5%) and adult (83.3%) respectively.

Association of Prevalence of Fasciolosis with Different Risk Factors: As indicated in Table 3, the prevalence of fasciolosis in relation to species, origins, age groups and body condition scores of animals had a significant difference ($p<0.05$). Higher prevalence was recorded in bovine (14.0%) and lower in ovine (2.7%). The current study revealed that higher and the lower prevalence was recorded in Este (18.8%) and Gaint (4.6%), respectively with respect to origin.

Table 1: Abnormalities encountered during ante mortem examination at Bahir Dar municipal abattoir

Conditions encountered	Species of animal Cattle (n=236)	Sheep (n=148)
Lameness	14(17.72%)	15(21.74%)
R. disorder	9(11.40%)	35(50.72)
Swelling	17(21.52%)	0(0%)
Diarrhea	39(49.36)	19(27.54%)
]Total	79(33.47%)	69(46.62%)

Table 2: Association of post mortem finding with species, origins, age groups and body condition scores of animals

Risk factors	No of animal examined	No of infected (%)	χ^2	P- value
Species				
Bovine	236	205(86.9)	4.776	0.021
Ovine	148	116(78.4)		
Total	384	321(83.6)		
Origin				
Metema	24	22(91.7)	3.169	0.492
Gaint	216	175(81.0)		
Este	28	28(87.5)		
Debre tabor	56	49(87.5)		
Wereta	56	47(83.9)		
Total	384	321(83.6)		
Age				
Young	55	41(74.5)	5.652	0.019
Adult	227	189(83.3)		
Old	102	91(89.2)		
Total	384	321(83.6)		
Body condition				
Poor	114	101(88.6)	3.118	0.097
Medium	179	147(82.1)		
Good	91	73(80.2)		
Total	384	321(83.6)		

Table 3: Association of prevalence of fasciolosis with the species, origins, age groups and body condition scores of animals.

Risk factors	No of examined animals	No of infected (%)	χ^2	P value
Species				
Bovine	236	33(14.0)	12.293	0.00
Ovine	148	4(2.7)		
Total	384	37(9.6)		
Origin				
Metema	24	3(12.5)	15.234	0.005
Gaint	216	10(4.6)		
Estie	32	6(18.8)		
Debre Tabor	56	10(17.9)		
Wereta	56	8(14.3)		
Total	384	37(9.6%)		
Age				
Young	55	1(1.8)	5.821	0.20
Adult	227	22(9.7)		
Old	102	14(13.7)		
Total	384	37(9.6)		
Bcs				
Poor	114	21(18.4)	19.909	0.00
Medium	179	16(8.9)		
Good	91	0(0.0)		
Total	384	37(9.6)		

Table 4: Association of prevalence of hydatidosis with species, origins, age groups and body condition scores of animals

Risk factors	No of examined animals.	No of infected (%)	χ^2	P value
Species				
Bovine	236	29(12.3)	12.537	0.00
Ovine	148	3(2.0)		
Total	384	32(8.3)		
Origin				
Metema	24	22(8.3)	12.944	0.027
Gaint	216	11(5.1)		
Este	32	2(6.2)		
Debre-Tabor	56	11(19.6)		
Wereta	56	6(10.7)		
Total	384	32(8.3)		
Age				
Young	55	1(1.8)	3.926	0.074
Adult	227	20(8.8)		
Old	102	11(10.8)		
Total	384	32(8.3)		
Bcs				
Poor	114	3(2.6)	7.030	0.045
Medium	179	20(11.2)		
Good	91	9(9.9)		
Total	384	32(8.3)		

Table 5: Causes, percentage of organ condemnation and financial losses analysis at Bahir dar municipal abattoir (n=384)

Organ condemned	Cause of condemnation	No(%) of organ condemned totally	No(%) of organ condemned partially	Average Price of each organ (ETB)	Financial loss (ETB)
Liver	General Calcification	36(9.4)	0	55	1, 980
	Fasciolosis	36(9.4)	0		1, 980
	Hydatidosis	8(2.1)	0		440
	Adhesion	24(6.3)	0		1, 320
	Cirrhosis	12(3.1)	0		660
	Abscess	25(6.5)	0		1, 375
	Local calcification	0(0.0)	30		825
	No lesion	0(0.0)	-		-
	Total	171(44.50)	30		9, 405
Lung	Lung worm	63(16.4)	0	10	630
	Pneumonia	39(10.2)	0		390
	Emphysema	46(12.0)	0		460
	Hydatidosis	28(7.3)	0		280
	Adhesion	20(5.2)	0		200
	Abscess	16(4.2)	0		160
	Hepatization	10(2.6)	0		100
	No lesion	0(0.0)	-		-
	Total	222(57.8)	-		2, 220
Kidney	Nephritis	15(3.9)	0	35	525
	Atrophy	4(1.0)	0		140
	Calculi	4(1.0)	0		140
	No lesion	0(0.0)	-		-
	Total	23(5.9)	-		805
Heart	Pericarditis	19(4.9)	0	40	760
	Ev. Problem	9(2.3)	0		360
	No lesion	0(0.0)	-		-
	Total	28(7.3)	-		1, 120
Carcass	TB	1(0.3)	0	180/kg	54, 000
	Bruise	0(0.0)	28		2, 520
	No lesion	0(0.0)	-		
	Total	1(0.3)	28		56, 520
	Over all total	445	58		70, 070 USD$.

Similarly, higher prevalence of fasciolosis was recorded in poor body condition (18.4%) than other body condition scores. With regard to age, highest prevalence (13.7%) was observed in old animals while the lowest prevalence (1.8%) and (9.7%) was observed in young and adult animals, respectively.

Association of Prevalence of Hydatidosis with Different Risk Factors: As indicated in table 4, the prevalence of hydatidosis in relation to the risk factors had a significant difference ($p<0.05$). Higher prevalence was recorded in bovine (12.3%) and lower in Ovine (2.0%) with respect to species. The higher and lower prevalence was recorded in animals originated from Debre-Tabour 11(19.6%) and Gaint 11(5.1%) respectively. Similarly, higher prevalence of hydatidosis (11.2) was recorded in animals with medium body condition than other body condition scores. On the other hand, there was no significant difference ($p>0.05$) in the prevalence of hydatidosis With respect to age groups of cattle and sheep.

Financial Loss Assessment: The total direct financial loss at Bahir-Dar Municipal abattoir within five months was assessed from the total condemned organs and carcasses of cattle and sheep as a result of major pathological findings. Out of 384 slaughtered cattle and sheep 321(83.6%) animal's organs and carcasses were condemned due to different reasons. The average market prices of each lung, liver, heart, kidney and one kg of meat of sheep and cattle were 10, 55 40, 35 and 180 ETB respectively. Parasitic diseases and pathological conditions like: Tuberculosis, calcification, bruise, Fasciolosis, abscess and adhesion cause a financial loss of 54, 000, 2, 805, 2, 520, 1, 980, 1, 375 and 1, 320 ETB, respectively. The total direct financial loss was estimated to be3383.39USD$ i.e approximately 70, 070 ETB (1 USD=20.7) (Table 5).

Hint: One total carcass condemnation was estimated to be 300 kg of meat and the bruise was estimated as half of one kilo of meat.

DISCUSSION

It was indicated that meat inspection assist in monitoring diseases in national herd and flock by providing feedback information to veterinary service to control or eradicate diseases and to produce wholesome products and to protect public from zoonotic hazards [40, 41]. Hence, the gathered information from abattoir record can be used by farmers to improve the husbandry of their animals in such a way that farmers can improve the overall management of their animals so that pre-slaughter problems would be reduced [42]. The classical ante-mortem and post-mortem procedures were designed to detect disease in an animal before slaughter and lesions produced by the disease after slaughter respectively.

Out of 384 cattle and sheep physically examined during ante mortem inspection in Bahir -Dar municipal abattoir, different abnormalities were found in 148(38.54%) head of cattle and sheep totally. This figure was found to be greater than the reports by Assefa and Tesfay [43] which were reported as15.5%.The most commonly encountered abnormalities during ante mortem inspection were diarrhea 58 (39.19%), respiratory disorder 44(29.73%), lameness 29(19.59%) and localized swelling 17(11.49%). The result of the current study is by far higher than the report at Nekemte Municipal abattoir by Efrem *et al.* [44] who reports localized swelling, lameness and nasal discharge (2.25%, 2.6% and 1.31%) respectively. But there was no report of diarrhea as ante-mortem finding in the previous studies. This may probably due to differences in geographical area of the origin of animals.

According to the information obtained from the suppliers, the most common cause of lameness was trauma caused by inappropriate vehicles and loading and off-loading negligence during transportation to market places and to the abattoir a similar reason with Regessa *et al.* [45]. 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 which was in line with Getachew [46]. However, these animals were passed for slaughter with great caution during postmortem examination, diseased animals that show signs of abnormality during ante mortem inspection should not be allowed to enter the abattoir for slaughter [47].

Different organs and carcass of cattle and sheep were examined by postmortem inspection to identify the presence or absence of abnormalities or diseases. From the total of 384 head of cattle and sheep slaughtered at Bahir-Dar municipal abattoir, 321(83.6%) animals organ were infected with different parasites or other diseases involving in one or different visceral organs. pathological lesions of infectious and non-infectious causes like faciolosis, hydatidosis, calcification, cirrhosis, abscess, adhesion, pericarditis, nephritis, calculi and bruise were found to be important causes for condemnation of edible organs of cattle and sheep like liver, heart and kidney in sheep and cattle. Similarly the same causes were found at central Ethiopia in sheep [45, 46].

Liver: From 171 condemned liver: 36(9.4%), 36(9.4%), 30(7.8%), 25(6.5%), 24(6.3%), 12(3.1%) and 8(2.1%) was due to liver fluke, generalized calcification, localized calcification, abscess, adhesion, cirrhosis and hydatidosis respectively. The prevalence of fasciolosis of liver in the present study was comparable to the report in Zambia and Tanzania Phiri, [26] and Mellau *et al*. [48] respectively. Higher prevalence of fasciolosis in the area (marsh area favors fasciola) has attributed for this finding. Because of an Increase in the prevalence of this disease across the year, it is important to monitor its development and develop appropriate strategies to reduce the problem [49]. Significant differences in the prevalence of the disease among abattoirs may be due to the agro-ecological and climatic differences between the regions in which abattoirs are located. Losses from liver condemnation were assumed to occur since hepatic pathology is associated to infection that might have public health importance and aesthetic value [50].

Lung: From a total of 222 condemned lungs 63(16.4%), 46(12.0%), 39(10.2%), 28(7.3%), 20(5.2%), 16(4.2%) and 10(2.6%) were due to lung worm, emphysema, pneumonia, hydatidosis, adhesion, abscess and hepatization respectively. The prevalence of pneumonia was higher compared to the 4% report in Tanzania and 1% report in North Ethiopia [48, 51]. In the current study problem of emphysema (12.0%) was higher than the previous reports 1.73% [52] and4.4% in Tanzania and in Northern Ethiopia by Mellau *et al.* [48] and Amuamuta *et al*. [53] respectively. In previous studies, pneumonia was reported as a principal cause of lung condemnation in sheep in central Ethiopia accounting for 42.1% by Getachew, [46]. But, the result of current study indicates that lung worm was the principal cause of lung condemnation and pneumonia accounts only for 10.2% of total causes of lung condemnation and it is much lower than the previous reports. Pneumonia might be also as a result of endemic diseases such as pasteurellosis, which is triggered by stress as indicated in Radiostitis *et al.* [52]. High prevalence of lung worm may probably due to the origin of slaughtered animals, which were only from Gaint all sheep bought and there was no case of lung worm in cattle slaughtered at Bahir-Dar municipal abattoir. The causes of condemnations of lungs reported in Northern Ethiopia, Zambia and Tanzania Phiri, [26], Assefa and Tesfaye [43] and Mellau *et al.* [48] were similar to the present Study. The prevalence of H. cyst was higher in lungs compared to other organs in the present study.

Heart: 28 hearts were condemned from 384 sheep and cattle due to pericarditis 19(4.9%) and Evisceration problem 9(2.3%). The prevalence rate of pericarditis was 19(4.9%) in the present study was higher than 0.8% and 1.04% reported in Zambia and Tanzania by Phiri , [26] and Mellau *et al*. [48] respectively.

Kidney: Abnormalities like nephritis, atrophy and calculi were seen in kidney and constitutes 15(4.9%), 4(1.0%) and 4(1.0%) of condemnation respectively from 23 total condemned kidneys. The causes of condemnations of kidneys in the present study were similar to that reported in other studies [26, 48, 53]. However, the prevalence of nephritis in the present study was relatively higher than the report in these studies. The causes of this problem should be identified and a strategy should be developed to minimize the problem.

Carcass: In the current study 29 (7.6%) carcasses were condemned. From those, 28 (7.6%) were due to bruise 28(7.3%) which was partial condemnation and 1(0.3%) due to tuberculosis, which was the only cause for whole carcass condemnation in Bahir-Dar municipal abattoir. The result of the current study was comparable to the report of Mitchell and slough [54] who stated that bruising of animals during transport is the major source of economic loss in Africa and Asia. It occurs due to beating of animals during transportation and the use of rough vehicles. Apart from affecting carcass value, bruising has also animal welfare implications as excessive use of sticks while driving to the abattoir, mishandling of animals during loading and unloading, improper transport vehicle and at slaughter could be responsible causes [24]. The main cause of whole carcass condemnation in the current study was generalized TB (0.03%). This result was lower than the reports 0.1% found by Mellau, *et al.* [48] in Arusha and 0.3% in Tanga by Swai and Schoonman [55]. Even though, the prevalence of tuberculosis in this study is lower than the previous studies, its zoonotic and economical value is higher than other more prevalent diseases.

In the present study, organ condemnation rate showed that, lung (57.81%) and liver (44.53%) respectively were the most frequently affected organs with the highest condemnation rate followed by carcass (7.55%), heart (7.29%) and kidney (5.99%). This finding is in agreement with reports of Cadmus and Adesokan [56] who recorded that lungs (45.7%) and the liver (32.9%) were the most affected organs. Even though, the

percentage of condemnation of each organ was higher in the present study, similar findings were also reported from Gondar, Northern Ethiopia by Yimam [57] and Nigeria by Ojo [58].

From the total cattle and sheep slaughtered, parasites like lung worm and fasciolosis were found to be the major causes of organ and carcass condemnation respectively that rendered lung and liver rejection from human consumption. Previous studies by Jembere [59], Aseffa [60] and Jibat *et al* [61] respectively have indicated a higher economic loss resulting from condemnation of edible organs and carcasses due to parasitic causes.

The cumulative prevalence of fasciolosis in the current study was recorded as 9.6%. This prevalence is higher than 6.7% reported in Arusha by Mwabonimana *et al*. [62]. However, the result is comparable to Mellau *et al*. [48] who reports (8.6%) in tanzania. A very high liver condemnation percentage as a result of fasciolosis (up to 30%) has been reported by Nzalawahe and Komba [63] in Kigoma, Tanzania. Studies conducted in Ethiopia and Nigeria by Mohammed *et al*. [64], Mulugeta *et al*. [65] Njoku-Tony [66] have also revealed higher occurrence of fasciolosis. This shows that fasciolosis is a large burden in cattle in most African countries. Although fasciolosis rarely cause mortalities in cattle, its effects result in reduced production and condemnation of livers during meat inspection in abattoirs [67].

A significance difference ($p<0.05$) was observed in prevalence of fasciolosis with respect to different risk factors. Higher prevalence was recorded in bovine (14.0%) and lower in ovine (2.7%), this could be due to their feeding behavior where cattle are usually deep grazers [54] and may be most probably cattle graze in marsh areas with stagnant water making them more exposed to the parasite than the grazing behavior of ovine. The prevalence with respect to origin showed Este (18.8%) was higher and the lower was Gaint (4.6%). This may probably due to differences in the geographical area variation ($p <0.05$) with origin. High prevalence rate of major parasites (Liver fluke and hydatid cyst) were reported in lowland (2.2% and 6.2%) than the highland (1.7% and 2.1%) and midland (8.8% and 15.0%) by Efrem *et al.* [44]. Differences in cattle and sheep management systems in different region may also contributed to variation in the prevalence of diseases between the two species. Similarly, in the current study animals with poor body condition and old age had higher prevalence of fasciolosis (18.45%) and (13.7%) respectively. It might be due to frequent exposure of animals as their age increases and their body condition score may be as a result of infection with the parasite.

The prevalence of hydatidosis in the current study was 7.3% which is much lower when compared with the reports from different abattoirs of the country like Adigrat Municipal Abattoir by Alembrhan and Haylegebriel [17] and Southern Wollo abattoir by Alemu *et al.* [16] who reported 18.61% and 17.4% respectively. These differences within the country are more probably due 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. As reported by Jembere [59] and Asmare *et al*. [23] animals with poor body condition were highly infected with hydatidosis. But the result of the present study of the disease was not in agreement with previous studies. Based on the comparison made by the current study, among body condition, high infection rate of hydatid cyst were 11.2, 9.9 and 2.6% from animals with medium, good and poor body conditions respectively. And it has statistical significance ($p<0.05$) among the animals with body conditions scores.

Financial Loss Assessment: The total direct financial loss at Bahir-Dar Municipal abattoir within five months was assessed from the total condemned organs and carcasses of cattle and sheep as a result of major pathological findings. The average market price of each lung, liver, heart, kidney and one kg of meat of sheep and cattle was 10, 55 40, 35 and 180 ETB respectively. Parasitic diseases and pathological conditions like: Tuberculosis, calcification, bruise, Fasciolosis, abscess and adhesion cause a financial loss of 54, 000, 2, 805, 2, 520, 1, 980, 1, 375 and 1, 320 ETB, respectively. The total direct financial loss during this active abattoir survey was estimated to be 70, 070 ETB (3383.39USD$). This finding is in line with the result reported by Alemayehu *et al.* [22], Alembrhan and Haylegebriel [17] and Bekele *et al.* [19] in cattle at Luna Export Abattoir, Adigrat, Mekelle and Hossasa municipal slaughter houses respectively.

CONCLUSION

This study revealed that the major organs and carcasses condemned in bovine and ovine slaughtered in Bahir dar municipal abattoir were; lung, liver, carcass, heart and kidney respectively. Parasitic diseases, other pathological conditions, mechanical damage during

evisceration and bruising were the prominent causes of organ and carcass condemnation observed at this abattoir. There was high burden of financial loss because of organ and carcass condemnation due to different reasons at Bahir dar municipal abattoir, which may also reflect the same scenario in other slaughterhouses in Ethiopia. Based on the above conclusions, the following recommendations are forwarded:

- Immediate, safe and controlled elimination of all condemned abattoir materials and the sale of contaminated offal and heads as dog's feed should be prohibited by law.
- Regular de-worming of sheep, cattle and dogs and elimination of stray dogs should be practiced.
- Awareness should be created in producers, animal attendants, farmers and customers about disease prevention control.
- Local and medium meat traders and abattoir workers should be trained about proper disposal of condemned offal's' and carcasses as well as proper evisceration and flaying procedures.
- Further studies should be carried out in cattle and sheep that are slaughtered in different abattoirs of the country and introduce preventive measures to reduce unnecessary financial losses encountered in the industry.
- The government should propose strategic disease control programs to alleviate financial losses, to improve meat quality and quantity and to avoid risk of contracting zoonotic diseases.

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