

Study of Major Zoonotic Parasitic Causes of Organ Condemnation and Financial Losses in Cattle Slaughtered at Kombolcha Elfora, Industrial Abattoir, Ethiopia

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Abstract

Prevalence study was conducted from August 2018 to March 2018 in Kombolcha ELFORA industrial abattoir in South Wollo Zone, Amhara regional state of Ethiopia. The overall objective was to determine the cause of organ condemnation, its public health and financial significance due to fasciolosis, hydatidosis, *Cysticercus bovis* and other causes. Accordingly, a total of 6627 slaughtered cattle were examined and it was found that 3467 (55.07%) animals had at least one organ condemned due to the presence of helminth parasites. Out of the total examined animals 807 physical abnormalities such as localized swelling 121 (1.8%), laceration 63 (0.95%), branding 147 (2.22%), lameness 108 (1.63%), abrasion 37 (0.56%), nasal discharge 250 (3.77%) and lacrimation 81 (1.22%) were encountered during anti mortem examination. In case of post-mortem, examination different organs were condemned due to Fasciolosis: 452 (13.03%), hydatid cyst: 665 (19.18%), *Cysticercus bovis*: 267 (7.70%), cirrhosis 447 (12.89%), pulmonary emphysema 381 (10.99%), congenital cyst 94 (2.71%) and abscesses 347 (10.0%), in liver, lung, heart, kidney, head and tongue, respectively. During this work the most affected and condemned organ found to be lung 1620 (46%), liver 1241 (35.79) followed by tongue 201 (5.80%), kidney 159 (4.59%), heart 134 (3.87%), head 107 (3.09) and carcass 5 (0.14%). Helminth parasites presence was compared among the different risk factor and a statistically significant difference ($p < 0.05$) was observed between presence of *Fasciola* and various body condition scores. In contrast, the presence of hydatid cyst and *C. bovis* were found to be insignificantly associated with the body condition score of the animal ($p > 0.05$). On the contrary there was statistically insignificant difference in animal origin and breed $p > 0.05$. The total annual direct financial loss from organ condemnation due to hydatidosis, fasciolosis, *C. bovis* and other causes was estimated to be 338,145.00 Eth birr = 11,514.78 USD annually. This large number of condemned edible organs and/or carcasses implies that public health considerations result in deprivation of valuable protein. Occurrence of zoonotic parasites and tuberculosis illustrates the possible public health problem and presence of environmental infections. Therefore, creation of awareness on animal attendants and/or cattle owners and abattoir workers about the effect of parasites and safe disposal of condemned organs must be made.

Keywords: Abattoir; Cattle; Hydatidosis; Fasciolosis; *Cysticercus bovis*; Kombolcha

Introduction

Meat inspection in Abattoir is commonly perceived as the sanitary control of slaughter animals and meat. The aim of meat inspection is to provide safe and wholesome meat for human consumption. The responsibility for achieving this objective lies primarily with the relevant public health authorities who are represented by veterinarians and meat inspectors at the abattoir stage.

Ethiopia has one of the largest livestock inventories in Africa providing support for the livelihoods of an estimated 80% of the rural community. Livestock rearing is an integral part of agricultural production and the estimated to be 1.2mln TLU livestock production [1]. Nevertheless, the economic benefit derived from the livestock sector does not commensurate with the potential and the sub sector remains untapped. Major constraints include the widely distributed various endemic and epidemic diseases, shortage of animal feed both in terms of quality and quantity, low productivity of the local breeds, extended and complicated livestock trade value chains are to mention a few [2].

Animal source foods contain nutrients commonly lacking in the diets of the poor and the vulnerable communities, yet they are very essential for cognitive and physical growth. Animal protein sources such as meat, milk and eggs are similar to the protein found in our body. These are considered to be complete sources of protein because; they contain all the essential amino acids that the human body needs to function effectively [3]. On top of this the effort made along the livestock export to the importing countries most notably to the Middle East countries has established an economic system that provides jobs, livelihood and better income for millions of producers, largely for the pastoralists (agro-pastoralists) and the private sectors engaged in this business.

Livestock in Ethiopia are critical resources to rural income, nutrition, food security, export earnings and rural employment. Rapid growth in demand for food of animal origin, stimulated by high population growth, gains in real per-capital income and urbanization represents a major opportunity to achieve poverty reduction, economic growth and for making an overall contribution to achieve sustainable development goals. Currently the per capital consumption of meat and milk in Ethiopia is about 10 kg and 18 liters per person/year respectively. This is far lower than what is recommended for sustainable human growth and development by FAO, 50 kg meat and 200 litres of milk per-capital [4].

The contribution of livestock is not limited to its share in the total gross domestic product (GDP); it also contributes to the national food supply (meat, eggs, milk) and to crop production through the provision of manure and draught power [4]. However, the potential contribution of livestock cannot be fully exploited because of losses that occur as a result of morbidity and mortality as a result of livestock diseases. Some of these losses can only be observed at slaughterhouses during ante mortem and postmortem examinations. The number of organs and carcasses condemned for various reasons implies serious economic losses to farmers and the livestock industry in the country [5]. In addition, condemnations also reduce the availability of meat required by the human population to meet their protein and mineral requirements.

In Ethiopia, increasing human population, coupled with expanding urbanization and higher average income is putting increasing pressure on the meat supply to meet this demand, millions of food animals are slaughter every year throughout the country primary for domestic consumption [6]. One of the losses from endemic disease is express in terms of organ condemnations. The most commonly affected organs are liver and lung mainly due fasciolosis and hydatidosis [4].

Abattoirs are vital in the detection and surveillance of animal diseases. Abattoir records can help in tracing an infected carcass back to the farm from which it originated. Abattoirs also aid in diagnosing chronic or subclinical infections during post-mortem examination, which may have gone unnoticed during ante-mortem examination. Epidemiological findings based on abattoir records are useful in assessing the risk of human exposure to zoonosis. In recent years, abattoir records have been recognized as a valuable syndromic surveillance tool for the detection of emerging diseases [7].

ELFORA abattoir is the main source of beef for all the delegates to these functions, as well as for the general population of the region. The Amhara region is amongst the drier areas of Ethiopia with variable climatic conditions and unpredictable rainfall, which may have a direct influence on the patterns of livestock diseases [8]. However, there has been little study on diseases of cattle raised in such drier areas of Ethiopia. The quality and safety of beef consumed in Kombolcha is unknown, as there has been little study on common pathological lesions encountered in slaughtered cattle. Causes of organ and carcass condemnations and the associated financial implications have not been properly documented.

Although similar surveys have been conducted in other regions, it is important to carry out the study because the prevalence and incidence of diseases differ according to geographical areas. Furthermore, such data could be a convenient and inexpensive source of information that could be used to monitor disease trends and possible emergence and re-emergence of pathogens. Kombolcha ELFORA meat processing plant is the major abattoir in South Wollo, Amhara regional state, Ethiopia. This study determined the various causes of bovine carcass and organ condemnation at this abattoir and estimated the associated economic losses, using 8-months consecutive monitoring of slaughter animals. The aim of this study was to determine the cause of organ condemnation, its public health and financial significance due to fasciolosis, hydatidosis, *Cysticercus bovis* and other causes at Kombolcha ELFORA industrial abattoir.

Materials and Methods

Study area

This study was conducted at Kombolcha ELFORA Industries Abattoir. The abattoir is privately owned which supplies lean meat to Kombolcha Meat Factory for canning, for Wollo and Kombolcha Universities, Military and other governmental organization. The abattoir is located at Kombolcha, South Wollo zone and about 375 km away from Addis Ababa the capital city of Ethiopia in the north-east direction [9]. Kombolcha is located 1°84'N and 0.39°46 E, at an elevation of 1840 m above sea level; it has an average annual rainfall of 1248 mm and annual temperature ranges from 11.8°C to 26°C and the relative humidity of the region varies from 23.9% to 79%. The Kombolcha ELFORA industrial abattoir was established by the Italian investor MR Sopral in 1957. It is privately owned and is the major source of inspected beef in Kombolcha town. A portion of this meat is supplied to the Kombolcha meat processing factory for canning letter supplied for military ration. The size, hygiene and quality standard of the abattoir is comparable to other abattoirs in Ethiopia. Currently, three veterinarian and three meat inspectors work in the abattoir. Approximately 90 - 150 cattle are slaughtered per day and slaughtering is usually done on alternate days. Any suspected tissue samples from the abattoir that require further laboratory testing are submitted to the nearby regional veterinary laboratory at Kombolcha.

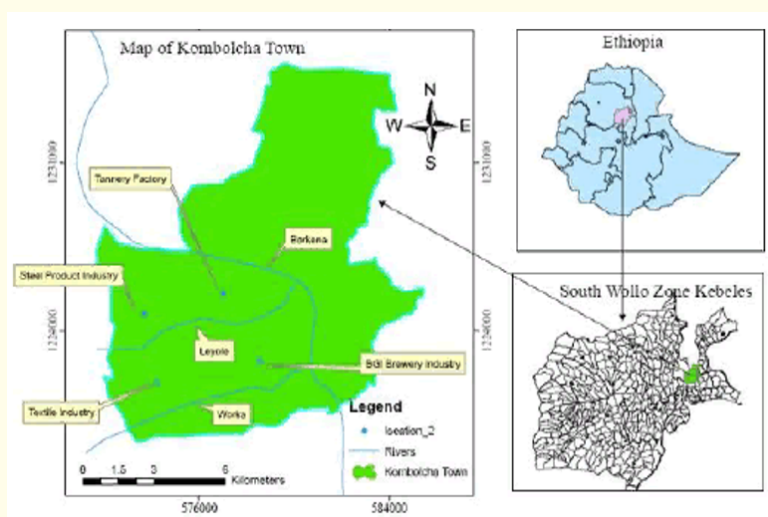


Figure 1: Map of the study area (Kombolcha).

Study animals and sampling

A total of 6628 cattle presented for slaughter at Kombolcha ELFORA Industrial Abattoir were inspected and examined for parasites responsible for organ/carcasses condemnation in the period between August 2018 and March 2018. The study was an active abattoir survey which included cattle brought from different livestock markets to Kombolcha ELFORA Industrial Abattoir. The sample size was determined by 95% confidence interval at a desired accuracy level of 5% [10] and with expected prevalence of 28.4% [11]. Using purposive sampling method, the samples were selected from cattle registered for slaughtering following the antemortem inspection.

$$1.962 \text{ pexp} (1-\text{pexp}) n = d^2$$

Where n = required sample size; pexp = expected prevalence; d = desired absolute precision.

Study design

A cross sectional study was conducted through abattoir survey from August 2018 to March 2018 to identify the cause of organ condemnation, its public health and direct financial loss due to organ condemnation in cattle slaughtered at Kombolcha ELFORA Industrial abattoir. A total of 6628 cattle have been examined by ante mortem and post mortem examination using standard examination procedures.

Study methodology

Antemortem examination: Regular visits were made Five (5) days per week to ELFORA Industrial abattoirs during the period from August 2018 to March 2018. Each week, five days visit was made for ante-mortem inspection on individual animals for assessment of animals' origins, age and body conditions before the animals were slaughtered. The average numbers of animal's slaughtered at Kombolcha ELFORA abattoir were 90 - 150 cattle per day and around 9760 - 10,000 cattle annually. Ante mortem inspection was conducted on individual animals while they enter individually and in mass before they entered into the lairage. For the ante mortem inspection, records of age breed and body conditions were done.

Abattoir survey: The cross sectional study, which was based on the abattoir survey, was conducted during detail meat inspection 6628 cattle slaughtered at Kombolcha ELFORA Industrial abattoir. In this study animals were selected during antemortem inspection (AMI) and the related risk factors such as sex, origin, breed and body condition were recorded before slaughtering.

Postmortem examination: The organs of all the cattle presented in the abattoir for slaughter were examined by visual inspection, palpation and incision. Organs of each slaughtered animals infected with hydatid cyst, fasciolosis, cysticercosis and other causes were identified systematically following the standard routine post mortem inspections procedure. The inspected organs were collected for close examination and then registered. Incision was made when necessary to confirm doubtful cases.

Direct financial loss assessment: Annual cost of the condemned organs due to bovine hydatidosis, cysticercosis, fasciolosis and other causes were assessed using the following formula set by [12]. The mean retail market price of condemned organs due to hydatidosis such as liver (40 ETB), lung (20 ETB), heart (45 ETB), kidney (60 ETB), tongue (50 ETB) and carcass 1 kg (140 ETB) were the parameters considered. To assess the economic losses due to fasciolosis, hydatidosis and cysticercosis, only direct economic losses were considered and the calculation was based on condemned organs like liver, lungs, heart, kidney, tongue and carcasses. Based on information from local butchers and customers in July 2018, to establish the price per unit organ and the average organ price were determined and this price index was used to calculate the loss [13]. The analysis was based on annual slaughter capacity of the abattoir considered, market demand, average market price of each organ in Kombolcha town and the rejection rate of specific organ. Information obtaining is subjected to mathematical computation by modifying the formula of [12].

$$\text{Annual economic loss due to organ condemnation} = (P11 \times Tk \times C1) + (P12 \times Tk \times C2) + (P13 \times Tk \times C3) + (P14 \times Tk \times C4) + (P15 \times Tk \times C5) + (P16 \times Tk \times C6)$$

Where, PI1 = Percent involvement of liver out of the total examined.

PI2 = Percent involvement of lung out of the total examined.

PI3 = Percent involvement of heart out of the total examined.

PI4 = Percent involvement of kidney out of the total examined.

PI5 = Percent involvement of Carcass out of the total examined.

PI6 = percent of involvement of tongue out of the total examined.

C1 = Average market price of liver.

C2 = Average market price of lung.

C3 = Average market price of heart.

C4 = Average market price of kidney.

C5 = Average market price of carcass (1 kg) and C6 = Average market price of tongue.

Tk = Average annual kill of bovine.

EL= $Sr \times Coy \times Roz$.

Where: EL= Estimated annual economic loss due to organs condemnation.

Sr = Annual cattle slaughter of the abattoir.

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

Roz = Condemnation rate of cattle liver/lung/heart/kidney/carcass.

Data management and statistical analysis: Data generated from ante mortem and postmortem meat inspection were recorded in Microsoft excel 2010 and statistical analysis SPSS version 20.00 program. 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. The data obtained during the study was subjected to 95% confidence interval statistical analysis for possible variation between rejection rates of specific organs, origin of animals, body condition, sex of animals and breeds of animals and differences were regarded statistically insignificant; when the 95% confidence interval drawn do not overlap to each other.

Results

Among 6628 cattle that were slaughtered and thoroughly examined using the standard postmortem procedure, at least single organ was condemned from 3467 (52.67%) animals due to severe helminthes infection of major viscera. Of which, 1241 (35.79%), 1620 (46%), 134 (3.87%) 162 (4.59%), 198 (5.71%) and 107 (3.09%) animals had their livers, lungs, hearts, kidneys, tongue, head, muscle and carcasses were rejected respectively (Table 1).

Organ	Number of animals		Percent %
	Inspected postmortem	Organ condemned	
Liver	6628	1241	35.79%
Lung		1620	46%
Heart		134	3.87%
Kidney		162	4.59%
Tongue		198	5.71
Head		107	3.09%
Carcasses		5	0.14%
Muscele		16 kg	
Total		6628	3467

Table 1: Proportion of organ condemned due to helminthosis at Kombolcha ELFORA industrial Abattoir (n = 6628).

Out of 6628 cattle examined at Kombolcha ELFORA industrial abattoir 807 (12.18%) had various types of abnormalities during ante-mortem inspection (Table 2). Majority of breed (98%) slaughtered were local breeds however relatively few cross breeds (2%) were also slaughtered (Table 5). According to the information obtained from abattoir, averagely 90 - 150 cattles were slaughtered per day and the ages of all animals presented for slaughter were old age which means above 8 years old.

Based on meat inspection of organ/carcasses condemned, a total of 6628 cattle were slaughtered and inspected at Kombolcha ELFORA Industrial abattoir during the period from August 2018 - March 2018. Of the slaughtered cattle, 3467 (52.31%) had pathological conditions that lead to condemnations of organs and/or carcasses. A total of 5 (0.55%) carcasses had lesions or pathological conditions and of these, 1 (4.34%) 2 (86.95%) and 2 (8.7%) were totally condemned because of abscesses, tuberculosis and cysticercosis respectively (Table 4). The rest were provisionally passed for human consumption after being chilled for 10 days at -10 ° C for cases of cysticercosis, chilled for 24h for cases of mild jaundice and mild haemorrhages and trimmed for bruises.

Mostly the ages of all animals presented for slaughter were old age which means above 8 years old. according to the obtained results adult 7 - 8 years old and old animals from 10 years and above were inspected and statistically significant difference ($p < 0.05$) was observed due to the prevalence of condemned organ and age is concerned. Organ-specific condemnations were: 1620 (46.6%) lung, the highest number of organ condemned followed by 1241 (35.79%) liver, 198 (5.71%) tongue and 162 (4.59%) kidneys, The least frequently condemned organs were 134 (3.87%) heart and 105 (3.03%) head (Table 4).

Of the liver that were condemned, fascioliasis 452 (13.03%) was the leading cause of organ condemnation, followed by cirrhosis 447 (12.89%) and Hydatidosis 127 (3.66%). In cases of lungs that were condemned, Hydatidosis 506 (14.59%) was the leading cause of condemnations, followed by emphysema 381 (10.99%) and pneumonia 290 (8.36%). Of 159 (4.59%) kidneys that were condemned, congenital cysts 94 (2.71%), nephritis 38 (1.10%) Infracts 15 (0.43%) and hydronephrosis 12 (0.35%) were the main reasons for condemnation.

Condition or abnormalities	No. of cattle affected (%)	Prevalence from total cattle slaughter	Judgment
Localized swelling	121 (14.99%)	1.8%	Judgment passed for slaughter but they need special attentions during PME
Laceration	63 (7.81%)	0.95%	
Branding	147 (18.22%)	2.22%	
Lameness	108 (13.38%)	1.63%	
Abrasion	37 (4.58)	0.56%	
Nasal discharge	250 (30.98)	3.77%	
Lacrimation	81 (10.04)	1.22%	
Total	807 (12.18%)	12.18%	

Table 2: Abnormalities encountered during anti mortem inspection (n = 6628).

Organ/carcass	Average resection rate of organ/carcass (%)	Average of annual cattle slaughter	Average price in Eth. Birr	Average price of organ/carcasse in USD
Liver	1241		40.00	1.36
Lung	1620		20.00	0.68
Heart	118		45.00	1.53
Kidney	159	10,000	60.00	2.04
Tongue	201		25.00	0.85
Head	105		80.00	2.72
Muscle	16 kg		140/kg	4.76/kg
Total carcass	5		140/kg	4.76/kg

Table 3: Finding of the study used in the direct financial loss assessment (n = 6628).

Direct financial loss assessment

The annual economic loss was estimated from the summation of totally rejected organs (liver, lung, heart and kidney) of cattle slaughtered at Kombolcha ELFORA industrial Abattoir. The annual rate of organs condemnation was assessed considering the overall rejection rate of each organ, the total annual slaughtered animals and retailed market price of cattle was estimated from the retrospective abattoir record of the last two years. While the retailed market price, was determined from the interview made with the butcheries in Kombolcha town. Information collected from Abattoir Butchers, Residents or Households and Meat Inspectors on the mean current price of visceral organs for liver, lung, heart, kidney tongue, head, muscle and carcass (kg) were 50, 20, 45, 60, 50, 80,140 and 140 Ethiopian Birr, respectively. Information obtained was then subjected to mathematical computation using the formula set by [12] and it was found to be about 338,145.00 Eth birr annually = 11,514.78 USD



Figure 2: Lung and carcasses condemned due to Tuberculosis.



Figure 3: Cirrhosis of liver.

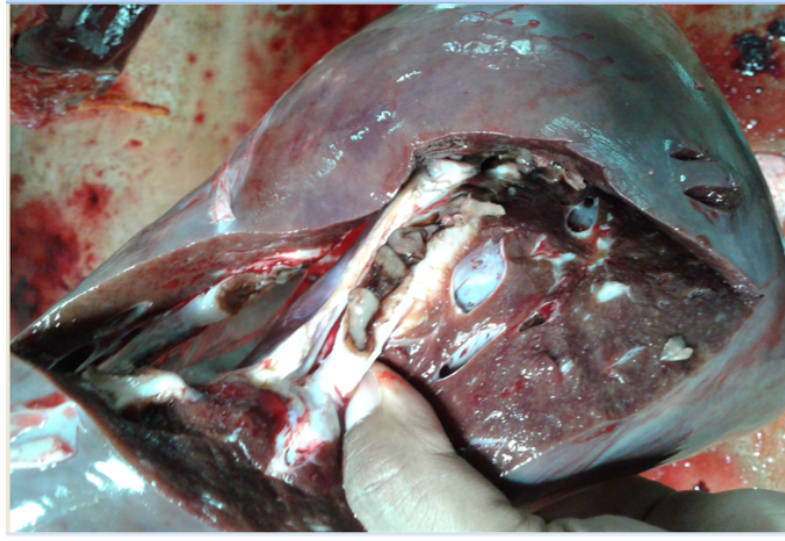


Figure 4: Liver affected with fasciolosis.

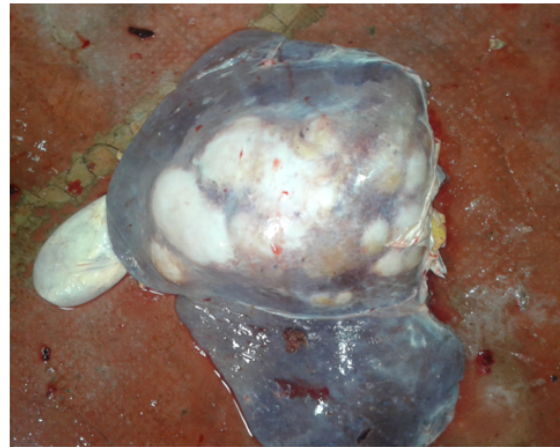


Figure 5: Lung and liver affected with hydatid cyst.

Condemned organ	Causes	No (%) organ condemned	Loss In Eth Birr	Loss in USD
	Fasciolosis	452 (13.03%)	18,080.00	\$ 614.72
	Hydatidosis	127 (3.66%)	5,080.00	\$ 172.72
	Abscessation	16 (0.46%)	640.00	\$ 21.76
Liver	Cirrhosis	447 (12.89%)	17,880.00	\$ 607.92
	Haemangioma	38 (1.10%)	1,520.00	\$ 51.68
	<i>C. bovis</i>	77 (2.22%)	3,080.00	\$ 104.72
	Peritonitis	84 (2.42%)	3,360.00	\$ 114.24
	Total	1241(35.79%)	49,640.00	\$ 1,687.76
	Hydatidosis	506 (14.59%)	10,120.00	\$ 344.08
Lung	Emphysema	381(10.99%)	7,620.00	\$ 259.08
	Abscessation	160 (4.61%)	3,200.00	\$ 108.80
	Pleurisy	283 (8.16%)	5,660.00	\$ 192.44
	Pneumonia	290 (8.36%)	5800.00	\$ 197.20
	Total	1620 (46%)	32,400.00	\$ 1,101.60
	<i>C. bovis</i>	83 (2.39%)	3,735.00	\$ 126.99
Heart	Hydatidosis	34 (0.98%)	1,440.00	\$ 48.96
	pericarditis	21 (0.54%)	855.00	\$ 29.07
	Total	136(3.98%)	6,030.00	\$ 205.02
	Congenital cyst	38 (1.10%)	5640.00	\$ 191.76
Kidney	Hydronephrosis	16(0.35%)	960.00	\$ 32.64
	Infracts	14(0.43%)	840.00	\$ 28.56
	Hydatidosis	94 (2.71%)	2,280.00	\$ 77.52
	Total	162 (4.59%)	9,720.00	\$ 330.48
	Abscesses	87 (2.60%)	4,350.00	\$ 147.90
Tongue	<i>C. bovis</i>	47 (1.36%)	2350.00	\$ 79.90
	Ulcer	64 (1.85%)	3200.00	\$ 108.80
	Total	198(5.71%)	9900.00	\$ 336.60
	Abscesses	75 (2.16%)	6,000.00	\$ 229.50
Head	Actinomycosis	11 (0.32%)	880.00	\$ 33.66
	<i>C. bovis</i>	19 (0.55%)	1520.00	\$ 58.14
	Total	105 (3.03%)	8,400.00	\$ 321.30
Muscle	Pus	7kg	980.00	\$ 33.32
	Bruise	9kg	1,260.00	\$ 42.84
	Total	16kg	2,240.00	\$ 76.16
	<i>C. bovis</i>	1 (0.03%)	21,420.00	\$ 728.28
Total Carcasses	Tuberculosis	2 (0.58%)	42,840.00	\$ 1,456.56
	Abscesses	2 (0.06%)	42,840.00	\$ 1,456.56
	Total	5 (0.66%)	107,100.00	\$ 3,641.40

Table 4: Causes of organ condemnation and financial analysis at Kombolcha ELFORA Industrial abattoir (n = 6628) (1Eth Birr = 0.034USD).
338,145.00 Eth birr annually = 11,550.48 USD.

Risk factor	Animal slaughter	Organ condemned	fasciolosis	H.cyst	C.bovis	X ²	P = value
Age							
Adult	6628	1213 (18%)	267 (59)	358 (47%)	118 (52%)	6.04	0.042
Old		2254 (34%)	185 (40.9)	403 (52.96)	109 (48%)		
Total		3467 (52.30)	452 (13%)	761 (21%)	227 (6.55%)		
Animal origin							
High land	6628	797 (11.57%)	77 (17%)	190 (25%)	73 (32.15%)	1.99	0.611
Mid land		1283 (19.36%)	203 (45%)	335 (44%)	104 (45.81%)		
Low land		1387 (20.93%)	172 (38%)	236 (31%)	50 (22%)		
Total		3467 (52.30%)	452 (13%)	761 (21%)	227 (6.55)		
Body condition							
Poor	6628	1803 (27.2%)	235 (52%)	282 (37%)	64 (28.19%)	4.20	0.031
Medium		1144 (17.26%)	149 (32)	251 (33%)	88 (38.76%)		
Good		520 (7.85%)	68 (15%)	228 (30%)	75 (33%)		
Total		3467 (52.30%)	452 (13%)	761 (21%)	227 (6.55%)		

Table 5: Association of animal origin, breed, age, body condition, and rejection rate of specific organs (n = 6628).

Organ condemned	No. of cond. organ	Abscesses	peritonitis	Fasciolosis	Cirrhosis	Heamangioma	Hydatidcysts	Pneumonia	Pleuricy	Emphysema	Tuberculosis	Congenital cysts	Infracts	Hydronephrosis	Nephritis	Bruising	C. bovis	Pericarditis	Ulcer	Actinomycosis
Liver	1241	16	84	452	447	38	127										77			
Lung	1620	160					506	290	283	381										
Heart	136						34										83	19		
Kidney	162						94					38	14	16						
Tongue	198	87															47		64	
Head	105	75															19			11
Muscle	16 kg	7 kg														9 kg				
Car-casses	5	2									2						1			
Total	3467	340/7 kg	84	452	447	38	761	290	283	381	2	94	14	16	38	9 kg	227	19	64	11

Table 6: Common causes of visceral organs condemnation and the percentage of the condemnation due to the pathological conditions.

Discussions

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. An important function of meat inspection is to assist in monitoring diseases in the national herd and flock by providing feedback information to veterinary services to control or eradicate diseases and to produce wholesome products and to protect the public from zoonotic hazards.

During the study, ante-mortem examination and after slaughtering (postmortem examination) were carried out. Out of 6628 cattle physically examined during ante-mortem inspection in Kombolcha ELFORA industrial abattoir, different abnormalities were found in 807 (12.18%) head of cattle. These abnormalities include abrasion 37 (0.56%), nasal discharge 250 (3.77%), lameness 108 (1.63%), branding 147 (2.22%), lacrimation 81 (1.22%), laceration 63 (0.95%) and localized swelling 121 (1.8%). However, these animals were passed for slaughter with great caution thorough postmortem examination because some of these different abnormalities either might be symptom of diseases or resulted due to the long journey from market area to the abattoir as animals derived on their foot. Meanwhile, this finding was in agreement with the work of [15].

From the total of 6628 head of cattle slaughtered, 3467 (52.31%) animal organ were infected with different parasites or other diseases involving in one or different visceral organs; that is 452 (13.03%) of liver due to only liver fluke and 127 (3.66%) of liver due to hydatid cyst, 16 (0.46%) of liver due to abscess, 447 (11.89%) of liver due to cirrhosis. Similarly, 506 (14.59%) of lung due to hydatid cyst, 160 (4.61%) of lung due to abscess, 381 (10.99%) of lung due to emphysema and 290 (8.36%) of lung due to pneumonia. In case of hearts 19 (0.54%), 34 (0.98%), 83 (2.39) was condemned due to *C. bovis*, hydatid cyst and pericarditis respectively. Organ like tongue is also condemned due to *C. bovis* 47 (1.36%) abscesses 87 (2.60%) and ulcer 64 (1.85%), in terms of kidney congenital cyst, Hydronephrosis, infracts and H. cystas 38 (1.10%), 16 (0.35%), 14 (0.43%) and 94 (2.71%) is the main cause of condemnation. In this study 5 animal is totally rejected due to 1 (0.03%) *C. bovis*, 2 (0.06%) tuberculosis and 2 (0.06) abscesses. 16kg muscle was partially condemned due to abscesses which was in line with the reports of [29]. This might be due to the frequent contact between the infected animals, backyard slaughtering, poor public awareness and factors like difference in culture, social activity and management of dogs.

The overall prevalence of the present work is 52.67% that is almost equivalent with the result of [16] which is 40.5% reported from Addis Ababa abattoir, but higher than [17-19] from Addis Ababa abattoir 34.15%, Ambo municipal abattoir, 29.69% and from Tigray region 22.1% respectively. The variation in prevalence between different countries and regions may be attributed mainly to strains difference in *E. granulosus* that exist in different geographical situations [20].

From the total cattle slaughtered parasites like fasciolosis and hydatidosis, were found to be the major causes that rendered liver rejection from the domestic market. Losses from liver condemnation were assumed to occur since hepatic pathology is associated to infections that might have public health importance [21,22] and aesthetic value. The highest number of liver was condemned due to *Fasciola* (13.03%) from all organs but from all infected liver *Fasciola* share (36.42%) and causing considerable direct economic loss in this study area. These results were agreed with the finding of [23,24] and [25] who stated that liver flukes in the liver and hydatid cyst in the lung among the main causes of organ rejection during post mortem findings.

The current study revealed that the prevalence rate of fasciolosis was recorded (13.03%) and this shows a significant difference in terms of body conditions of slaughtered animal ($p < 0.05$) and also shows a lower prevalence of fasciolosis when compared with the following study like [26-29] and [24] reported a rejection rate of 37.14%, 54.8%, 43.7%, 53.9%, 50%, liver due to fasciolosis at Hawassa, Dire Dawa, Gonder, Haramaya and Addis Ababa abattoirs respectively. The relative low prevalence of bovine fasciolosis observed in this study as compared to the findings of other studies, may be attributed to the agro ecological condition unsuitable for the development of snail intermediate host prevailing in the areas from which the slaughtered animals were brought. In Ethiopia bovine fasciolosis exist almost in all regions [30].

Hydatidosis is a zoonotic disease that occurs worldwide and causes considerable economic losses and public health problem in many countries [21]. It also the main disease in ruminant and man in Ethiopia affecting primary the lung and liver [31]; From the total animal examined 506 (14.59%) lungs were condemned due to hydatidosis, 127 (3.66%) liver and 34 (0.98%) of heart and 94 (2.71%) kidney were affected with hydatid cysts. This study shows that the prevalence rate of hydatidosis in which was recorded to be 761 (21.95%) is in line with the finding of [32] 27.5% in lekemte, 25.2% [23], 24.3% [24] and 22.1% in cattle slaughtered at Tigray region [19]. However *it was* lower than with the finding of [27] 64.56%, [33], 36.58% in Bahir Dar [34], 54.8% in Assela [35], 48.9% in Debre Markos and [36], 62.96% in Bale Robe and higher than the prevalence rate of bovine hydatidosis which were scoring (4.8%) and 5.6% reported from different African country such as Kenya [37] and in Libya [38] respectively. The variation in prevalence of hydatidosis from different areas of a country might be attributed mainly to the differences in animal husbandry system, backyard slaughtering of animals, lack of proper disposal of infected carcass and presence of stray dog could attribute for the variation in prevalence of hydatidosis. On top of this, difference in culture, social activities and attitudes to dogs in different region may contribute for variation [39].

This finding is also similar with the prevalence of disease reported from Turkey 13.5% [40] and 11.6% [41]. This might be due to the abundance and frequent contact between the infected intermediate and final hosts. It could also be associated to slaughtering of aged cattle which have had considerable chance of exposure to the parasitic ova, backyard slaughtering of small ruminants and provision of infected offal's to pet animals around homesteads [42]. Many people slaughter animals at home and allow dogs to eat condemned meat or offal. This Poor public awareness about the disease and presence of few slaughter houses could have contributed to such a higher prevalence rate.

The overall cause of organ condemnation, obtained from abattoir was 52.31%, it was relatively high and almost higher than the findings from Nekemte municipal abattoir (47.94%) by [29] and Gondar Elfora Abattoir (24.7%) [14]. However, the overall prevalence of hydatidosis was 21.95% which is comparable when compared with several reports from different abattoirs of the country like Adigrat Municipal Abattoir (18.61%) [43], in Southern Wollo abattoir [44] (17.4%) but higher than the work of [29] at Nekemte municipal abattoir (12.73%). This difference within the country is attributed mainly to variations in the ecological and climatic conditions such as altitude, rainfall and temperature, although differences in livestock management system and the ability of the inspector to detect the infection may play a part.

Regarding organ distribution, the current study showed that lungs 506 (14.59%) were the most preferred predilection site for Hydatid cysts followed by liver 127 (3.66%). This might be due to the fact that cattle are slaughtered at older age, during which period the liver capillaries are dilated and most oncospheres pass directly to the lung. It is also possible for the hexacanth embryo to enter the lymphatic circulation and be carried via the thoracic duct to the heart and then trapped in the lungs [45]. Furthermore, the lungs and liver possess the first great capillaries encountered by the migrating echinococcus oncosphere (hexacanth embryo) which adopt the portal vein route and primarily negotiate hepatic and pulmonary filtering system sequentially before any other peripheral organ is involved [46].

Factors governing prevalence of hydatidosis in a given locality may be associated with prevailing specific social, cultural environmental and epidemiological situation [42,36]. This is in agreement with the present study many research reported that liver and lung were the most commonly affected organs by hydatid cyst [39,40]; particularly the lungs is the organ most affected by hydatidosis because at old age the liver capillaries are dilated and most cyst pass directly to the lung, secondly the cyst passes to the lung via the thoracic duct without involving the liver [41].

The rejection rate of kidney and heart was not as significance as those of liver and lung and such unlike to produce the pronounced economic effect associated with the first two. During the study period bovine kidney were rejected due to, congenital cysts, hydatidosis, hydronephrosis and infracts in the prevalence rate of (2.71%), (1.10%), (0.35%) and (0.40%) respectively. Bovine heart were rejected mainly due to *C. bovis*, 83% (2.39%), hydatid cysts 32 (0.92) and pericarditis 19 (0.54%). This findings is in agreement with the work done

by [47] and [15], which illustrated that bovine kidney were rejected due to hydatidosis, where as bovine heart were rejected mainly due to *C. bovis* and hydatidosis.

In case of body condition and disease distribution the result of the present study was in agreement with previous studies of [48,49]. Based on the comparison made among body condition, high infection rate of hydatid cyst were 37%, 33% and 30% from animals with poor, medium and good body conditions respectively and the result of the present study indicated that infection rate has statistical insignificant ($p > 0.05$) among animals with poor (thin), good (medium) or very good (good) body conditions scores, but there was statistically significant difference in animal which has poor body condition than medium and good body condition when infection rate by fasciolosis was concerned ($p < 0.05$), which was in line with the reports of [50-52] in different parts of Ethiopia.

Similarly, comparison for animals those came from midland (38%, 44%, 45.8%), lowland (45%, 31%, 22%) and highland (17%, 25%, 32.15%) for fasciolosis, hydatidosis and *C. bovis*, respectively indicates midland animals were highly attacked by the parasites than lowland and highland, respectively. However, there is no significant different in prevalence between the three-agro climates at individual level ($p > 0.05$). But there was a marked significant difference ($p < 0.05$) between fasciolosis and agro-climate of the study area, fasciolosis is more common in midland area than high land and low land area. This might be most of the slaughtered animals originated from midland area, were most likely graze on the field due to decreasing labor and to overcome inefficiency during draught period. And next to midland, lowland animals are likely to have a higher possibility of acquiring infection due to their longer exposure to infection and to lower immunity to combat infection. Additionally, the reason for lower prevalence in highland cattle may be due to lack of free grazing because of human density around highland area this result was in agreement with the work of [29].

The direct financial loss incurred during this study as a result of condemnation of different organs of cattle was estimated about 338,145.00 Eth birr = 11,550.48 USD annually. Therefore, the total annual financial loss due to major zoonotic parasites in the study abattoir is the summation of losses from organ and carcass condemnation. This finding is by far less than the result reported by [29] at Nekemte municipal abattoir (1,011,020.22 ETB) but almost in agreement with the finding of [24,37,44] and [45] a total financial loss of about 110,584.046, 19,910.0, 233,501.94 and 88,806.85 Ethiopian Birr per annum in cattle due to major cause of organ condemnation at Luna Export Abattoir, Adigrat, Mekelle and Hossana municipal slaughterhouses, respectively. This discrepancy is probably due to the difference in selling price of the difference locality, the consumption rate of the community and may be the ecological and climatic difference between those localities.

This study suggested that parasites particularly, fasciolosis and hydatidosis were the major causes of economic loss through condemnation of affected organs. Annual losses in animal productivity due to fasciolosis were conventionally estimated approximately 3.2 billion per annum [46]. The result of this study clearly demonstrate the need to develop effective control measures on the prevention and control of cattle parasite so as to decrease the direct economic losses that can occur in the livestock production system of the country

Conclusion and Recommendations

Animal disease is the major concern to the livestock industry as it causes extensive financial waste as the result of direct and indirect economic losses. According to the result of this study parasitic disease like fasciolosis, hydatidosis and *C. bovis* were the major causes for the respective organs condemnation at the abattoir, which may also reflect the same scenario in other slaughter houses in Ethiopia. Hence, this study may be valuable for the country by providing data in monitoring disease conditions and management practices of animals that have public health hazard and aesthetic value. Based on this concluding remark the following recommendations are forwarded:

- Standard regulations and functional meat inspection procedure should be properly conducted in the abattoir to provide safe and wholesome meat to the consumer.
- Condemned organs should be incinerated in a place of giving to the wild animal in order to break the live cycle of the diseases transmission.

- Enhance awareness of animal attendants, customers and abattoir workers about the public health significance of the continuous life cycle of the involved parasites.
- All condemned organs should be safely disposed, stray dogs and cats must be prohibited from abattoirs and their numbers should be systematically reduced.
- Detailed epidemiological study should be carried out for those important helminthes identified in the study.

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