

# Major Abnormalities and their Economic and Public Health Significance in Ruminants Slaughtered at Haramaya and Aweday Municipal Abattoirs, Eastern Hararghe, Ethiopia

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## Abstract

A cross sectional study was conducted from October 2016 to June, 2017 in two abattoirs to assess the major abnormalities causing organ and carcass condemnation in cattle, sheep and goat as well as their economic and public health importance. In this study, a total of 700 animals (240 cattle, 230 sheep and 230 goats) were systematically selected and thoroughly examined at AM and PM. The PM result showed 12.43% liver (15.4% in cattle, 13.9% in sheep and 7.83% in goat) were condemned mainly due to fasciolosis (4.86%), hydatid cyst (3.57%) and fibrosis (2.3%). Similarly 12% lung (14.2% in cattle, 12.6% in sheep and 9.13% in goat) were also rejected due to hydatid cyst (6.3%), hepatization (1.57%), adhesion (1.14%) and lung worm (1%). The main causes of condemnations in kidneys, heart and spleen were infarction, pericarditis and hydatid cyst. However, *Cysticercus bovis* infestation was the only problem caused total and partial carcass, tongue and heart condemnation in cattle. The estimated annual financial loss was about 20559.43 and 20232.85 USD at Haramaya and Aweday municipal abattoirs respectively. Concerning public health issue of hydatid cyst and *C. bovis*, questionnaire survey and interviews were carried-out on randomly selected 100 respondents to evaluate the awareness, practice and ways of transmission of the disease. Accordingly, majority of the respondents had the habit of eating raw meat (68%), consuming backyard slaughtered meat (53%), feeding dogs infected raw viscera (28%), had close contact with dog (57%) and drinking surface water (11%). Retrospective patient case-book (2015 and 2016) survey showed 0.167% (42/25096) human hydatidosis among patients admitted for X-ray and ultrasound examination and 1.89% (791/41812) *Taenia saginata* taeniosis based on stool examination. Generally, the present study showed many parasitic and nonspecific lesions causing huge financial loss and hazardous to public health; therefore, further study is recommend at the study areas.

**Keywords:** Abattoir; Financial loss; Public health; Organ condemnation; Ruminant

## Introduction

Ethiopia has the largest livestock population in Africa. An estimate indicates that the country is a home for about 57.8 million cattle, 28.89 million sheep and 29.7 million goats [1], and accounts for 40% of the agricultural gross domestic product (GDP) and 20% of the total GDP of the Ethiopia excluding other contribution like transportation, traction power and fertilizers [2]. However, the country's benefit from livestock was marginalized due to several factors such as limited genetic potential, traditional management system, lack of appropriate disease control policy and lack of appropriate veterinary services [3]. Additionally, each year, due to livestock disease, a significant loss results from death of animals, inferior weight gain and condemnation of edible organs and carcass at slaughter during routine meat inspection [4]. Slaughterhouses surveillance could be used to monitor the infectious disease status among food animals [5] and play an important role in eliminating various diseases that are not fit for human consumption [6].

Abattoir surveillance conducted in strict meat inspection, comprising of ante mortem (AM) and postmortem (PM) examination. AM inspection attempts to avoid introduction of clinically diseased animals in to slaughter house and also serves to obtain information that will be useful in making sound PM inspection while PM inspection is carried out using visualization, palpation and incision to check presence of any pathological change and remove organ and carcass with gross abnormalities. It helps to prevent distribution of contaminated meat that could result to disease risk in man and animals and assisting in detection and eradication of certain diseases of livestock [7]. On the other hand, many studies in Ethiopia have been reported there are

considerable financial loss, due to major cause of organ and carcass condemnation in different abattoirs, of about 5,213,939 [8], 15,843.89 [9], 827,686.05 [10], 79,894.58 [11], 52807 [12], 612,054.3 [13] and 152,173.125 [14] in US dollar annually.

Despite many studies that have been conducted on major causes of organ condemnation and economic significance in other parts of Ethiopia which mainly concentrated in Central, Western, Southern and Northern parts [9-15], there is no documentation on the major causes of organ condemnation, their economic and public health significance in the current study area. Therefore, the objectives of this study were:

- To identify major abnormalities causing organ and carcass condemnation and to estimate annual financial losses sustained from ruminants slaughtered at Haramaya and Aweday municipal abattoirs
- To assess the public health significance and extent of public awareness toward zoonotic disease transmitted through eating raw meat.

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## Materials and Methods

### Study area

The study was conducted in Haramaya and Aweday municipal abattoirs, Eastern Hararghe zone, Oromia region. Haramaya and Aweday towns are located at about 495 km and 505 km respectively east of Addis Ababa on the Ethiopian main road from Addis Ababa to Harar city. Haramaya district is topographically situated at an altitude of 1600 to 2100 m above sea level at 9°26'N latitude and 42°3'E longitudes with the mean annual temperature and relative humidity of 18°C and 68%, respectively. The available land mark of the area is Haramaya University. The animals slaughtered at both abattoirs are cattle, sheep and goat mostly introduced from Haramaya, Kersa and Kurfa chale district for local consumption.

Haramaya district receives an average annual rain fall of approximately 900 mm, with a bimodal distribution pattern. Kurfa chale district rest in the agro-ecological zones of an altitude ranging from about 1400 m to 3300 m. a.s.l. and the mean annual rain varies from 550 mm to 850 mm in low land and southern mountain range, respectively and has an annual average temperature range of 14.5°C to 34.6°C. Kersa district has an altitude ranges from 1400 to 3200 m above sea level. All these area of cattle source get similar weather circulation which allows similar rain distribution pattern characterized by low rainy season from February to May and high rain season from July to September. The dry season extends from October to January [16].

### Study population

Study animals were only local breed of cattle, sheep and goats brought to slaughterhouses at Haramaya and Aweday from Haramaya, Kurfa chale and Kersa district. Each species of the animal came from different districts which used as the place of origin and both male and female were included as categorical factors. Animals were also categorized based on their body condition score as described by [17] into three categories: good, medium and poor. Age of those animals was divided into young and adult.

### Study design and methodology

Both cross-sectional and active abattoir survey supported by questionnaire and retrospective study of patient case book survey were conducted.

#### Active abattoir survey

Active abattoir survey was conducted in Haramaya and Aweday municipal abattoirs from October, 2016 to June, 2017. During the study period, both abattoirs were visited three days per week for AM and PM inspection. Codes were given for the butcher houses to which slaughtered animals are given at both AM and PM (by permanent marker on gluteal region).

**Ante mortem examination:** AM examination was carried out on individual animal in the lairage. Inspection of the animals was made while at rest or in motion for any obvious sign of disease and abnormality following the FAO guidelines. On each visit, AM inspection was conducted after coding the systematically selected animals of all species and categorized according to origin, sex, age and body condition score. District where the animal came from was used as the origin variable, young and adult were used for age category and body condition score also categorized into good, medium and poor before slaughter with strict physical examination to make judgment and approve for slaughtering. Additionally, general behavior of

the animals, nutritional status, cleanliness and sign of diseases and abnormality of any type were registered according to the standard AM inspection procedures. The animals those fit the standards were allowed to pass for slaughtering and judgment was done following the procedure illustrated [18].

**Post mortem examination:** According to Meat Inspection Regulation Notice Number 428/1972 by Government of Ethiopia [19], the routine inspection of carcass was done as per the procedure stated below. Tongue: Visual inspection and palpation of the surfaces and a longitudinal ventral incision of the tongue from the tip of the root. Triceps muscles: One deep incision into the triceps muscles of both sides of the shoulder. Masseter muscle: Extensive deep incision into external and internal muscles of masseter parallel to the plane of the jaw. Heart: Visual inspection and longitudinal incision of the myocardium from base to apex. But more incision can be made when necessary. Neck muscle: Visual inspection and three parallel incisions into long axes of the neck muscles on both sides should be done. Thigh muscle: Two parallel incisions on the thigh muscles of both hind legs. Lung: Careful inspection, palpation and two parallel incisions into the diaphragmatic lobes of the lung through the lung substances and visual examination of intercostal muscles and incisions when necessary. Liver: After visualization and palpation on the surface, incision should be made along bile duct up to hepatic vein and inspection for abnormality. However, minor infections are difficult to detect irrespective of the skill of the inspector.

Throughout each visit of post-mortem inspection, all organs and carcass were thoroughly examined by visual inspection, palpation and systematic incisions for the presence of cysts, adult parasites and other pathological lesions that change in color, consistency and size of the organs were differentiated and the results were recorded and the decisions were classified as totally approved, partially approved, conditionally approved as fit for human consumption and totally condemned as unfit for human consumption based on guidelines on meat inspection for developing countries [20]. These areas were identified and recorded and recorded along animal's ante mortem record on the table format prepared on note book.

**Questionnaire survey:** Concerning the public health significance, selected individuals from both in and around Haramaya and Aweday were questionnaire to evaluate their knowledge, attitudes and practice on zoonotic disease transmitted from animals. The questionnaire was translated into local language (Afaan Oromo) and supplemented for those can read and write while illiterate personals were interviewed. It was well designed to gather about their custom of back yard slaughter and habit of eating raw meat and awareness of its effect; experience in abnormality of organs and its cause in slaughtered animal; information on meat born zoonotic disease transmitted to human; attitude of feeding infected viscera to dogs; having close contact with dog and awareness toward disease transmitted from it and using surface water for drinking or washing food equipment and their hand. Accordingly, the totals of 100 peoples were randomly selected as had been met on the way, in the butcher house and at their home. Questionnaire was distributed to those can able to read and write while illiterates were interviewed. These peoples were stratified based on their sex, age, religion, residential place (urban, rural area) and their education level.

**Retrospective study:** The significance of certain disease like *Taenia saginata* infection (locally known as "kosso"), human hydatidosis and others of documented patient case folder in 2015 and 2016 were searched in the Hiwot-Fana and Haramaya hospitals and Addele health center. Hiwot-Fana hospital is found in Harar city whereas the

Haramaya hospital and Addele health center are found in Haramaya district.

Cystic-echinococosis (hydatid cyst) cases from the total patient admitted for X-ray and ultrasound examination following clinical examination and recorded tentatively as hydatidcyst in Hiwot-Fana and Haramaya hospitals from September 2015 to June 2017. In addition, *Taenia saginata* infection cases were obtained from the laboratory case book of the total patient admitted for fecal examination following history and clinical examination, suspecting GIT parasite invasion in both these hospitals and Addele health center.

### Sample size determination

Assuming there is no previous report on the prevalence of major cause of organ condemnation in the study area, the sample size was determined based on 50% expected prevalence at 95% confidence interval and 5% degree of precision using the formula described by [21].

$$N = \frac{1.96^2 \times P_{exp} (1 - P_{exp})}{D^2} = \frac{1.96^2 \times 0.5(1 - 0.5)}{(0.05)^2} = 384$$

N=total sampled population

$P_{exp}$ =expected prevalence of organ condemnation

D=degree of precision

1.96 is equals to the value of z at 95% confidence interval

However, in order to increase the degree of precision 316 of study animals were added and a total of 700 animals were sampled.

### Sampling technique

At both abattoirs the study animals were selected using systematic random sampling from animals detained for slaughters and the selected ruminants were then given codes during AM inspection. The questionnaire was conducted based on random sampling of people. However, human hydatidosis and *T. saginata* taeniasis were from case books (total patients admitted for x- ray and ultrasound examination and conducted stool examination suspecting for gastro-intestinal parasitosis respectively).

### Financial loss

The annual financial loss in Haramaya and Aweday municipal abattoirs was assessed based on the average of previous (2015 and 2016) total annual slaughter of cattle, sheep and goats at both abattoirs and the rate of organ and carcass rejection from market during active abattoir survey. Accordingly, the average annual slaughter of 2786 cattle, 3785 sheep and 4158 goats were obtained in Haramaya municipal abattoir while 3273 cattle, 3690 sheep and 4478 goats were assessed in Aweday municipal abattoir. All affected organs and carcasses rejected due to the presence of gross lesions encountered in each species were used to calculate financial losses. The retail market price of different organs and 1 kg meat (carcass) in all species was collected from different butchershops of the study areas and the average price was used for calculation (Table 1). The annual financial loss due to organ and carcass condemnation was estimated based on the formula set by [22].

$AEL = ASR(RMP \times CR)$ , Where:

AEL: Annual Economic Loss estimated due to organ and carcass condemnation in cattle/sheep/goats

ASR: Annual Slaughtering Capacity of cattle/sheep/goats in both abattoirs

RMP: Average cost of each cattle/sheep/goat's liver/lung/heart/kidney/carcass CR: Proportion of each organ and carcass condemnation in cattle/sheep/goat's.

### Data management and analysis

Data recorded on Microsoft excel was imported to SPSS soft software version 20 for analysis. The association between species, abattoir, origin, sex, age and body condition score was analyzed by logistic regression and difference was regarded statistically significant if  $p$ -value is  $\leq 0.05$  at 95% confidence level. Prevalence of major cause of organ condemnation and proportion of condemned organs as well as annual financial losses were assessed using descriptive statistics. Also retrospective data obtained from hospital was counted manually and percentage was calculated.

## Results

### Ante mortem finding

Out of the total (n=700) animal examined during the study, 23 (3.286%) animals, comprise 11 (4.58%) of cattle, 5 (2.17%) of sheep and 7 (3.04%) of goats, were demonstrated different types of abnormalities. Of these abnormalities, branding (1.66%), coughing (0.83%), lacrimation (0.42%), nasal discharge (0.42%) and rough hair coat (1.25%) were found in this study. In small ruminant, coughing (0.87%), rough hair coat (0.87%) and nasal discharge (0.43%) in sheep while coughing (1.3%), rough hair coat (0.43%), nasal discharge (0.87%) and lameness (0.43%) were encountered in goats (Table 2). These animals were conditionally passed for slaughter.

### Post mortem finding

Out of the total animals examined, 174 (24.8%) animals were contracted abnormality of specific organs, resulted organs or carcass condemnation. In this study, the rate of organ condemnation was obtained significantly different among the species at ( $p=0.00$ ) with prevalence of 77(32%), 54(23.5%) and 43(18.7%) in cattle, sheep and goat respectively. The cattle were found about more than two times (AOR=2.69) affected than goat and sheep also were found relatively more affected (AOR=1.70) than goats. In addition, among body condition category, the highest rate of organ condemnation was recorded in animals with poor BCS at prevalence of (75.7%) followed by medium (32.3%) and good (19.3%) BCS with high significance level at ( $p=0.00$ ). The rate of organ condemnation had shown 27.6%, 26.8% and 13.1% prevalences in those animals originated from Haramaya, Kersa and Kurfa chale districts respectively with high level of significance at ( $p=0.00$ ). The animals slaughtered at Haramaya abattoir relatively found to be affected (AOR=1.36) than those slaughtered at Aweday abattoir. Of total examined animals 32.1% female and 22% male were encountered with abnormality of certain organs indicating, females had significantly higher chance of getting abnormality than males (AOR=1.67;  $p=0.00$ ). The result also indicated rate of organ and carcass condemnation were 26% and 12.7% in adult and young ages respectively ( $p=0.00$ ) (Table 3).

During the course of the study, 84 (12%) of lung were condemned where higher frequency was found in cattle (14.2%) followed by sheep (12.6%) and goat (9.13%). The frequency of lung condemnation due to hydatid cyst (6.3%) was considerably higher which embrace (7.9%), (7.83%) and (3%) in cattle, sheep and goat respectively. Following the

Organs	Average retail market price per Ethiopian birr (ETB)	
	Cattle	Sheep and Goat
Tongue	25	10
Heart	30	15
Liver	80	45
Lung	40	30
Spleen	10	5
Kidney	20	6
Muscle (1 kg)	120	120

**Table 1:** Retail market price of different organs in cattle, sheep and goat.

Abnormality	Cattle (N=240)	Ovine (n=230)	Caprine (n=230)	Total (n=700)
Coughing	2 (0.83%)	2 (0.87%)	3 (1.3%)	7 (1%)
Branding	4 (1.66%)	-	-	4 (0.57%)
Lacrimation	1 (0.42%)	-	-	1 (0.14%)
Nasal discharge	1 (0.42%)	1 (0.43%)	2 (0.87%)	4 (0.57%)
Rough hair coat	3 (1.25%)	2 (0.87%)	1 (0.43%)	6 (0.86%)
Lameness	-	-	1 (0.43%)	1 (0.14%)
Total	11 (4.58%)	5 (2.17%)	7 (3.04%)	23 (3.28%)

**Table 2:** Type and prevalence of abnormalities encountered during ante mortem examination.

Organs affected	Cause	Species			Total (%) (n=700)
		Cattle (%) (n=240)	Sheep (%) (n=230)	Goat (%) (n=230)	
Lung	Hydatid cyst	19 (7.9)	18 (7.83)	7 (3)	44 (6.30)
	Emphysema	2 (0.83)	1 (0.43)	2 (0.87)	5 (0.71)
	Pneumonia	3 (1.25)	-	3 (1.3)	6 (0.86)
	Hepaticization	4 (1.7)	4 (1.74)	3 (1.3)	11 (1.57)
	Adhesion	-	3 (1.3)	5 (2.2)	8 (1.14)
	Abscessation	3 (1.25)	-	-	3 (0.43)
	Lung Worm	3 (1.25)	3 (1.3)	1 (0.43)	7 (1)
	<b>Sub-total</b>	<b>34 (14.2)</b>	<b>29 (12.6)</b>	<b>21 (9.13)</b>	<b>84 (12)</b>
Liver	Fasciolosis	18 (7.5)	14 (6.1)	2 (0.87)	34 (4.86)
	Fibrosis	4 (1.7)	3 (1.3)	9 (3.9)	16 (2.3)
	Cirrhosis	5 (2.1)	1 (0.43)	3 (1.3)	9 (1.3)
	Hydatid cyst	9 (3.75)	12 (5.2)	4 (1.74)	25 (3.57)
	Total	37 (15.4)	32 (13.9)	18 (7.83)	87 (12.43)
Kidney	Infarction	3 (1.25)	2 (0.87)	2 (0.87)	7 (1)
	Calculi	-	-	1 (0.43)	1 (0.14)
	Total	3 (1.25)	2 (0.87)	3 (1.3)	8 (1.14)
Heart	Total	6 (2.5)	-	-	6 (0.86)
	Pericarditis	5 (2.1)	3 (1.3)	4 (1.74)	12 (1.7)
	Total	11 (4.58)	3 (1.3)	4 (1.74)	18 (2.57)
Tongue	Total	6 (2.5)	-	-	6 (0.86)
Spleen	Hydatid cyst	4 (1.7)	2 (0.87)	-	8 (1.14)
Muscle	Total	4 (1.7) (7 kg)	-	-	4 (0.57)
Carcass	Total	2 (0.83)	-	-	2 (0.29)

AOR: Adjusted Odd Ratio; Ref: Reference; BCS: Body Condition Score; CI: Confidence of Interval

**Table 3:** Association of risk factors towards condemnation rate of certain organs.

hydatidcyst, hepatization (1.57%), adhesion (1.14%), lung worm (1%), pneumonia (0.86%), Emphysema (0.71%) and abscessation (0.43) were the major cause of lung condemnation regardless of species affected. Abscessation of lung was confined to cattle and accounted for rejection of 3 lungs while adhesion was found in small ruminants. Fasciolosis was resulted the highest rate of liver condemnation in cattle (7.5%) and then sheep (6.1%) while fibrosis (3.9%) was the leader in goats. Of the total liver examined 87 (12.43%) were condemned due to fasciolosis (4.86%), fibrosis(2.3%), cirrhosis(1.3%), hydatidcyst (3.57%) and *S. hepatica* (0.43%) regardless of the species affected (Table 4).

Infarction (1%) and renal calculi (0.14%) were the only lesion resulted in kidney condemnation. Infarction was contributed 1.25%, 0.87% and 0.87% in cattle, sheep and goat respectively; while a calculus (0.43%) was encountered only in goat. *C. bovis* and pericarditis were also the only cause of heart condemnation in this study with the prevalence of 0.86% and 1.7% respectively. But *C. bovis* was only found in cattle and caused condemnation of 2.5% heart, tongue (2.5%), (1.7%) 7 kg muscle partially and two carcasses (0.83%) totally. Hydatid cyst was the only lesion obtained in spleen and contributed to its condemnation with 1.7% in cattle and 0.87% in sheep; it was not encountered in spleen of goat (Table 4).

### Financial loss

The direct financial loss of condemned organs in each species was calculated based on current retail market price and the annual estimate was computed by multiplication with proportion of rejection and annual slaughtering capacity of abattoir. Then the obtained values in each species were added to compute the annual financial loss in both abattoirs by Ethiopian birr (ETB) which converted to USD.

Accordingly, the total financial losses due to organ and carcass condemnation were estimated to be 20559.43 and 20232.85 USD in Haramaya and Aweday municipal abattoir respectively. In this study, the annual financial loss due to lung condemnation was found 30366 ETB in Haramaya and 35320.69 ETB at Aweday municipal abattoirs. The leading financial loss (14218.3 and 21802.28 ETB at Haramaya and Aweday municipal abattoirs respectively) was due to condemnation of lungs affected by hydatid cyst. Tongue, muscle and carcass were condemned due to infestation by *C. bovis* and posed great estimate of annual financial loss (Tables 5 and 6).

### Questionnaire and retrospective survey

In the present study, 68% and 63% of the total respondents were

Organs affected	Cause	Species			Total (%) (n=700)
		Cattle (%) (n=240)	Sheep (%) (n=230)	Goat (%) (n=230)	
Lung	Hydatid cyst	19 (7.9)	18 (7.83)	7 (3)	44 (6.30)
	Emphysema	2 (0.83)	1 (0.43)	2 (0.87)	5 (0.71)
	Pneumonia	3 (1.25)	-	3 (1.3)	6 (0.86)
	Hepatization	4 (1.7)	4 (1.74)	3 (1.3)	11 (1.57)
	Adhesion	-	3 (1.3)	5 (2.2)	8 (1.14)
	Abscessation	3 (1.25)	-	-	3 (0.43)
	Lung Worm	3 (1.25)	3 (1.3)	1 (0.43)	7 (1)
	<b>Sub-total</b>	<b>34 (14.2)</b>	<b>29 (12.6)</b>	<b>21 (9.13)</b>	<b>84 (12)</b>
Liver	Fasciolosis	18 (7.5)	14 (6.1)	2 (0.87)	34 (4.86)
	Fibrosis	4 (1.7)	3 (1.3)	9 (3.9)	16 (2.3)
	Cirrhosis	5 (2.1)	1 (0.43)	3 (1.3)	9 (1.3)
	Hydatid cyst	9 (3.75)	12 (5.2)	4 (1.74)	25 (3.57)
		1 (0.42)	2 (0.87)	-	3 (0.43)
	<b>Total</b>	<b>37 (15.4)</b>	<b>32 (13.9)</b>	<b>18 (7.83)</b>	<b>87 (12.43)</b>
Kidney	Infarction	3 (1.25)	2 (0.87)	2 (0.87)	7 (1)
	Calculi	-	-	1 (0.43)	1 (0.14)
	<b>Total</b>	<b>3 (1.25)</b>	<b>2 (0.87)</b>	<b>3 (1.3)</b>	<b>8 (1.14)</b>
Heart		6 (2.5)	-	-	6 (0.86)
	Pericarditis	5 (2.1)	3 (1.3)	4 (1.74)	12 (1.7)
	<b>Total</b>	<b>11 (4.58)</b>	<b>3 (1.3)</b>	<b>4 (1.74)</b>	<b>18 (2.57)</b>
Tongue		6 (2.5)	-	-	6 (0.86)
Spleen	Hydatid cyst	4 (1.7)	2 (0.87)	-	8 (1.14)
Muscle		4 (1.7) (7 kg)	-	-	4 (0.57)
Carcass		2 (0.83)	-	-	2 (0.29)

**Table 4:** Type of condemned organs, cause and rate of condemnation in cattle, sheep and goat.

Organs affected	Cause	Frequency of organ rejection in Haramaya abattoir			Total annual economic loss (EL)	
		Cattle (%) (n=120)	Sheep (%) (n=115)	Goat (%) (n=1)	In ETB	In USD
Lung	Hydatid cyst	9 (7.5)	7 (5.83)	2 (1.74)	14218.3	604.26
	Emphysema	1 (0.83)	1 (0.87)	1 (0.87)	1785	75.86
	Pneumonia	1 (0.83)	-	1 (0.87)	1648.5	70
	Hepaticization	2 (1.7)	1 (0.87)	3 (2.6)	4193	178.2
	Adhesion	-	2 (1.74)	1 (0.87)	2040.5	86.72
	Abcessation	2 (1.7)	-	-	1894.48	80.5
	Lung Worm	2 (1.7)	3 (2.6)	1 (0.87)	4585.98	194.9
Total	No. (%)	17 (14.2)	14 (12.2)	9 (7.82)		
	Annual EL	15891.44	7966.49	6503	30366	1290.52
Liver	Fasciolosis	11 (9.2)	6 (5.2)	2 (1.74)	32542.73	1383
	Fibrosis	1 (0.83)	2 (1.74)	5 (4.35)	12952.95	550.5
	Cirrhosis	3 (2.5)	1 (0.87)	2 (1.74)	10234.87	434.97
	Hydatid cyst	3 (2.5)	4 (3.5)	-	11533	490.14
		1 (0.83)	1 (0.87)	-	3332	141.6
Total	No. (%)	19 (15.8)	14 (12.2)	9 (7.83)		
	Annual EL	35348.96	20745.55	14501	70595.55	3000.24
Kidney	Infarction	1 (0.83)	1 (0.87)	2 (1.74)	1094	46.5
	Calculi	-	-	1 (0.87)	217	9.22
Total	No. (%)	1/0.83	1 (0.87)	3 (2.61)		
	Annual EL	463	197	651	1311	55.72
Heart		4 (3.3)	-	-	2758.14	117.23
	Pericarditis	3 (2.5)	1 (0.87)	3 (2.6)	4205.12	178.7
Total	No. (%)	7 (5.8)	1 (0.87)	3 (2.6)		
	Annual EL	4847.64	494	1621.62	6963.26	295.93
Tongue		4 (3.3)	-	-	2298.45	97.7
Spleen	Hydatid cyst	1 (0.83)	-	-	231.24	9.83
Muscle		3 (2.5) (5 kg)	-	-	41790	1776
Carcass		1 (0.83) (119 kg)	-	-	330208	14033.3
Total annual EL in	ETB	431078.73	29403.04	23276.62	483763.5	20559.43
	USD	18320.4	1249.6	989.23	20559.43	

EL: Economic Loss; ETB: Ethiopian Birr; money conversion rate: 1USD=23.53 ETB in 2017

**Table 5:** Rate of rejection of organs with causative lesions in Cattle, Sheep and Goats slaughtered in Haramaya municipal abattoirs, and estimated annual financial loss.

claimed regular consumption of raw meat and thought as more nutritious than cooked one respectively. The habit of eating raw meat and considering it as nutritious were found highest percentage in illiterate (100%) and primary school respondents while the lowest (33.3%) was recorded among the respondent of 15 to 30 ages. All of respondents (100%) with educational status of college and university level were found aware of eating infected raw meat as a source *T. saginata* taeniosis (locally known as “kosso”) and relatively smaller percentage was recorded in female (16.6%). The habit of feeding infected raw viscera or organs to dog be generally distributed throughout all stratification (Tables 7 and 8). The 100% of respondents dwell in rural area use back yard slaughtered meat while 100% of college and university level respondents were selected to use abattoir slaughtered meat.

However, majority of the respondents were claimed as they have

no preference whether back yard slaughtered or abattoir slaughtered meat. Also according to this study, (97.3%) of illiterate, 83% of urban, (76.3%) of Christian religion respondents were the major stratification having close contact or association with dog while the lowest percentage (27.6%) was found in rural area respondents. However, only few 19 (19%) of respondents were almost aware that the dog could be the source of only rabies virus disease.

Retrospective survey was conducted to assess the significance of *T. saginata* taeniosis and human hydatidosis in Hiwot-fana hospital, Haramaya hospital and Addele health center during 2015 and 2016. The case of *T. saginata* taeniosis was collected from the total patient case book registered as GIT parasitosis and confirmed based for *T. saginata* based on stool examination following history and clinical examination. Out of the total patient admitted for X-ray and ultrasound examination following clinical examination and registered as hydatid case.

Organ affected	Cause	Frequency of organ rejection in Aweday abattoir			Total annual economic loss (EL)	
		Cattle (%) (n=120)	Sheep (%) (n=115)	Goat (%) (n=115)	In ETB	In USD
Lung	Hydatid cyst	10 (8.3)	11 (9.6)	5 (4.3)	21802.28	926.57
	Emphysema	1 (0.83)	-	1 (0.87)	1865.77	79.3
	Pneumonia	2 (1.7)	-	2 (1.74)	3783.98	160.8
	Hepaticization	2 (1.7)	3 (2.6)	-	4144.44	176.13
	Adhesion	-	1 (0.87)	4 (3.5)	3776.66	160.5
	Abcessation	1 (0.83)	-	-	1086.6	46.18
	Lung Worm	1 (0.83)	-	-	1086.6	46.18
Total	No. (%)	17 (14.2)	15 (13)	12 (10.4)		
	Annual EL	16351.84	9645.66	9323.19	35320.69	1501.1
Liver	Fasciolosis	7 (5.8)	8 (6.96)	-	26743.8	1136.58
	Fibrosis	3 (2.5)	1 (0.87)	4 (3.5)	15043.45	639.33
	Cirrhosis	2 (1.7)	-	1 (0.87)	6204	263.7
	Hydatid cyst	6 (5)	8 (6.96)	4 (3.5)	31701.93	1347.3
		-	1 (0.87)	-	1444.6	61.4
Total	No. (%)	18 (15)	17 (15.6)	9 (7.84)		
	Annual EL	39275.72	26003.36	9558.7	74837.78	3180.53
Kidney	Infarction	2 (1.7)	1 (0.87)	-	1306	55.5
	Calculi	-	-	-	-	-
Total	No. (%)	2 (1.7)	1 (0.87)	-		
	Annual EL	1113	193	-	1306	55.5
Heart		2 (1.7)	-	-	1669	70.93
	Pericarditis	2 (1.7)	2 (1.74)	1 (0.87)	3216.4	136.7
Total	No. (%)	4 (3.4)	-	-		
	Annual EL	3338	963	584.4	4885.4	207.62
Tongue		2 (1.7)	-	-	1391	59.12
Spleen	Hydatid cyst	3 (2.5)	2 (1.74)	-	1139.25	48.42
Muscle		1 (0.83) (2 kg)	-	-	6519.8	277.1
Carcass		1 (0.83) (108 kg)	-	-	352070	14962.6
	ETB	419418	37194.6	19466.3	476078.9	20232.85
	USD	17824.82	1580.73	827.3	20232.85	

**Table 6:** Rate of rejection of organs with causative lesions in cattles, sheeps and goats slaughtered in Awaday municipal abattoirs, and estimated annual financial loss.

Retrospectively, the total of 42 (0.167%) human hydatidosis and 791 (1.89%) *T. saginata* taeniosis were recorded out of the total case surveyed (25096) and (41812) respectively. The highest percentage of human hydatidosis (0.2%) and *T. saginata* taeniosis (2.95%) was obtained from Haramaya hospital and Addele health center respectively (Table 9).

## Discussions

### Ante-mortem findings

During AM examination, of the total 700 animals examined at Haramaya and Aweday abattoir 23(3.286%) animals were demonstrated different types of abnormalities. Of these 11 (4.58%) of cattle were 2 (0.83%) coughing, 4 (1.66%) branding, 1 (0.42%) nasal discharge, 1 (0.42%) lacrimation and 3 (1.25%) rough hair coat. Similar results were reported [14] in cattle slaughtered at Adigrat abattoir and relatively higher rate of these lesions [12] in Nekemte municipal abattoir. However, respiratory disorder 44 (29.73%), lameness 29 (19.59%) and localized swelling 17 (11.49%) were reported by [23] as the major AM abnormalities encountered. This might be due to differences in management and care towards animal handling, and long distance

journey of animals.

In small ruminant, coughing (0.87%), rough hair coat (0.87%) and nasal discharge (0.43%) in sheep while coughing (1.3%), rough hair coat (0.43%), nasal discharge (0.87%) and lameness (0.43%) were encountered in goats. However, relatively higher rate were reported [13] and higher prevalence of AM finding like nasal discharge in goat (8.85%) and sheep (9.64%), Coughing in goat (4.43%) and sheep (3.91%) and Lameness in goat (2.86%) and sheep (4.43%) were reported [11] at Bishoftu Elfora Export Abattoir. Long distance journey to bring the animal into the abattoir might result in stress that increases the frequency of AM abnormalities in their studies unlike our current study.

### Post mortem findings

Out of the total animals examined, 174 (24.8%) animals were contracted abnormality of certain organs, resulted organs or carcass condemnation. In this study, the rate of organ condemnation was significantly higher ( $p=0.00$ ) in cattle (32%) than in sheep 23.5% and in goat 18.7%. There was also significant variation ( $p=0.00$ ) in rate of organ condemnation among the districts where 27.6%, 26.8% and

		Sex		Age		Address		Total (n=100)
		Male (n=76)	Female (n=24)	15-30 year (n=36)	>30 year (n=64)	Urban (n=53)	Rural (n=47)	
Eat raw or improperly cooked meat	Yes	58 (76.3%)	10 (41.6%)	12 (33.3%)	56 (87.5%)	45 (85%)	23 (49%)	68%
	No	18 (23.7%)	14 (58.3%)	24 (66.6%)	8 (12.5%)	8 (15%)	24 (51%)	32%
Consider raw meat as nutritious	Yes	53 (69.7%)	10 (41.6%)	12 (33.3%)	51 (79.6%)	40 (75%)	23 (49%)	63%
	No	23 (30.2%)	14 (58.3%)	24 (66.6%)	13 (20.3%)	13 (24.5%)	24 (51%)	37%
Observed organ with lesion in slaughtered animal	Lung (fluid pouches)	25 (32.9%)	3 (12.5%)	12 (33.3%)	16 (25%)	28 (53%)	0 (0%)	28%
	Liver	8 (10.5%)	2 (8.3%)	0 (%)	10 (15.6%)	0 (0%)	10 (21%)	10%
	In muscle	3 (3.9%)	0 (0%)	0 (%)	3 (4.7%)	1 (1.9%)	2 (4.2%)	3%
	Haven't seen	43 (56.6%)	19 (79%)	24 (66.6%)	38 (59%)	25 (47%)	37 (78.7%)	62%
Measure taken on affected organ of slaughtered animal	Cooked and ate	29 (38%)	2 (8.3%)	12 (%)	19 (29.7%)	19 (35.8%)	12 (25.5%)	31%
	Fed pet animal	23 (30.2%)	5 (20.8%)	12 (33.3%)	16 (25%)	18 (34%)	10 (21%)	28%
	Couldn't identify	24 (31.6%)	17 (70.8%)	12 (33.3%)	29 (45.3%)	16 (30%)	25 (53%)	31%
Where to slaughter food animal	Backyard	43 (56.6%)	10 (41.6%)	24 (66.6%)	29 (45.3%)	6 (11.3%)	47 (100%)	53%
	Abattoir	33 (43.4%)	14 (58.3%)	12 (33.3%)	35 (54.7%)	47 (88.7%)	0 (0%)	47%
Prefer meat to eat	Slaughtered at backyard	8 (10.5%)	2 (8.3%)	0 (0%)	10 (15.6%)	0 (0%)	10 (21.3%)	10%
	Slaughtered at abattoir	17 (22.4%)	4 (16.6%)	12 (33.3%)	9 (14%)	9 (17%)	12 (25.5%)	21%
	Don't prefer	51 (61%)	18 (75%)	24 (66.6%)	45 (70.3%)	44 (83%)	25 (53%)	69%
Has close contact with dog	Yes	40 (52.6%)	17 (70.8%)	12 (33.3%)	45 (70.3%)	44 (83%)	13 (27.6%)	57%
	No	36 (47.3%)	7 (29.1%)	24 (66.6%)	19 (29.7%)	9 (17%)	34 (72.3%)	43%
Know disease from dog	Only rabies	18 (23.7%)	1 (4.2%)	10 (27.8%)	9 (14%)	19 (36%)	0 (0%)	19%
	Do not know any	58 (76.3%)	23 (95.8%)	26 (72.2%)	55 (86%)	34 (64%)	47 (100%)	81%
Use surface water	Drink	6 (7.9%)	5 (20.8%)	2 (5.5%)	9 (14%)	0 (0%)	11 (23.4%)	11%
	Washing: (food equipment, hand etc)	47 (61.8%)	7 (29.1%)	24 (66.6%)	20 (31.2%)	18 (34%)	36 (76.6%)	54%
	Never use	23 (30.2%)	12 (50%)	0 (0%)	35 (54.7%)	35 (66%)	0 (0%)	35%

Table 7: The respondent's awareness and attitude toward meat born disease and related disease cycle attribution based on sex age and address stratification.

		Religion		Educational status				Total (n=100)
		Muslim (n=62)	Christian (n=38)	Illiterate (n=37)	Primary school (n=10)	Secondary school (n=36)	College and university (n=17)	
Eat raw or improperly cooked meat	Yes	33 (53%)	35 (92%)	37 (100%)	7 (70%)	20 (55.5%)	4 (23.5%)	68%
	No	29 (46.8%)	3 (%)	0 (0%)	3 (30%)	16 (44.4%)	13 (76.5%)	32%
Consider raw meat as nutritious	Yes	31 (50%)	32 (84.2%)	37 (100%)	7 (70%)	15 (41.6%)	4 (23.5%)	63%
	No	31 (50%)	6 (15.8%)	0 (0%)	3 (30%)	21 (58.3%)	13 (76.5%)	37%
Observed organ with lesion in slaughtered animal	Lung (fluid pouches)	28 (45.16%)	0 (0%)	7 (18.9%)	1 (10%)	11 (%)	9 (53%)	28%
	Liver	7 (11.3%)	3 (7.9%)	9 (%)	0 (0%)	1 (0%)	0 (0%)	10%
	In muscle	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Haven't seen	27 (43.5%)	35 (92%)	21 (%)	9 (90%)	24 (66.6%)	8 (47%)	62%
Measure taken on affected organ when observed in slaughtered animal	Cooked and ate	22 (35.5%)	9 (23.7%)	2 (5.4%)	0 (0%)	12 (33.3%)	2 (11.7%)	31%
	Fed pet animal	16 (25.8%)	12 (31.6%)	6 (16.2%)	10 (100%)	12 (33.3%)	12 (70.6%)	28%
	Couldn't identify	12 (19.3%)	29 (76.3%)	29 (78.4%)	0 (0%)	12 (33.3%)	3 (17.6%)	31%
Where to slaughter food animal	Backyard	40 (64.5%)	13 (34.2%)	29 (78.4%)	4 (40%)	20 (55.5%)	0 (0%)	53%
	Abattoir	22 (35.5%)	25 (65.8%)	8 (21.6%)	6 (60%)	16 (44.4%)	17 (100%)	47%
Prefer meat to eat	Slaughtered at backyard	10 (16%)	0 (0%)	6 (16.2%)	0 (0%)	4 (11.1%)	0 (0%)	10%
	Slaughtered at abattoir	12 (19.3%)	9 (23.7%)	0 (0%)	0 (0%)	13 (36.1%)	8 (47%)	21%
	Don't prefer	40 (64.5%)	29 (76.3%)	31 (83.8%)	10 (100%)	19 (52.7%)	9 (53%)	69%



Close contact with dog	Yes	28 (45.1%)	29 (76.3%)	33 (89.2%)	3 (30%)	12 (33.3%)	9 (53%)	57%
	No	34 (54.8%)	9 (23.7%)	4 (10.8%)	7 (70%)	24 (66.6%)	8 (47%)	43%
Know disease from dog	Only rabies	10 (16%)	9 (23.7%)	0 (0%)	0 (0%)	2 (69.4%)	17 (100%)	19%
	Do not know any	52 (83.8%)	29 (76.3%)	37 (100%)	10 (100%)	34 (94.4%)	0 (0%)	81%
Use surface water	Drink	5 (8%)	6 (15.8%)	9 (24.3%)	2 (20%)	0 (0%)	0 (0%)	11%
	Washing: (food equipment, hand etc)	41 (66%)	13 (34.2%)	20 (54%)	5 (50%)	21 (58.3%)	8 (47%)	54%
	Never use	16 (25.8%)	19 (50%)	8 (21.6%)	3 (30%)	15 (41.6%)	9 (53%)	35%

Table 8: The respondent's awareness and attitude toward meat born disease and related disease cycle attribution based on their religion and educational status stratification.

Health institution	Year	Human hydatidosis		Taeniasis	
		Visited cases	Clinical Case	visited cases	Confirmed cases
Hiwot-fana hospital	2015	6781	9 (0.13%)	6312	101 (1.6%)
	2016	7426	11 (0.15%)	5948	71 (1.19%)
	Total	14207	20 (0.14%)	12260	172 (1.4%)
Haramaya Hospital	2015	2947	8 (0.27%)	9864	148 (1.5%)
	2016	3346	6 (0.18%)	10450	198 (1.89%)
	Total	6293	14 (0.2%)	20314	346 (1.7%)
Addele health center	2015	2054	5 (0.24%)	4896	152 (3.1%)
	2016	2542	3 (0.12%)	4342	121 (2.78%)
	Total	4596	8 (0.17%)	9238	273 (2.95%)
	Grand total	25096	42 (0.167%)	41812	791 (1.89%)

Table 9: Retrospective data summary on Human hydatidosis and taeniasis from different Health institution.

13.6% rate were recorded in animals from Haramaya, Kersa and Kurfa Chale district respectively. Supporting our finding, the study conducted [24] reported the degree of liver condemnation due to fasciolosis is the highest in animals originated from Haramaya district (30.9%) than Kersa district (26.7%) and Dawe (Kurfa chale district) (7.4%). This might be attributed to presence of a marshy area of common grazing land along the basin where Haramaya Lake was dried up and others like around Addelle and Finkille, which could create favorable condition for disease cycle and transmission.

The organ rejection rate was 1.7 times higher in female than male. The higher rate of organ condemnation in female might be due to the fact that farmers sold only female animals having reproductive abnormality and less productive due to presence of certain abnormality and it may also arose from small number of female included in the study. In contrast, [25] found 10.28% and 6.52% prevalence of harboring hydatidcyst in male and female respectively. In our study area, the adult (26%) animal were more subjected to organ condemnation than young age (12.7%) group with considerable level of significance ( $p=0.00$ ). [23] also reported (89.2%), (83.3%) and (74.5%) organ condemnation rate in old, adult and young in cattle and sheep slaughtered at Bahir-Dar municipal abattoir and [25] also reported higher condemnation rate of organs in adult age (12.11%) than young age (5.6%) in cattle slaughtered at Harar city abattoir. The higher rate of organ condemnation in aged animal might be due to prolonged time to acquire many infectious or non-infectious diseases that affect certain organ and cause condemnation during slaughter.

In this study, highest rate of organ condemnation was recorded in animals with poor BCS (75.7%) followed by medium (32.3%) and good (19.3%) BCS with high difference of significance level at ( $p=0.000$ ). Similar finding was reported [12,26]. Besides the nutritional imbalance, the rate of abnormalities of certain organ in animal which might leads to deprivation of body condition. In the present study 14.2% of lung was condemned due to different causes like hydatidcyst

(7.9%), hepatization (1.7%), lung worm (1.25%), abscessation (1.25%), pneumonia (1.25%) and the least was found emphysema (0.83%). Hydatid cyst was also the major cause of lung condemnation (7.83%) in sheep and (3%) in goat and followed by by hepatization, adhesion and Lung Worm in sheep. Only a single lung was condemned due to lung worm in goats. The present study reported higher rejection rate of lung due to hydatidosis in cattle than that reported [27] from Wolaita Sodo (15.95%) and [12] from Nekemte abattoir (12.7%). The higher rate 21.5% reported [28] from Adama municipal abattoir, (24.2%) [29] from Gondar Elfora abattoir. In addition, [23] reported that lung worm (16.4%), pneumonia (10.2%), hydatidosis (7.3%), abscess (4.2%) and hepatization as the major cause of lung condemnation in cattle and sheep slaughtered at Bahir-Dar municipal abattoir. Unlikely, pneumonia (21.6%) in sheep and 21.6% in goat, emphysema (7.2%) in sheep and 6.7% in goats and hydatid cyst (1.2%) in sheep and (1.4%) in goats are reported by [10] as major cause of lung rejection at Elfora Export Abattoir. This might be due to the long journey transportation of the animals from different region of Ethiopia into the Elfora abattoir could be trigger stress which lead to development of pneumonic disease like pasteurellosis. The lower infection rate of animals by hydatid cyst and lungworm might be attributed to the difference in grazing behavior of the animals and management practice in different area. Factors like differences in culture, social activity, systems of animal husbandry, variation of rainfall distribution, lack of proper removal of infected organ and attitude to dogs in various regions might have accounted for variation of the prevalence in different areas of a country. In this study, pneumonia was also responsible for the lung condemnation in cattle and goat.

Of the total liver examined, 87(12.43%) of liver were condemned (15.4% in cattle, 13.9% in sheep and 7.83% in goat) due to fasciolosis (4.86%), fibrosis (2.3%), cirrhosis (1.3%), hydatid cyst (3.57%) and *S. hepatica* (0.43%). Fasciolosis resulted to (7.5%), (6.1%) and (0.87%) liver condemnation in cattle, sheep and goat respectively and followed

by hydatid cyst (3.75%) in cattle and (5.2%) in sheep and the highest number of liver was condemned due to fibrosis (3.9%) in goat. *S. hepatica* was identified only in cattle and sheep in this study (Table 4). In this study, the prevalence of fasciolosis in cattle was partially agreed with the findings [28] in Adama, and [14] in Adigrat abattoir reported 9.6% and 9.26% respectively. However, this finding was much lower than that of [29] in Gondar, [27] in Sodo, whom reported 26.9%, and 24.24% respectively. In small ruminant [4] reported (7%) fasciolosis in sheep which agreed with the present findings while he reported higher (4.3%) in goats. The lower rate of liver condemnation in goat due to fasciolosis, hydatidcyst and *S. hepatica* than cattle and sheep mainly agreed with the study in tropics [4,11,30-32]. The higher rate of fasciolosis observed in cattle and sheep in comparison with goats could be due to their feeding behavior where sheep and cattle are usually grazers and goats tend to be more of browsers making them less exposed to the parasite.

The present study also showed that the heart was condemned due to pericarditis (1.7%) and *C. bovis* (0.86%) out of the total animal examined. Pericarditis was contributed to condemnation of (2.1%), (1.3%) and (1.74%) heart in cattle, sheep and goat respectively. This finding was agreed with the finding of [33] who reported 1.5% *C. bovis* on heart at Jimma abattoir. However, the higher rejection rate of heart was caused by Hematoma (22.69%) followed by *C. bovis* (8.40%) and Pericarditis (4.20%) at Dire Dawa municipal abattoir [8] and [34] reported that hydatid cyst was the most common cause of heart condemnation followed by *C. bovis* and pericarditis at Gondar ELFORA abattoir. However, in this study Pericarditis and *C. bovis* were the only cause of heart condemnation. This might be due to proper handling during slaughter and sufficient bleeding which can reduce hematoma.

In our study the kidney rejection rate was 1% (7) due to infection where 3 (1.25%), 2 (0.87%) and 2 (0.87%) were in cattle, sheep and goat respectively, and calcification (0.43%) only in goat. Hydatid cyst was the only cause of spleen condemnation 8 (1.14%) involving 4 (1.7%) and 2 (0.87%) in cattle and sheep. [9] reported nephritis (4.2%) as the major cause of kidney condemnation followed by hemorrhage (1.5%) and infarction (0.8%) in cattle slaughtered at Hawassa municipal abattoir and [11] also reported calcification (3.39%) in both sheep and goat while nephritis (3.65%) in goat and (3.91%) in sheep as the major lesion caused kidney condemnation. This lower frequency and type of lesion in this study might be attributed to the better animal husbandry practice of Hararghe population and variation of disease distribution and difference of community awareness in using veterinary health service.

In the current study 2.5% (n=240) of the cattle were encountered with organ and partial and total carcass condemnation due to *C. bovis* infestation. *C. bovis* was found the only PM abnormality resulted for partial condemnation of muscle (1.7%) and total condemnation of tongue (2.5%) and carcass (0.83%) out of the total cattle examined during the course of this study. Likewise, (2.8%) carcass was condemned due to *C. bovis* [12,26] reported *C. bovis* mostly caused partial condemnation of carcass/ muscle, (0.56%) tongue and (0.37%) total carcass due to *C. bovis* in cattles while [35] reported cysticercosis, tuberculosis and jaundice were the major cause of total carcass condemnation at Bolgatanga municipal abattoir of Ghana.

## Financial loss

Based on the active abattoir survey, the recorded estimate of annual financial loss in Haramaya and Aweday abattoir was found

about 483763.5 ETB and 476078.9 ETB due to organ and carcass condemnation in ruminants respectively. About 6351 USD was lost only from organs and carcasses condemnation during the active abattoir survey. The other study reported financial loss of about 342,228.00 ETB per annum [9] in cattle slaughtered at Hawassa municipal Abattoir, 110,361 ETB loss [15] on small ruminant slaughtered at luna export abattoir during the active abattoir survey and the higher loss 21,565,849 ETB was reported [26] in cattle slaughtered at Gondar ELFORA abattoir. These and other many studies didn't investigated cattle, sheep and goat at once and calculated annual financial loss which pretended difference. In addition, such difference in amount of financial loss likely due to difference of abattoir slaughter capacity, difference of disease distribution in different geographical area where the animal was originated and status and purpose of abattoir (high rate of condemnation in export abattoir to control standard quality assurance). Since thousands of abattoirs found in Ethiopia, billions of Ethiopian birr could be lost annually as a result of organ and carcass condemnation.

In this study, the highest annual financial loss estimate was experienced as a result of carcass/muscle condemnation due to heavy infestation of *C. bovis*, followed by liver and lung condemnation in both abattoirs. Due to carcass rejection about 68.25% (330208 ETB) financial loss was incurred in Haramaya abattoir and similar result in Aweday abattoir. The liver condemnation caused high loss (70595.55 ETB) per annum; out of this fasciolosis was accounted for 46% followed by fibrosis (18.3%), hydatid cyst and the rest by others in Haramaya abattoir (Table 5). Out of the total estimated annual financial loss in lung rejection, 46.8% was due to hydatid cyst and followed by lungworm (15.1%) and hepatization (13.8%) were the major lesion factors in Haramaya abattoir while also hydatid cyst was contributed for (61.7%) followed by hepatization (11.7%) and the rest by pneumonia, adhesion, emphysema and lungworm in Aweday abattoir. The study conducted by [10,12,36].

## Public health significance

Following examination of public health risk disease like hydatid cyst and *C. bovis* during abattoir survey, questionnaire survey was carried out to assess public awareness and practice on the ways of transmission of the disease and its significance in human patients was collected from hospital and health center around the study areas.

The data obtained from questionnaire and interview showed that 68% of respondents stated as they eat raw or improperly cooked meat. Among the stratification, 100% illiterate, 92% Christian religion, 87% >30 years age, 85% urban dwellers 76.3% male preferred eating raw meat. All the illiterate respondents considered raw meat as nutritious. The other study also stated that deep-rooted tradition of eating raw or improperly cooked meat (*kurt*, *kitffo* and *dullet*) dishes are all sources of viable cysts (*C. bovis*), a source of *T. saginata* taeniosis [37-40].

Being 28%, 10% and 3% of total respondents observed fluid pouches lesion on lung, abnormal liver and muscle respectively during animal slaughtering through their experience, 29% were supported delivering these abnormal raw viscera to dogs. Further, 53% of respondents slaughter food animals at their back yard, 10% prefer to eat backyard slaughtered meat and 69% had no preference. [25] Also mentioned that eating back yard slaughtered beef, close contact with stray dog and drinking surface water which contaminated with infected dog feces as the major ways of acquiring hydatidosis in human. Also [41,42] reported that eating uninspected backyard slaughtered raw meat had been considered as a risk factor for human hydatidosis. This

could be due to the low level of awareness of the people on zoonotic disease, because of cultural beliefs that raw meat is better than cooked one and the deeply established traditional habit of eating raw meat in the country [43]. Retrospective case book analysis of patients admitted for x-ray and ultrasound examination following clinical examination at hospitals and health center in and around the study area showed 0.167% (42/25096) human hydatidosis. The result in this study is higher than 0.1% and 0.044% prevalence of human hydatidosis reported by [14] from Addis Ababa and [44] from Bahir Dar respectively. However, the higher prevalence of human hydatidosis (0.195% and 0.22%) was reported [25] in and around Harar and from Portugal. This high prevalence in the study area might be due to low public awareness, back yard slaughtering practice, poor control measures and presence of large number of stray dogs that contribute to human infection [25]. In addition, 1.89% (791/41812) prevalence of *T. saginata* taeniosis in human was obtained from the case book of total patient's that registered as GIT parasitosis and confirmed for *T. saginata* based on stool examination following history and clinical examination. In support of this finding Teklemariam reported 1.1% prevalence of *T. saginata* taeniosis retrospectively from recorded laboratory data based on patients stool examination. However, the extremely higher prevalence of 60.7% and 64% were reported based on interviews among the study participants which had been infected by taeniosis at least once during the year before their study period [40]. This difference of prevalence between stool examination and interview result was due to well-known usage of taenicial tablet bought from local drug shop without physician prescription and usage of traditional taenicial drug. Generally, the deep-rooted culture of raw beef consumption, increased *C. bovis* in slaughtered cattle at abattoir and rough type of meat inspection resulted to increase its public health risk and maintain disease cycle.

### Conclusion and Recommendations

The present study revealed hydatid cyst, fasciolosis, *C. bovis*, fibrosis, hepatization, lungworm, cirrhosis, adhesion, infarction and pericarditis were the major causes of organs condemnation in cattle, sheep and goat while *C. bovis* exclusively affect cattle in Haramaya and Aweday municipal abattoirs. Among the species, the highest frequency of organ condemnation was found in cattle while the least was found in goats. Also, a group of body condition, origin and age collectively in cattle, sheep and goat were the major statistically significant risk factors toward condemnation of specific organ due to specific lesions. The major organs condemned in these abattoirs were found result in annual financial loss of about 20559.43 and 20232.85 USD in Haramaya and Aweday municipal abattoir respectively. 0.167% and 1.89% prevalence of human Hydatidosis and *T. saginata* taeniasis were found from hospitals and health center retrospectively, considered as a public health risk disease in the study area. Questionnaire survey result showed the majority of respondents accustomed to consume raw meat, eating back yard slaughtered meat and feeds dog the infected raw viscera. Such habit enhances the risk of public health as zoonosis. Therefore, veterinary officials should actively work to reduce burden of the disease in animals by performing proper medication and improving management system of animals based on farmer's awareness creation. In addition, it is important if veterinary officials and public health authorities cooperatively prepare public health education program to reduce deep-rooted custom of eating of raw meat, feeding abnormal raw viscera to dog, careless contact with dog and consumption of back yard slaughtered meat. Further, meat inspection should be performed by well-trained professionals and proper disposal of condemned organs were also highly recommended at the abattoirs.

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