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Article

The Major Platyhelminthes Parasites Causes of Red Offal Condemnation and Its Direct Economic Losses in Cattle Slaughtered at the Nekemte Municipal Abattoir, Western Ethiopia

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Abstract

Platyhelminthes are a significant cause of organ condemnation across the globe, particularly in Ethiopia. Consequently, a cross-sectional study was conducted from January to May 2024 to identify the Platyhelminthes responsible for organ condemnation and estimate its economic impact in cattle slaughtered at the Nekemte municipal abattoir. Standard ante-mortem and postmortem inspection procedures were employed. A total of 422 cattle were included in the study through systematic random sampling. Among the 422 slaughtered cattle, 59 (14%) exhibited clinical signs in ante-mortem examination, including rough hair coat (3.3%), lameness (2.6%), coughing (2.4%), tick infestation (1.9%), depression (1.7%), branding (1.2%), and blindness (0.9%). Postmortem examinations revealed that 132 (31.2%) cattle were infected by Platyhelminthes parasites. Due to these helminths 92 (21.9%) livers, 52 (12.3%) lungs, and 13 (3.1%) hearts were condemned. The major Platyhelminthes identified were *Fasciola* spp., *hydatid* cysts, *Cysticercus bovis*, and combined infections of *Fasciola* and *hydatid* cysts, with prevalence's of 15.9%, 6.4%, 3.1%, and 5.9%, respectively. A statistically significant difference ($P < 0.05$) was found in the prevalence of these major Platyhelminthes based on age and body condition. However, no statistically significant difference ($P > 0.05$) was observed in the sex and origin. The total annual economic loss due to organ condemnation in the study area amounted to 612,470.00 ETB. This study highlights a relatively high prevalence of organ condemnation due to Platyhelminthes infections. Thus, awareness should be raised among cattle owners and abattoir workers regarding the impact of parasites and the importance of safe disposal practices of condemned organs.

Keywords: cattle; economic loss; red offal organ; nekemte abattoir; platyhelminths

1. Introduction

The livestock sector is a dynamic and vital component of global agriculture, contributing approximately 40% to the global agricultural output and supporting the livelihoods and food security of nearly a billion people (Thornton, 2010). Livestock provide essential resources, including meat and milk, as well as draft power, manure, and transportation services. The country Ethiopia has abundant livestock resources and is ranked first in Africa and fifth globally in terms of livestock population. The livestock population includes over 71 million cattle, 43 million sheep, 54 million goats, 57 million

poultry/chickens, 13.33 million equines, and 7 million bee colonies, according to CSA (2023). Despite this vast resource, the sector's potential is hindered by pervasive animal diseases, malnutrition, inadequate husbandry practices, poor infrastructure, and limited trained personnel (PACE-Ethiopia, 2003). Among these challenges, parasitic diseases particularly, helminthic infections, mainly Platyhelminthes play a significant role in organ condemnation.

Platyhelminthes are among the primary helminthic parasites responsible for organ and carcass condemnations and economic losses in abattoirs worldwide, particularly in developing countries such as Ethiopia. In Ethiopian abattoirs, *Fasciola spp.*, *hydatid cysts*, *Cysticercus bovis*, and *Paramphistomum* have been identified as major causes of organ condemnation in cattle (Assefa et al., 2015; Denbarga et al., 2011; Fekadu et al., 2012). Beyond the condemnation of edible organs, these parasites contribute to significant economic losses by impacting cattle productivity and fertility, resulting in mortality, morbidity, weight loss, slowed growth, poor fertility performance, and reduced physical strength (Elsa et al., 2012).

Conducting abattoir surveys is an effective approach to identifying parasitic diseases of economic and public health significance (Abunna et al., 2010; Sheferaw and Abdu, 2017). These surveys not only enhance disease surveillance for conditions of human and animal health importance but also allow for the examination of animals entering the human food chain for unusual signs, lesions, or specific diseases (Alton et al., 2010). Generally, abattoir surveys are instrumental in understanding livestock disease epidemiology, assessing public exposure to zoonotic diseases, and estimating financial losses from condemned organs and carcasses (Moje et al., 2014).

In Ethiopia, various studies have aimed to document disease conditions observed during ante-mortem and postmortem inspections and to assess the economic impact of organ and carcass condemnations (Denbarga et al., 2011; Assefa et al., 2015; Fekadu et al., 2012; Mulatu et al., 2013). For instance, from the aspects of economic loss, Mesele et al. (2012) reported an annual financial loss of 21,565,849 ETB from condemned organs and carcasses at the Gondar Elfora abattoir, while Fekadu et al. (2012) estimated an annual economic loss of 172,664.09 ETB at Jimma Municipal abattoir. Similarly, Fasil (2009) reported a financial loss of 150,048.98 ETB per year at Gondar Municipal abattoir. Understanding the specific causes of organ condemnation and the associated economic losses is crucial for designing effective control measures, enhancing animal husbandry, and reducing preventable losses (Edwards et al., 1999).

Although multiple studies have examined the prevalence and economic losses due to carcass and organ condemnation in Ethiopian abattoirs, limited research is available on the causes of organ (red offal) condemnation in East Wollega, western Ethiopia. Notably, most studies at Nekemte Municipal Abattoir have focused on specific parasitic diseases, such as fasciolosis, hydatidosis, and *Cysticercus bovis*, without providing a comprehensive assessment of Platyhelminthes parasites contributing to red offal organ condemnation. Additionally, no citable data currently address the primary Platyhelminthes-related causes of red offal organ condemnation and the associated financial losses in cattle slaughtered at the Nekemte Municipal Abattoir. This study, therefore, aims to identify the primary Platyhelminthes parasites responsible for red offal organ condemnation and to evaluate the economic losses in cattle slaughtered at this abattoir.

2. Materials and Methods

2.1. Study Area

The study was conducted from January 2024 to May 2024 in the Nekemte Municipal abattoir, East Wollega Zone, Oromia region, Western Ethiopia (**Figure 1**). Nekemte town is located at 331 km from Addis Ababa. It is situated at the latitude of 9°4' 9571N and a longitude of 36°32'9281E. It found an altitude of 2124 meters above sea level. The mean annual rainfall and average temperature range from 1800-2200 mm and 20-25°C, respectively. The area receives bimodal rainfalls that are long rainy seasons and short rainy seasons. The long rainy seasons occur during the months of June to

September, while the short rainy seasons are observed during the months of March, April, and May (EWARD, 2007).

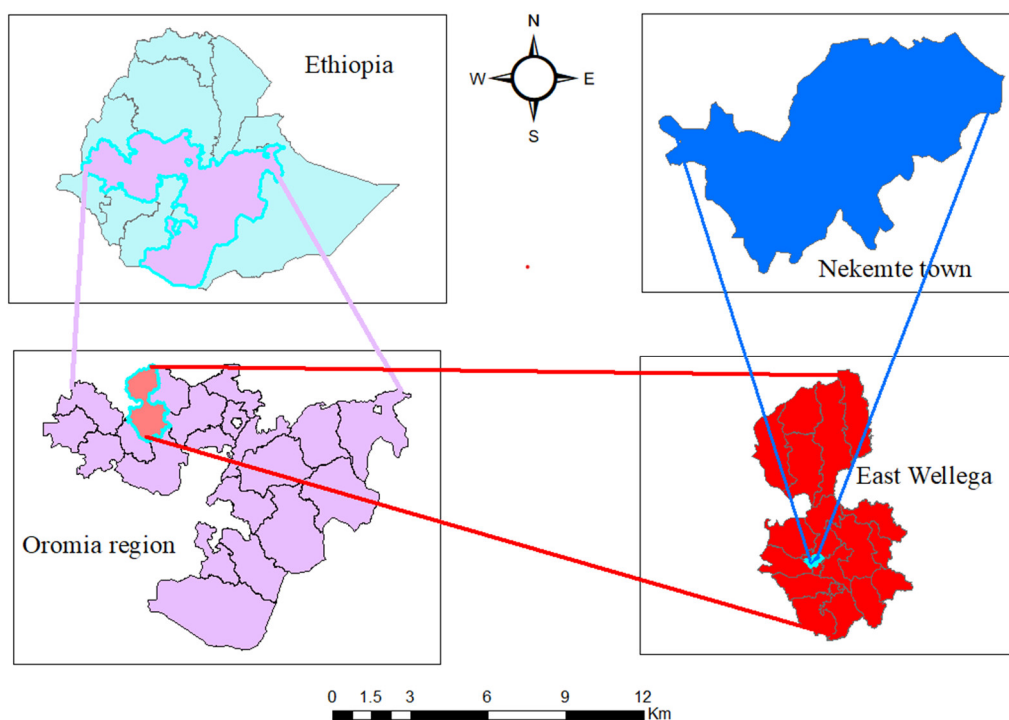


Figure 1. Study area map (Nekemte town).

2.2. Study Population

The study population was cattle presented to the abattoir for slaughter from different districts around the town, like Arjo Gudetu, Uke, Jimma Arjo, Sasiga, Getema, Baldra, Diga, and Nekemte town. 422 study cattle were randomly selected during the study period. Cattle age, sex, breed, body condition, and origin were considered as risk factors and recorded during data collection. The age study cattle was grouped as 3-5 years (young), 6-9 years (adult), and >9 years (old) by using dentation Pace and Wakeman (2003). The body condition of cattle was classified as poor, medium, and good based on Nicholson and Butterworth (1986). Furthermore, both male and female cattle, as well as only local breeds, were incorporated in the study.

2.3. Study Design and Sampling Techniques

A cross-sectional study was conducted from January to May 2024 to identify the primary Platyhelminthes parasites responsible for red offal organ condemnation and to estimate the associated economic losses in cattle slaughtered at the Nekemte Municipal Abattoir. Study cattle were chosen using a systematic random sampling method, with visits made to the abattoir twice weekly throughout the study period. During each visit, cattle were randomly selected for both ante-mortem and postmortem examinations until the total sample size of 422 cattle was achieved.

2.4. Sample Size Determination

The sample size for this study was calculated using the formula provided by Thrusfield (2013), based on an expected prevalence of 50%, a 95% confidence interval, and a 5% desired level of precision.

$$n = \frac{(1.96)^2 P_{exp} (1 - P_{exp})}{d^2}$$

where N = number of sample size, P_{exp} = expected prevalence, d^2 = absolute precision, CI = Confidence interval (95%). Using these parameters, the minimum sample size calculated was 384. However, to increase the precision of the study, this number was raised by 10%, resulting in a final sample size of 422 cattle.

1.5. Data Collection Methods

1.5.1. Ante-Mortem Examination

During the ante-mortem inspection, each of the study animals was examined. Sex, origin, breed, age, and body condition scoring of animals have been recorded. Both sides of the animal would be inspected at rest and in motion. Moreover, the general behavior of the animal and signs of disease have been properly registered according to the standard ante-mortem inspection procedures. Judgment was done according to the procedure given by FAO (2011), animals fit for human consumption were allowed for slaughter. The study animals were selected using a systematic random sampling method by considering the age, sex, breed, body condition, and origin of the cattle. During the study period, two visits were made each week, purposefully chosen based on the days with the highest number of cattle slaughtered out of the three slaughter days per week. Cattle were marked with identification codes using a permanent marker on their heads in the pre-slaughter holding area, and the data were recorded. On each selected day, forty cattle were slaughtered, with ten cattle chosen for examination. The first animal was randomly selected, and the subsequent cattle were selected at intervals of four as they entered the slaughterhouse, ensuring systematic sampling. Each selected animal then underwent a detailed postmortem inspection.

1.5.2. Post-Mortem Examination

During postmortem inspection red offal organs such as the liver, lung, spleen, kidney, and heart were thoroughly inspected by visualization, palpation, and incisions to find out about the presence of cysts of parasites (FAO, 2011; Mesele *et al.*, 2012). According to the guideline described by the Ministry of Agriculture, the examination includes a longitudinal incision of the heart from base to apex, two longitudinal ventral incisions of the tongue from tip to root, one deep incision into both sides of the triceps muscles of the shoulder, a deep incision into the external and internal muscles of the masseter parallel to the plane of the jaw, three parallel incisions into the long axes of the neck muscles on both sides, and one extensive incision. The results were recorded according to the organs examined. Judgment was made according to guidelines on meat inspection for developing countries and classified into the following categories of judgment. Approved as fit for human consumption, conditionally approved as fit for human consumption, totally condemned as unfit for human consumption, and partially condemned as unfit for human consumption (FAO, 2011).

2.5. Financial Loss Assessment

The direct financial losses from condemned organs were assessed based on the market value of the organs. This analysis took into account the annual slaughter capacity of the abattoir, market demand, average prices set by the abattoir's marketing department, and the type of organs rejected. The direct financial loss from organ condemnation was calculated using the following formula (Ogunrinde and Ogunrinde, 1980; Amuamuta *et al.*, 2012).

$$\begin{aligned} \text{Total Direct Financial Loss} &= \text{Annual slaughter capacity} \times \text{Average price of condemned organ} \\ &\times \text{Proportion of condemned organs} \\ ALC &= CSR \times LC \times P \end{aligned}$$

Whereas ALC = Annual loss from organs condemnation, CSR = Mean annual cattle slaughtered at the Nekemte abattoir, LC = Mean cost of one organ at the Nekemte and P = organ condemnation rate.

2.6. Data Management and Analysis

The collected data was entered into Microsoft Excel and analyzed using SPSS Statistics version 20. Descriptive statistics were employed to summarize the data and expressed in terms of frequency and percentage. Pearson Chi-Square (χ^2) was conducted to measure the degree of association between the prevalence of the parasitic diseases and risk factors. A p-value of less than 0.05 ($P < 0.05$) was considered as the cut-off value for statistical significance difference.

3. Result

3.1. Ante-Mortem Inspection Result

Among the 422 cattle slaughtered at the Nekemte Municipal Abattoir, 59 cattle (14%) exhibited various abnormalities during ante-mortem examination. The primary abnormalities observed included rough hair coat (3.3%), lameness (2.6%), coughing (2.4%), tick infestation (1.9%), depression (1.7%), branding marks (1.2%), and blindness (0.9%) in (Table 1). These findings highlight a range of health issues in cattle prior to slaughter.

Table 1. Abnormalities recorded during ante mortem examination.

Abnormal Conditions recorded	No. of cattle affected	Percentage (%)
Tick infestation	8	1.9
Lameness	11	2.6
Depression	7	1.7
Body brand	5	1.2
Coughing	10	2.4
Blindness	4	0.9
Rough hair coat	14	3.3
Total	59	14

3.2. Results Postmortem Examination

In the current study, out of 422 cattle inspected, 132 (31.3%) tested positive for Platyhelminthes parasites. Among these, (15.9%) were positive for *Fasciola*, (6.4%) for hydatid cysts, (3.1%) for *Cysticercus bovis*, and (5.9%) showed co-infections of hydatid cysts and *Fasciola* (Table 2). These results indicate a significant prevalence of Platyhelminthes parasitic infections in slaughtered cattle.

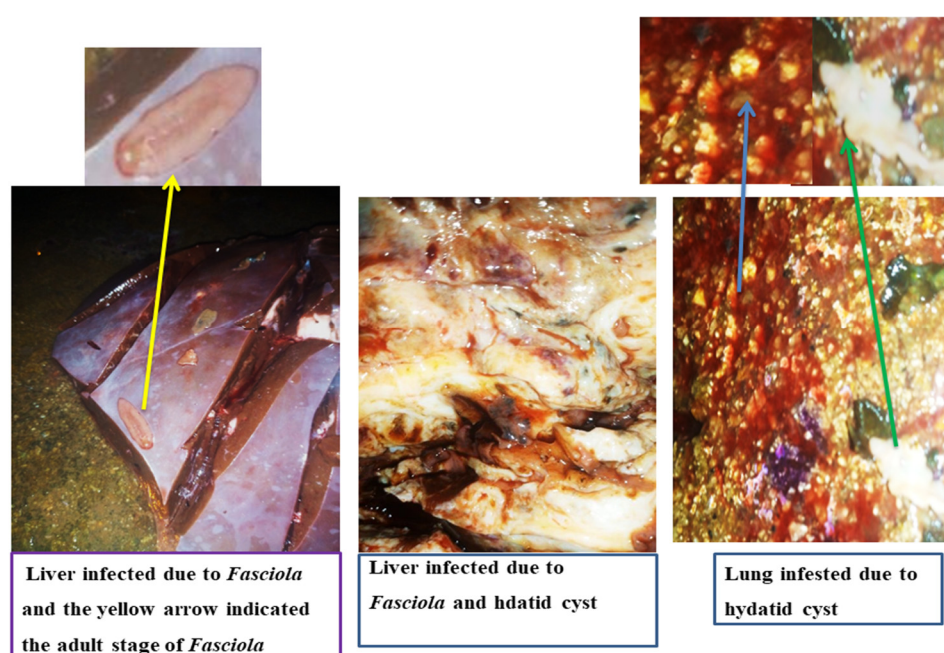
Postmortem examination revealed that certain organs were deemed unfit for domestic markets and human consumption due to parasitic infections. Specifically, the liver, lung, and heart were condemned due to the presence of *Fasciola* (6.4%), hydatid cysts (3.1%), *Cysticercus bovis* (3.1%), and a combination of hydatid cysts and *Fasciola* (5.9%). The highest rate of condemnation due to helminthic parasites was observed in the liver, followed by the lungs and heart in (Figure 2). In all cases, *Fasciola* was identified as the most common cause of visceral organ condemnation (Table 3).

Table 2. The overall prevalence of the major Platyhelminthes in the Nekemte municipal abattoir.

Major Platyhelminthes encountered	No. of Positive Animals	Prevalence (%)
Fasciolla	67	15.9
Hydatic Cyst	27	6.4
Cysticercus bovis	13	3.1
Fasciolla and Hydatic cyst	25	5.9
Total	132	31.3

Table 3. Summary of organ condemnation due to Platyhelminthes in the Nekemte municipal abattoir.

Organs	Type Platyhelminthes	No. of organs condemned	Percent (%)
Liver	<i>Fasciola</i>	67	15.9
	<i>Fasciola</i> and Hydatid cyst	25	5.9
	Total	92	21.8
Lung	Hydatid cyst	27	6.4
	<i>Fasciola</i> and Hydatid cyst	25	5.9
	Total	52	12.3
Heart	<i>Cysticercus bovis</i>	13	3.1
	Total	13	3.1
Overall total		157	37.2

**Figure 2.** The major infected and condemned red offal organ due to Platyhelminthes.

The organ condemnation rates associated with different risk factors were examined, with 132 (31.3%) found to have helminthic infections. Among these, 67 (15.9%) livers, 27 (6.4%) lungs, 13 (3.1%) hearts, and 25 (5.9%) combinations of lung and liver were condemned. Adult cattle showed higher condemnation rates compared to young and old animals. Regarding sex, male cattle had higher condemnation rates than females, and cattle in medium body condition were more likely to be condemned than those in good body condition. The highest condemnation rates were observed in Sasiga for liver (19.0%), Uke for lungs (9.5%), Baldra for heart (6.1%), and for both lung and liver (8.2%). A statistically significant difference ($p < 0.05$) was found in the prevalence of major Platyhelminthes between age and body condition. However, no significant difference ($p > 0.05$) was observed between the prevalence and the risk factors of sex and origin (**Table 4**).

Regarding the major Platyhelminthes parasites, the causes of red offal organ/organs condemnation associated with different risk factors were examined. Out of 132 cattle (31.3%) positive for major parasites, 11 young cattle (16.7%), 98 adults (31.6%), and 23 old cattle (50.0%) were affected. The prevalence in medium and good body condition cattle was 92.0% (23 cattle) and 27.5% (109 cattle), respectively. The highest prevalence was found in Baldra (38.8%), followed by Argo Gudatu (38.3%), Sasiga (34.5%), Uke (32.4%), and others. Regarding sex, 32.6% of males and 92.0% of females

were infected. Statistically significant differences ($p < 0.05$) were observed between age and body condition, but no significant differences ($p > 0.05$) were found between sex and origin (Table 5).

Table 4. Organs condemnation rates associated with different risk factors.

Variables	No. of examined	Liver (%)	Lung (%)	Heart (%)	Liver and lung (%)	χ^2	p-value		
Age									
Young	310	5(7.6)	1(1.5)	0	5(7.6)	27.2	0.001		
Adult	66	48(15.5)	19(6.1)	11(3.5)	20(6.5)				
Old	46	14(30.4)	7(15.2)	2(4.3)	0				
Sex									
Male	337	55(16.3)	24(7.1)	10(3.0)	22(6.5)	3.346	0.502		
Female	85	12(14.1)	3(3.5)	3(3.5)	3(3.5)				
Body conditions									
Good	397	59(14.9)	20(5.0)	5(1.3)	25(6.3)	111.71	0.000		
Medium	25	8(32.0)	7(28.0)	8(32.0)	0				
Origins									
Argo gudatu	60	11(18.3)	5(8.3)	3(5.0)	4(6.7)	18.5	0.913		
Diga	39	4(10.3%)	3(7.7)	1(2.6%)	0				
Baldra	49	9(18.4%)	3(6.1%)	3(6.1%)	4(8.2%)				
Uke	74	10(13.5%)	7(9.5%)	3(4.1%)	0				
Sasiga	58	11(19.0%)	3(5.2%)	2(3.4%)	4(6.9%)				
Jimma arjo	48	8(16.7%)	3(6.2%)	0	3(6.2%)				
Getema	60	11(18.3%)	3(5.0%)	1(1.7%)	0				
Nekemte town	34	3(8.8%)	0	0	2(5.9%)				
Total		67(15.9%)	27(6.4%)	13(3.1%)	25(5.9%)				

Table 5. The major Platyhelminthes parasite causes organ (red offal) condemnation associated with different risk factors.

Categories	No. examined	No. positive %	Major Platyhelminthes (n (%))			Fasciola and hydated cyst %	χ^2	P-value
			Fasciola %	Hydate d cyst %	C.bovis %			
Age								
Young	310	98(31.6)	5(7.6)	1(1.5)	0	5(7.6)	27.2	0.001
Adult	66	11(16.7)	48(15.5)	19(6.1)	11(3.5)	20(6.5)		
Old	46	23(50.0)	14(30.4)	7(15.2)	2(4.3)	0		
Sex								
Male	337	110(26.7)	55(16.3)	24(7.1)	10(3.0)	22(6.5)	3.35	0.502
Female	85	22(25.9)	12(14.1)	3(3.5)	3(3.5)	3(3.5)		
Body conditions								
Good	397	109(27.5)	59(14.9)	20(5.0)	5(1.3)	25(6.3)	111.7	0.000
Medium	25	23(92)	8(32.0)	7(28.0)	8(32.0)	0		
Origins								
Argo gudatu	60	23(38.3)	11(18.3)	5(8.3)	3(5.0)	4(6.7)		

Diga	39	8(20.5)	4(10.3)	3(7.7)	1(2.6)	0		
Baldra	49	19(38.8)	9(18.4)	3(6.1)	3(6.1)	4(8.2)	18.5	0.91
Uke	74	24(32.4)	10(13.5)	7(9.5)	3(4.1)	0		
Sasiga	58	20(34.5)	11(19.0)	3(5.20)	2(3.4)	4(6.9)		
Jimma Arjo	48	14(29.2)	8(16.7)	3(6.2)	0	3(6.2)		
Getema	60	19(31.7)	11(18.3)	3(5.0)	1(1.7)	0		
Nekemte town	34	5(14.7)	3(8.8)	0	0	2(5.9)		
Total	422	132(31.3)	67(15.9)	27(6.4)	13(3.1)	25(5.9)		

3.3. Results of Direct Economic Loss Assessment

Direct economic loss assessment information was collected from abattoir data record and butchery shops on the mean current price of visceral organs in Nekemte town for liver, lung, and heart, which were 300, 100, and 200 Ethiopian Birr, respectively. The abattoir record from January 2024 to May 2024 revealed that; the mean of one day slaughtered cattle was 20, and the mean of one year slaughtered cattle was 7,300. Hence the annual economic loss due to rejection of organ (red offal) was calculated based on average price per organ (Table 6).

$$ALC = CSR \times LC \times P$$

Whereas ALC = annual economic loss from organs condemnation, CSR = mean annual cattle slaughtered at the Nekemte abattoir, LC = mean cost of each cattle liver/lung/heart at the Nekemte abattoir and P = condemnation rate of cattle liver/lung/heart at the Nekemte abattoir

For liver: $ALC = 7,300 \times 300 \text{ ETB} \times 0.218 = 477,420 \text{ ETB}$

For lung: $ALC = 7,300 \times 100 \text{ ETB} \times 0.123 = 89,790 \text{ ETB}$

For heart: $ALC = 7,300 \times 200 \text{ ETB} \times 0.031 = 45,260 \text{ ETB}$

Total ground cost of all organs = 612,470.00 ETB

Table 6. Annual direct economic loss due to organ (red offal) condemnation.

Types of organs	Total organs condemned	No. of organs condemned	Percentages of organs condemned	Average price of each organ (ETB)	Annual slaughter rate	Annual loss estimation (ETB)
Liver	92		21.8%	300	7,300	477,420
Lung	52		12.3%	100	7,300	89,790
Heart	13		3.1%	200	7,300	45,260
Total ground cost of all organs				612,470.00 ETB		

4. Discussion

Parasitic diseases, mainly helminthic infections, represent a significant health concern and contribute to considerable economic losses in regions where livestock farming is a central component of agriculture. Developing countries, despite having around two-thirds of the global livestock population, experience disproportionately lower production of meat and milk (FAO, 2011). In the present study, a combination of routine ante-mortem and post-mortem examinations was conducted. Among 422 cattle slaughtered at the Nekemte Municipal Abattoir, 59 (14%) exhibited various abnormalities, including rough hair coat (14, 3.3%), lameness (11, 2.6%), coughing (10, 2.4%), tick infestation (8, 1.9%), depression (7, 1.7%), branding (5, 1.2%), and blindness (4, 0.9%). Ante-mortem examinations revealed that rough hair coat and lameness were the most common abnormalities. These results are higher than findings from Heliso *et al.* (2020), who reported 3.93% at Wolaita Sodo Municipal Abattoir, and Denbarga *et al.* (2011), who found 1.9% at the Gondar Elfora Abattoir. However, this study was lower than the reports of Alemu *et al.* (2017), who recorded 16.2% at the Gondar Elfora Abattoir. The increased incidence of rough hair coat in this study could be attributed to stress from transportation, as animals are often brought from distant regions. Lameness, in turn,

was likely caused by physical trauma during the loading, transportation, and unloading process, as reported by Regassa et al. (2010).

This study identified fasciolosis, hydatid cysts, and *Cysticercus bovis* as the primary causes of organ condemnation in cattle slaughtered at the Nekemte Municipal Abattoir. A total of 132 (31.3%) cattle organs were condemned due to platyhelminthic infestations. The condemnation rate in this study was comparable to the findings of Molla et al. (2019) (38.3%) at Ethiopian abattoirs and (Adane and Guadu, 2014) (28.6%) at Gondar Elfora Abattoir. However, it was higher than the report by Ciui et al. (2023) from Bavaria (13.27%) and lower than that of Mathiwos and Morka (2019) (42%) from Enango. This variation can be attributed to differences in disease prevalence across regions.

Of the 422 cattle slaughtered, 67 (15.9%) livers, 27 (6.4%) lungs, and 13 (3.1%) hearts were condemned, along with 25 (5.6%) instances of liver and lung rejection. These results align with studies by Dinsefa and Bedaso (2016) at the Adwa municipal abattoirs. The liver rejection rate in this study is lower than reports by Denbarga et al. (2011) (31.1%) from Gondar, Mohammed et al. (2012) (66.5%) from Kombolcha, and Fekadu et al. (2012) (64.4%) from Jimma, but higher than findings from Mathiwos and Morka (2019) (9.5%) from Enango and from Oryan et al. (2012) (4.2%). The higher rate in the study area is likely due to the presence of swampy areas conducive to fasciolosis and the contamination of animal feed with *Echinococcus* eggs from dogs, leading to hydatid cysts.

The lung rejection rate of 27 (6.4%) is consistent with Mohammed et al. (2012) (14.3%) from Kombolcha and Mathiwos and Morka (2019) (10%) from Enango, but lower than studies by Mesele et al. (2012) (19.68%) from Gondar, Amuamuta et al. (2012) (25.8%) from Bahir Dar and Fekadu et al. (2012) (46.2%) from Jimma. This variation may be due to differences in feed contamination with *Echinococcus* eggs. The heart rejection rate (3.1%) in this study is similar to findings by Mathiwos and Morka (2019) (5.25%) from Enango and Mohammed et al. (2012) (5.37%) from Kombolcha, but lower than reports by Dinsefa and Bedaso (2016) (7.9%) and (6%) from Durame. Conversely, it was higher than findings from Wabe et al. (2017) (1%) from Hawassa and Alemu et al. (2017) (0.96%) from Gondar. The lung and liver are the most common sites of hydatid cysts due to their size, blood supply, and availability of oxygen, which favor the migration of *Echinococcus* larvae.

Chi-square analysis revealed a significant association between organ condemnation and the age and body condition of the cattle ($P < 0.05$). This result is in agreement with findings by Mohammed et al. (2012) in Kombolcha and Ahmed (2023) in Chiro, but diverges from studies by Mathiwos and Morka (2019) in Enango and Amare et al. (2017) in Gondar, possibly due to variations in sample sizes, immunity, and management systems. No significant association was found between sex and origin of cattle and organ condemnation ($P > 0.05$), which aligns with the findings of Alemu et al. (2017) in Kombolcha and Ahmed et al. (2019) in Hayik, but contradicts studies done by Alton et al. (2010) in Ontario.

The total direct economic loss due to organ condemnation at Nekemte Municipal Abattoir was 612,470.00 Ethiopian Birr. This result is similar to findings by Melaku et al. (2012) (681,333.87 ETB) and Adane and Guadu (2014) (751,725.00 ETB) at Gondar Elfora Abattoir but lower than economic losses reported by Ahmed et al. (2019) (3,736,231.25 ETB) in Hayik and Sheferaw and Abdu (2017) (3,522,005.00 ETB) in Kombolcha. It was higher than reports from Mesele et al. (2012) (39,490.00 ETB) in Gondar and Fekadu et al. (2012) (172,664.09 ETB) in Jimma. The differences in economic losses are likely due to variations in disease prevalence, annual cattle slaughter volumes, and market prices for organs and carcasses.

5. Conclusion and Recommendations

The current study revealed that the prevalence organ condemnation due to bovine Platyhelminthes parasites was 31.3%. *Fasciola*, hydatid cyst and *Cysticercus bovis* were the major Platyhelminthes parasites identified during the study period. These parasites induce considerable public health hazard and economic loss due to total condemnation and trimming of infected organs. Age and body conditions were the most important risk factors for the occurrence of organs' condemnation due to these helminthes parasites. Lack of standard meat inspection, poor hygienic

conditions for waste disposal, poor sludge and sewage treatment and food associated with undercooked beef consumption were the major risk factors for the occurrence of the disease. The role of societies, public health professionals, and veterinary professionals play a great role to control, prevention, and eradication of the disease.

Based on this study, the following recommendations were forwarded:

- Standard regulations and functional meat inspection procedures should be properly conducted in the abattoir to provide safe and wholesome meat to the consumer.
- 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 of, stray dogs and cats must be prohibited from abattoirs and their numbers should be systematically reduced.
- There should be strong and close collaboration between medical and veterinary professionals to reduce the impact of the disease both in humans and animals.

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Ethics Approval: This study was conducted in accordance with the ethical guidelines established by the University of Gondar (UoG), Ethiopia. The collection data during ante-mortem examination were carried out with utmost care to minimize pain and risk to the animals. All procedures adhered to animal welfare standards and followed established postmortem protocols. Ethical approval for the study was obtained from the Departmental Ethical Committee of the College of Veterinary Medicine and Animal Sciences, University of Gondar (in September 2023, Ref.No: CVMAS.Sc/ 17.282023).

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