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Bovine Hydatidosis and Its Economic Impact in Durame Municipal Abattoir, Kembata Zone, Ethiopia

Amarech Menamo[1], Tariku Geinoro[2*], Biruk Alemu[3], Sead Aliyi[4] and Miessa Banata[5]

[1]*Agriculture Office, Kedida Gamela Woreda, Kembata Zone, Durame, Ethiopia*
[2]*Ethiopian Agricultural Authority, Hawassa, Ethiopia*
[3]*Care Ethiopia, Afar Region, Awash, Ethiopia*
[4]*Lega Hida District Agricultural Office, East Bale Zone, Ethiopia*
[5]*Hawassa University College of Veterinary Medicine, Hawassa, Ethiopia*

**Corresponding author*

Abstract

A cross-sectional study was conducted on bovine hydatidosis in cattle slaughtered at Durame municipality abattoir in Southern Nations Nationalities and Peoples Region of Ethiopia with objective of determining the prevalence of hydatid cyst in the study area. Accordingly, a total of 398 randomly selected slaughtered cattle were examined both during *ante-mortem* and *post-mortem* inspections and then a prevalence of 10.55% (42/398) was observed. The chi-square test of potential risk factors revealed that there was statistically significant difference in the prevalence of hydatidosis between animals from different origin ($p < 0.05$). However, breed, age, sex and body condition showed no significant effect ($p > 0.05$) on the prevalence of the disease. Regarding the distribution of hydatid cyst; liver (49.21%), lung (28.57%), heart (19.05%) and spleen (3.17%). The estimated annual financial loss due to organ condemnation was 5,684,684 ETB (120,951 USD) based on the local market price in the study period. This study assured that bovine hydatidosis was the problem of cattle in this study area. Therefore, it needs due attention to safeguard the public health and the economy.

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Keywords

Abattoir; Bovine; Durame; Hydatidosis; Prevalence

Introduction

Hydatidosis (Cystic Echinococcosis), the most significant parasitic disease affecting animals globally with economic and public health implications. It is caused by the larval stage (metacestode) of *Echinococcus granulosus* (Pal *et al*., 2022). It is typically more common in developing nations, particularly in rural areas where the dog coexists closely with humans and domestic herbivores and feeds on the leftovers and offal of wild herbivores that his master hunts or domestic herbivores that have been bred for butchering. The highest incidence is known to occur primarily in areas where sheep and cattle are raised (Srinivasa, 2013).

The disease is more significant for public health and has a bigger economic impact in nations where the livestock industry plays a significant role in agriculture and when the primary method of producing cattle is an extensive grazing system (Perry *et al*., 2018). Additionally, the long-standing practice of feeding domesticated canines and wild carnivores with condemned offal, backyard animal slaughter, the resulting lack of stringent meat inspection protocols, and the ensuing contamination of

pasture and grazing lands all contribute more than anticipated (Bernabucci *et al*., 2025). In Ethiopia, abattoir reports from different regions of the country indicated that hydatidosis is highly prevalent disease incurring economic loss and affecting public health (Hammed, 2025). However, the current status of the problem and its associated risk factors is not known in current study area. Hence, to convey relevant recommendations, knowledge of the current state of hydatidosis would be crucial. Therefore, estimating the prevalence and financial impact of bovine hydatidosis in the study area was the aim of the current study.

Materials and Methods

Study area

The study was conducted in Durame town administration municipality abattoir, Kembata Tembaro zone in Southern Nations Nationalities and Peoples Region of Ethiopia. Durame is located 370 kilo metres South to Addis Ababa with 07° N' North latitude and 38° 00' East longitude. The minimum and maximum average temperature of the area is 18-24 ^{0}C; and the average rain fall being 1200-1300mm. The climate of the area seems favorable to crop, vegetable and livestock production (Markos, 2003).

Study area

The study was undertaken on both sexes of local and cross breeds of cattle brought from different zones and woredas that were slaughtered at Durame municipality abattoir. Most of cattle's slaughtered at the abattoir were adult males of local breeds. A few cross breed females were culled due to old age, poor performance and reproductive problems were also slaughtered.

Sample size determination

The sample size for the study was determined according to the method described by (Thrusfield, 2005). Considering 95% confidence interval at a desired accuracy level of 5% and with null expected prevalence and hence, the required sample size is 384 but a total of 398 animals were included in this study in order to increase the precision.

Study Design and Methodology

A cross sectional study was performed to assess the characteristics of hydatid cyst in Durame municipality abattoir through meat inspection conducted on 398 cattle's during the study period.

Anti-mortem *inspection*

Anti-mortem inspection was done on individual animals for assessment of animal origin, body condition, breed and age determination. During anti-mortem inspection each of the study animal was given an identification number based on enumerates mark on its body tagged before slaughter.

Post-mortem inspection

Post mortem inspection procedure was conducted on organs namely lung, liver, heart, kidney and spleen involving visualization and palpation to detect the presence of hydatid cysts. Number of hydatid cysts that were found per organ and per animal was registered.

Assessment of financial loss

To assess the financial loss due to hydatidosis, only direct loss was considered and the calculation was based on condemned organs (liver, lungs, heart and spleen). In calculating cost of condemned edible organs, 5 different meat sellers; 2 meat inspector and 5 meat consumers were interviewed randomly to establish the unit price per organ and the average organ price was determined and this price index was used to calculate the loss (Denbarga *et al*., 2011). The economic effect of the parasite was determined by the following formula set by Ogunrinade and Ogunrinade (1980).

LOC= NAS [(Plu×Cplu) + (phr×Cphr) + (pli×Cpli) + (psp×Cpsp)] Where: LOC = Loss due to organ condemnation, NAS = Mean number of cattle slaughter annually, Plu = Percent involvement of lung cases, Cplu = Current mean retail price of lung, Phr = Percent involvement of heart, Cphr = Current mean retail price of heart, Pli = Percent involvement of liver, Cpli = Current mean retail price of liver, Psp = Percent involvement of spleen, Cpsp = Cur-rent mean retail price of spleen.

Data Analysis

Data collected from anti-mortem and post-mortem findings were entered in to Ms-Excel program (Microsoft Corporation, USA) and the data was analyzed using SPSS (Statistical Package for Social Science) 25 version. Chi-square test was used to determine the association between the prevalence of cysts and risk factors.

Statistical significance was considered when *P*-values were below the 0.05 threshold.

Results and Discussion

Prevalence

The total number of infected animals with hydatid cyst are 42 (fourty two) out of 398 animals examined with overall prevalence of 10.55%. Among the study animals, 362(90.95%) cattle were local breeds whereas 36(9.05%) were cross breeds. Three hundred fifty four (88.94%) of the animals were males while the remaining 44(11.06%) were females. In addition, 291(73.12%) were under or equal to five years of age and the remaining 107(26.88%) were above five years of age and 246(61.81%) and 152(38.19%) good and medium body conditioned, respectively (Table 1).

Organ distribution of cysts

The total number of hydatid cyst found is 63 (sixty three) out of which 31 (49.21%), 18 (28.57%), 12 (19.05%) and 2 (3.17%) cysts are investigated in organs liver, lung, heart and spleen, respectively, with descending order of proportion (Table 2).

Table.1 *Prevalence of hydatid cyst in relation to breed, age, sex, body condition and origin*

Risk factors	No Examined	No infected	Prevalence (%)	X^2	p-value
Breed					
Local	362	39	10.77	0.207	0.649
Cross	36	3	8.33		
Total	**398**	**42**	**10.55**		
Sex					
Male	354	39	11.02	0.731	0.393
Female	44	3	6.82		
Total	**398**	**42**	**10.55**		
Age					
≤5 years	291	31	10.65	0.012	0.915
>5 years	107	11	10.28		
Total	**398**	**42**	**10.55**		
Body condition					
Good	246	21	8.54	2.774	0.096
Medium	152	21	13.82		
Total	**398**	**42**	**10.55**		
Origin					
Boditi	56	11	21.57	**12.436**	**0.029**
Arsi negele	62	5	8.06		
Wolayita Soddo	85	5	5.88		
Durame	51	4	7.84		
Shinshicho	58	3	5.17		
Shone	86	14	16.28		
Total	**398**	**42**	**10.55**		

Table.2 *Organ distribution of the cysts*

Organ	No of cysts	Proportion (%)
Lung	18	28.57
Liver	31	49.21
Heart	12	19.05
Spleen	2	3.17
Total	**63**	

Table.3 *Organs condemned and financial loss*

Organ	Condemned	Unit Price (ETB)	Loss (ETB)	Prevalence (%)	Annual Loss	
					ETB	USD
Liver	25	300	7,500	6.28	4,003,500	85,181
Lung	18	150	2,700	4.52	1,440,750	30,654
Heart	10	40	400	2.51	213,350	4,539
Spleen	2	25	50	0.51	27,094	577
Total	**55**	**515**	**10,650**	**13.82**	**5,684,694**	**120,951**

Assessment of financial loss

Due to the aesthetic value, zoonotic importance and to break the life cycle of the parasite, all the infected organs were condemned. Out of 398 animals examined, a total of 55 organs from which 25 livers, 18 lungs, 10 hearts and 2 spleens were condemned during the study period (Table 3). Mean number of cattle slaughtered annually was estimated to be 2,125 (two thousand one hundred twenty five). The average price of liver, lung, heart and spleen were 300, 150, 40 and 25 ETB, respectively. The total annual financial loss incurred was 5,684,694 ETB (120,951 USD).

The overall prevalence of hydatidosis in cattle slaughtered in Durame municipal abattoir during the study period was 10.55%. The current finding is in close agreement with that reported 11.26% in Mizan Teppi by (Jemere *et al*., 2013), 11.6% in Mekelle Abergelle export abattoir by (Yitbarek *et al*., 2012), 10.56% in Libya by (Layla and Wahab, 2015), 10.6% in Morocco by (Azlaf and Dakkak., 2006) and 12.4% in India (Dhote *et al*, 1992). The present finding was higher than the previous works reported like 2.1% from Zambia by (Fredrick *et al*., 2012), 6.99% from Iran by (Ahmadi and Meshkehkar, 2011), 2.8% from Sudan by (Sahar Adam and Atif Elamin, 2011). However, the current finding is lower than prevalence study in other areas like 54.8% in Arsi region (Alemayahu, 1990), 57.6% in Assela (Gadisa and Addis, 2016), and 52.69% Hawassa (Regassa *et al*., 2010). These discrepancies in disease prevalence among the various studies in different areas might be due to the difference in availability and frequency of exposure of the final hosts among the infected intermediate hosts and vice-versa.

Association of origin of animals and prevalence was statistically significant (p-value < 0.05) which agree with findings of (Dawit, D., 2018) in Wolayita zone Kindo koysha woreda. Whereas the variables breed (in agreement with Gebretsadik, 2009 and Alembrhan A. and Haylegebriel T., 2014), age (in agreement with Jemere *et al*., 2013), sex and body condition were insignificant (p-value >0.05). All contradicts with the findings of (Mekuria *et al*., 2019).

In the present study, the livers were found to be most commonly infected with hydatid cysts of the lungs and other organs. That is, 31 (49.21%), 18 (28.57%), 12 (19.05%) and 2 (3.17%) cysts were investigated in organs liver, lung, heart and spleen, respectively, with descending order of proportion. These findings were supported by studies in Ethiopia by (Miheret *et al*., 2013; Yitbarek *et al*., 2012) and other studies conducted in Libya by (Layla and Wahab, 2015), (Tashani *et al*., 2002) and (Khan *et al*., 2001). The reason why the liver most commonly infected is because the bile duct in the liver receives the blood with the oncospheres after the blood has passed the duodenum (Soulsby, 1982).

The annual financial loss incurred due to organ condemnation, because of hydatidosis was estimated to be 5,684,694 ETB (120,951 USD). This finding is much higher than the reports of (Fuad and Mekonnin, 2015) which was 1,160,932.40 ETB (56,647.70 USD) in Bishoftu and (Gadisa and Addis, 2016) which was 3,479,679.13 ETB (173983.96 USD) in their study in Asella, Ethiopia. This difference may be due economic inflations through time.

Recommendations

In conclusion, the current study revealed the occurrence and economic impact of bovine hydatidosis in cattle slaughtered in Durame municipality abattoir. The vital organs like liver, lung and heart were affected in the study area. These organs are most consumable for the public, hence, serious public health issue and major cause of economic loss due to organ condemnation. Therefore, based on this study and other facts about the public health and socio –economic impact of the disease, the following recommendations are forwarded:

There should be strict routine meat inspection so that infected organs can be condemned accordingly and also backyard slaughtering of animals should be prohibited through designing and reinforcing of legislation, construction of slaughter houses which full fills the necessary facilities and implementation of proper meat inspection services.

All condemned organs should be properly disposed in order to break the life cycle of some metacestodes like Echinococcus granulosus and stray dogs and cats must be prohibited from abattoirs and their number should also be systematically reduced.

There should be public education to create awareness so that all consumers avoid consumption of raw meat.

Further investigation on public health significance of the disease should be done on the area.

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