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A Cross-Sectional Study on the Prevalence and Financial Loss Attributed to Hydatidosis in Cattle Slaughtered at Bahir Dar Municipal Abattior, Bahir Dar, Ethiopia

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ABSTRACT

Hydatidosis is a public health hazard in Ethiopia. The status of the disease in the study districts has not been elucidated. Hence, the current cross-sectional study was designed and conducted from December 2017 to April 2018 in an attempt to determine the prevalence and financial losses associated with bovine hydatidosis on cattle slaughtered at Bahir dar Municipal Abattoir and identify potential risk factors were identified.

Applying simple randomly sampling method, both adult and old male cattle animals were selected prior to slaughter. Antemortem and postmortem examination methods were made during the study. During antemortem examination, relevant data including sex, origin of animals (districts), body condition, age and clinical signs were collected. Similarly, postmortem inspection was conducted to examine the existence of hydatid cysts in the organs under study (liver and lungs) for each animal following the standard meat inspection procedures.

Of 384 heads of cattle slaughtered and examined, 127 were found positive for *Echinococcos granulosus* with an overall prevalence of 33.05%, computed by standard statistical methods. No statistically significant association detected between selected risk factors (P> 0.05) and the disease. The prevalence of hydatid cysts by organs included: 46 (11.97%), 45 (11.71%), and 36 (9.375%) for lungs, livers, and both lung and liver, respectively. The annual financial loss due to organ condemnation and live carcass weight loss associated to bovine hydatidosis at the study abattoir was estimated to be 10,531,776.12 ETB/385,496.93USD. The current study has revealed a higher prevalence of bovine hydatidosis in the study districts urging prompted and collaborative actions to be set in place.

Keywords: Abattior, cattle, Financial loss, Hydatidosis, Prevalence Risk factors

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1. INTRODUCTION

Ethiopia leads the African content in livestock population with each species estimated at 57.8 million heads of cattle, 28.89 million sheep, and 29.7million goats as of CSA (2016). Dominantly, livestock serve as source of cash income, food, draught power and main national source of foreign currency. However, in Ethiopia, livestock productivity remained at its marginal level mainly attributed to mismanagement, limited genetic improvement, feed shortage and rampancy in animal diseases. Of livestock diseases causing serious problems, parasitism holds the biggest share in the tropics (FAO, 2011). Among parasitic diseases, metacestode in domestic ruminants inflicts enormous economic damage due to the condemnation of affected organs and lowering of meat, milk and wool production. The metacestode is passively transferred to the definitive host when the latter ingests the infected intermediate host (Soulsby, 1982). Infection with *Echonococos granulosus*, the stage of the parasitic tapeworm is recognized as one of the world's major zoonosis affecting both humans and domestic animals (Cringoli *et al*., 2007). The two most important species of *Echinococcus* are *Echinococcus granulosus*, *E.multilocularis*, with the larval stage developing in a very wide range of intermediate hosts including man (Smyth, 1994).

The definitive hosts for *Echinococcus granulosus* are dogs which harbor adult tape worms and excrete the parasites' eggs along with their feces whilist livestock and human are the main intermediate hosts (Oku *et al*., 2004). Transmission of the adult worm residing within the small intestine of the definitive host (dogs) begins when gravid proglottids release eggs that are passed along with dogs' feces and ingested by an intermediate host (cattle ingest the eggs during grazing). Once in the small intestine, eggs hatch and release oncospheres that penetrate the intestinal wall and move through the circulatory system into different organs, in particular the liver and lungs (John *et al*., 2006).

Many studies conducted on different abattoirs on the prevalence of hydatidosis and financial losses. However, evidences pertaining to the current status of bovine hydatidosis and the magnitude of financial losses it poses in the selected districts were unavailable. Therefore, the objectives of the current study were to assess the current prevalence of hydatidosis in cattle slaughtered at Bahir Dar Abattoir, assess associated risk factors and estimate direct and indirect losses due to organ condemnation.

2. MATERIALS AND METHODS

2.1 Study area

The study was conducted from December 2017 to April 2018 on cattle slaughtered at Bahir Dar municipal abattoir originated were from four districts namely Adet, Este, Zenzelima and Merawi of Gojam zone, Amhara region, Ethiopia.

2.2 Study population

The study was undertaken on local zebu cattle intended for slaughter at Bahir dar municipal abattoir. Study cattle were males aged adult and above. Animals slaughtered

at the abattoir were purchased from local markets whose actual source was the study districts mentioned so far.

2.3 Study design

A cross sectional type of study design was applied for the study.

2.4 Sampling method and sample size determination

The study sites were purposely selected whereas each study animal for inspection was selected randomly. The total sample size required for the study was determined using Thrusfield formula (Thrusfield, 2005) with 95% confidence interval and 5% absolute precision.

2.5 Antemortum and postmortem examinations

Antemortally, each animal was examined clinically both at rest and in motion with provision of identification number. Age was estimated using teeth eruption approach (De-Lahunta and Habel 1986). Based on age, study animals were divided into two groups: adult (≤ 5 years) and old (>5 years) according to (Pasquini and Spurgeon, 2003).

Inspection of target organs (liver and lung) was performed to confirm existence/absence of hydatid cysts applying meat inspection procedures. Initially, visualization and palpation of organs (liver, lung) was carried followed by further incisions for confirmation of cyst presence or absence.

2.6 Financial loss analysis

The annual financial loss due to hydatidosis was estimated by summing up cost of offals condemned and cost of carcass weight losses due to parasite infection (Kebede *et al*., 2009; Getaw *et al*., 2010). The annual number of cattle slaughtered at the abattoir was determined based on retrospective analysis of data recorded over one year (2017/2018). As a result, the annual cattle slaughtering capacity of the abattoir was estimated to be 4720 cattle in that year.

2.7 Direct financial loss

Direct financial loss was calculated based on the number of condemned organs, annual average number of animals slaughtered at the abattoir, percent involvement of organs out of total examined (rate of organ condemnation) and average market prices of condemned organs. Thus, the annual financial loss incurred due to condemned organs due to hydatidosis was calculated using formula set by Zewdu *et al*., (2010).

$$LOC = (pI1xTkxc1) + (pI2xTkxc2) \quad \text{----Equ.1}$$

Where; LOC=loss from organs condemnation

PI1 = percent involvement of lung out of total examined, PI2 = percent involvement of liver out of total examined,C1 = average market price of lung, C2 = average market price of liver, Tk = average annual kill of bovines).

2.8 Indirect financial loss

Indirect loss was calculated based on live weight reduction due to hydatidosis, average carcass weight of local adult zebu cattle which was 126 kg (ILCA, 1979), prevalence of bovine hydatidosis and average local price of one kg of beef using the formula set by Ogunirade *et al.* (1981). ACW = CSR × CL × BC × P, Where: ACW = Annual cost from carcass weight loss; CSR = average slaughtered cattle per annual in the

abattoir; CL = carcass weight loss in the individual = (126×5%); BC = average price of 1 kg carcass at town=Bahir dar 190 ETB ; P = prevalence of hydatidosis at Bahir Dar municipal apattior.

2.9 Data management and analysis

Relevant data obtained was coded and entered in Microsoft excel system and further analyzed using IBM SPSS version 20.0. Descriptive statistics was employed to determine the prevalence and frequencies while chi-square test was computed to assess the association between organ condemnation and risk factors.

3. RESULT ANALYSIS

3.1 Overall prevalence

Of 384 cattle slaughtered at study abattoir, 127(33.05%) of them harbored hydatid cyst in one or more of their visceral organs as presented in the table 1. All cattle slaughtered were male aged adult and above.

Table 1. Over all prevalence of bovine hydatidosis in Bahir Dar municipal Abattoir

Cattle examined	Number of postive	Prevalance(%)
384	127	33.05

3.2 Analysis of associated risk factors

Prevalence of bovine hydatidosis was determined based on risk factors: age, origin and body condition score of animals. No statistically significant association found between the disease and risk factors (P>0.05).

3.3 Analysis of risk factors

The prevalence of bovine hydatidosis based on the age of slaughtered animals was computed to 37.6% and 29.32 % in adult and old, respectively. No statistically significant association between age groups and the disease (P>0.05). Similarly, the prevalence of bovine hydatidosis in line with body condition score was determined to be, 37.5%, 31.6.02% and 30.92% in poor, medium and good body condition scores, respectively with no statistically significant association with the disease(P>0.05) as shown in the table 2.

As indicated in table 2, the prevalence of bovine hydatidosis with respect to origins of the animals slaughtered were found to 38.23%, 28.2 %, 36% and 38.58% for Adet, Este, Zenzelima and Merawi, respectively with no statistically significant association (P>0.05) with the disease.

Table 2. The prevalence of bovine hydatidosis among different risk factors

Variable	Not examined	No positive	Prevalance	X^2	P- value
Age					
Adult	176	66	37.6%	4.939	0.176
Old	208	61	29.32%		
BCS					
Good	97	30	30.92%	10.282	0.093
Moderate	183	58	31.6%		
Poor	104	39	37.5%		
Origin					
Adet	102	39	38.23%	8.893	0.447
Este	117	33	28.2%		
Zenzelima	80	29	36%		
Merawi	85	26	30.58%		

Table 3: Distribution of hydatid cysts in different organs and proportion of organs involved in the study animals

Organ infected	Examined	No of cases	Prevalance	Proportion from infected
Lung only	384	46	11.97%	36.22%
Liver only	384	45	11.71%	35.48%
Lung and liver	384	36	9.375%	28.4%
total	384	127	33.05%	100%

3.4 Financial loss estimation

3.4.1 Direct financial loss

For aesthetic value, zoonotic importance and breakage of parasite's life cycle, all infected organs were condemned. Out of 768 organs inspected, 160 (83 lungs, and 77 livers) were condemned due to hydatidosis as shown below in table 4.

Table 4. Total number of organs condemned due to hydatidosis and its current price

Organ type	Rejection rate (%)	Price per organ in Birr	Total
Lung	83 (21.61)	20	1660
Liver	77 (20.05)	70	5390
Total	160 (41.7)	90	7050

The direct financial loss was calculated using the formula given:

$$LOC = (pI1xTkxc1) + (pI2xTkxc2) \quad \text{----Equ.2}$$

= (4720*21.61*20) + (4720*20.05*70) =8,664,504 ETB/313,931.3USD

The indirect financial loss was also calculated as follows

LCWL = CSR × CL × BC × P ----Equ.3

=4720*126kg*5%*190birr*33.05% =1,867,272.12 ETB/68,348.17USD

The present study has estimated an overall financial loss to be 10,531,776.12 ETB/385,496.93USD per annum. The study implied as the indirect loss was superior to direct loss.

4. DISCUSSION

The present study has provided an up dated total prevalance of bovine hydatidosis in cattle over the study areas to be 33.05%. The current report was almost in agreement with the findings of Tolossa *et al* (2009) and Feyissa (1987) who reported prevalence of 31.44% and 31.19% in Jimma and Nekemte municipal abattiors, respectively. However, the current report was relatively higher than the findings of Ayele *et al* (2016) who reported prevalence of 24.1 % and 20.05% in cattle in Debre tabor and Dire dawa municipal abattiors, respectively. Similarly, Abera *et al* (2014) and Abunna *et al* (2012) reported a prevalence of 11.3% and 12.17% in Harar and Kombolcha Elfora municipal abattiors, respectively. On the other hand, the current report was lower than the findings of Ayub (2016), Getaw *et al (*2010), kebede *et al* (2009), jobre *et al (*1996), kebede (2012) and Ernest *et al* (2008) who reported prevalence of 55.5%,46.8% , 48.9% , 46.5% , 47.2% and 48.7% in Jimma municipal abattior, in Hawassa Municipal abattoir, in Debre Markos Municipal abattoir, in Debre Zeit Municipal abattoir, in Southern region of Ethiopia and Nagorgoro district of Arusha region, Tanzania, respectively.

Variations observed in the prevalence of hydatidosis among different reporters might be attributed to strain difference of *Echinococcus granulosus* that exist in different geographical locations, the source of cattle, dog population, dog management and deworming practices, offal disposal habits, body condition score of slaughtered animals, age of the animals slaughtered and socio economic practices in different region of the country (Arbabi *et al*., 2006 and McManus, 2006).

Analytical attempt was also made to assess the existence or absence of relationship between the disease and the risk factors. Accordingly, association was assessed between animal origin and prevalence of the disease and found to be statistically insignificant (P>0.05) which was in agreement with the findings of Regassa *et al*., (2010). This could be due to difficulty in getting exact origin of the animals and exchanging of the animals in local markets. However, the present finding doesn't agree with the findings of Yetnayet (2010) who reported that the existence of statistically significant co-relation between bovine hydatidosis and origins of animals which in turn could be attributed to difference in social activity, attitudes of dogs and climatic conditions in different regions. Similarly, an attempt was also made to find the impact of body condition of animals on disease occurrence where no statistically significant association indicated between the disease and animal body condition score. The present

finding aligns with the findings reported by Regassa *et al*., (2010). However, it disagrees with the study reported by Melaku *et al* (2011) who reported that animals with poor body condition are highly infected followed by medium and good.

The current study has also pointed out the magnitude of annual financial loss due to organ condemnation and carcass weight loss as a consequence of hydatidosis to be 10,531,776.12ETB/385,496.93USD. The study revealed a relatively higher annaul loss compared to previous reports. Regassa *et al.,* 2010) reported an annual financial loss amounted at 1,791,625.89 at Hawassa municipal abattoir, 681,333.87 ETB reported by (Melaku *et al*., 2012) from Dessie Municipal abattoir and 674,093.038 ETB by (Endalew and Nuraddis, 2013) from Gondar. The differences in financial loss estimation in various abattoir studies may be due to the variations in the prevalence of the disease, mean annual number of cattle slaughtered in different abattoirs and variations in the retail market price of organs (Polydrous, 1981).

5. CONCLUSION AND RECOMMENDATION

Bovine hydatidosis could be taken as the leading cause of economic loss in meat industries in Ethiopia. The present study has provided a higher and updated status of hydatidosis prevalence in the locality chosen and could be a public health concern and has also estimated the magnitude of annual financial loss associated with the disease in that specific site of the study. The current study has revealed a higher (concerning) prevalence of bovine hydatidosis in the study districts urging prompted and collaborative actions to be set in place.

6. REFERENCES

1. Abera,T., Lemma, B.,Urga., Niguse, A., and Agonafir, A.Prevalence of Bovine Hydatidosis and Its Economic Significance in Harar Municipality Abattoir, Eastern Ethiopia College of Veterinary Medicine, Jigjiga University, Jijiga, Ethiopia American-Eurasian Journal of Scientific Research 9 (5):2014.p.143-149.
2. Abunna, F., Fentaye, S., Megerssa, B. andRegassa, A. prevalance of bovine hydatiodisis in kombolcha Elfora abattior north eastern School of Veterinary Medicine, Hawassa University, Hawassa, Ethiopia.2012.
3. Ayele, B., Tadess, A., ,Asefa, A and Haile, B.Prevalence and Economic Significance of Bovine Cystic Echinococcosis in Debra Tabor Municipal Abattoir, North West EthiopiaActaParasitologicaGlobalis 7 (3): 2016.114-120.
4. Ayub,T., Benti, D. and Mukarim, A. Study on Prevalence and Monetary Loss Attributed to Hydatidosis in Cattle Slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopiaglobal journal of medical research: gveterinary science and veterinary medicineVolume 16 Issue 2 Version 1.0. 2016.
5. Bourée, P.,. Hydatidosis: dynamics oftransmission. World Journal of Surgery, 2000, 25: 4-9.
6. Cringoli, G., Rinaldi, L., Musella, V., Veneziano, V., Maurelli, P., Di Pietro, F., Frisiello M, and Di Pietro, S. Geo-referencing livestock farms as tool for studying cystic echinococcosis epidemiology in cattle and water buffaloes from southern Italy. Geospat. Health 2(1):2007.p.105-111.

7. CSA, Federal Democratic Republic of Ethiopia. Central Statistical Agency (CAS), Volume 8, report on livestock and livestock Characterics. Statistical bulletin 583 Addis Ababa Ethiopia.2016.
8. Endalew, D. and Nuradddis, I. Prevalence and Economic Importance of Hydatidosis in Cattle Slaughtered at North Gonder, Elfora Abattoir European Journal of Applied Science, **5**: 2013.p.29-35.
9. Ernest, E., Nonga, H.E, Kassuku, A.A and Kazwala, R. R. Hydatidosis of slaughtered animals in Ngorongoro district of Arusha region, Tanzania. *Tropical AnimalHealth Production,*2008.DOI 10.1007/s11250-008-9298-z.
10. FAO, http://www.fao.org/ag/againt/subjexts/heath/dieases cards/hundatid/htm/.2011.
11. Feyissa, R., Prevalence of hydatidosis inNekemte municipal slaughter house, DVM Thesis,FVM, AAU, DZ, Ethiopia.1987.
12. Jobire, Y., F. Lobagho, R., Tiruneh, A. and Dorchies, G. Hydatidosis in selected regions in Ethiopia: an assessment trial on its prevalence, economic and public health importance, Revue de MedecineVeterinaire., 147: 1996.p.797-804.
13. John D, T., William,T., William, P., Markell, A., Edward, K. and Marietta,V., The Cestodes: *Echinococcusgranulosus*, *E.multiloularis* and *E.vogeli*(Hyatid Disease)". *MarkellandVoge'sMedicalParasitology* (9th ed.). *Elsevier Health Sciences.*2006.. pp. 224
14. Kebede, N., Mekonnen, H., Wossene, A.andTilahun, G. Hydatidosis of slaughtered cattle inWolaitaSodo Abattoir, southern Ethiopia. Trop.Anim. Health Prod., 41: 2009.p.629-633.
15. Kebede, N., Tesfu, K., Getache, T. and Chandia, M.occurance of bovine hydatidosis and evalution of its risk to humans in traditional communities of souther region of Ethiopia. J. Health Dev. 26(1):2012.p.43-48.
16. Melaku , A., Lukas, B. and Bogale, B. Cyst Viability, Organ Distribution and Financial Losses due to Hydatidosis in Cattle Slaughtered at Dessie Municipal Abattoir, North-eastern Ethiopia, Vet.World.**5**(4):2012.p.213-218.
17. Oku, Y., Malgorb, R., Benavidezb, U., Crmonab, C. andKamiyac, H. Control program against hydatidosis and the decreased prevalence in Uruguay. Int. Congr. Ser. 1267.2004.p.98-104.
18. Parija, S. Medical Parasitology, Protozoa logy and Helimenthology Text and Atlas. 2nd ed. India; Chennai Medical Book Publisher.2004.p. 221-229.
19. Regassa, F., Molla, A. and Bekele, J. Study on the prevalence of cystic hydatidosis and its economic significance in cattle slaughtered at Hawassa Municipal abattoir, Ethiopia. Trop Anim Health Prod, 42: 2010.p.977–984.
20. Regassa, F., Molla, A. and Bekele, J. Study on the prevalence of cystic hydatidosis and its economic significance in cattle slaughtered at Hawassa municipal abattoir. *Trop. Anim. Hlth.Prod.* **42**: 2010.p.977-984.
21. Smyth, J.D. Procedures for testing the viability of human hydatid cysts following surgical removal, especially after chemotherapy.Transactions of theRoyal Society of Tropical Medicine and Hygiene, 20. Macpherson, S., 1985. 74: 1994. P.649-652.
22. Soulsby, E.J.L.,. Helminthes Arthropods and Protozoa of domestic Animals 7th(Edn.), .1982.p. 90.
23. Thompson, R.C. and McManus, D.P.Aetiology: parasites and life cycles. In: WHO/OIE Manual in echinococcosis in humans and animals. WHO/OIE, Paris, 2002.p. 1-226.

24. Tolosa, T., Tigre, W., Teka, G. and Dorny, P. Prevalence of bovine cysticercosis and hydatidosis in Jimma municipal abattoir, South West Ethiopia.Onderstepoort*Journal of VeterinaryResearch,* **76**:2009.p.323–32.
25. Urquhart, G., J. Duncan, L. Armour, J. Dunn and Jenning, A.,. Veterinary parasitology. 2 ed, the ,Blackwell Science, Oxford,1996.p: 120-129.
26. Yetnayet, G. Prevalence and economic significance of Bovine hydatidosis in cattle slaughtered at Gonder ELFORA abattoir, North Gondar.DVM thesis, Faculty of Veterinary Medicine, University of Gondar, Ethiopia.2010.

Ethics approval and consent to participate
The local ethical committee of Samara University has ruled out as no formal ethics approval was required for this study. Additionally, the research work is not an experimental one rather it was an observational study of live and respective slaughtered animals at the abattoir.
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Abbreviations

ILCA	International Livestock Center for Africa
CSA	Central Statistical Agency
FAO	Food and Agricultural Organization
USD	United States Dollar
ETB	Ethiopian Birr
CSR	Average slaughtered cattle per annual in the abattoir
CL	Carcass weight loss in the individual animal
BC	Average price/cost/ of 1 kg carcass at Bahir Dar town
P	Prevalence of hydatidosisat Bahir Dar municipal apattior
ACW	Annual cost from carcass weight loss
IBM	International Business Machines
SPSS	Statistical Packages for Social Sciences
P –value	Probability value

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