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Cystic Echinococcosis of Cattle in Jimma Municipal Abattoir, South West Ethiopia

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Abstract: The purpose of this study was to estimate the prevalence and the distribution of internal organs of cystic echinococcosis on cattle slaughtered in Jimma municipal abattoir from November 2009 to February 2010, Western Ethiopia. Out of 564 cattle 205 (36.3%) were harbored hydatid cyst. The percentage of hydatid cyst in lung, liver, kidney, spleen and heart were found to be 92.7%, 53.2%, 1.5%, 0.5% and 0.5%, respectively. The lung was the most predominantly affected organ followed by the liver. Cattle body conditions significantly affect the prevalence of cystic echinococcosis (χ^2= 7.47, P = 0.008) and higher prevalence was recorded in animals with poor body condition. Of 217 cysts collected from the lung 51 (23.5%) were fertile, 117 (53.9%) were sterile and 49 (22.6%) were calcified. Likewise from 124 cysts collected from the liver 18 (14.5%), 34 (27.4%) and 72 (58.1%) were fertile, sterile and calcified respectively. Higher numbers of large and medium sized cysts were found in the lung when compared with other organs. The prevalence of the present study was higher therefore reduction of stray dog population, regular treatment of dogs and fencing the surrounding of the abattoir are the main core points to reduce the prevalence of the disease in the area.

Key words: Abattoir · Echinococcosis · Cattle · Jimma · Ethiopia

INTRODUCTION

Echinococcosis is a zoonotic infection caused by the larval stage of cestodes belonging to the genus *Echinococcus*. Four species of *Echinococcus* (*E*) are currently considered taxonomically valid: *E. granulosus*, *E. multilocularis*, *E. oligarthrus* and *E. vogeli* [1]. The cestode *E. granulosus* is the causative agent of cystic hydatid disease, or hydatidosis, which is recognized as one of the major zoonoses, affecting both humans and domestic animals in various parts of the world [2].

Echinococcus species require two mammalian hosts for completion of their life-cycles. Segments containing eggs or free eggs are passed in the faeces of the definitive host, a carnivore. The eggs are ingested by an intermediate host, in which the metacestode stage and protoscolices develop. The cycle is completed if such an intermediate host is eaten by a suitable carnivore [1].

The dynamic transmission of the parasite is determined by the interaction of factors associated with these hosts and external environment [3]. The global distribution of the parasite is in part because of its ability to adapt to a wide variety of domestic and wild intermediate hosts. It is a cyclozoonotic entity and is more important in rural areas where close association existing between dogs, men and domestic animals [4]. Diagnosis of echinococcosis in dogs or other susceptible carnivores depends on the demonstration of adult cestode of the echinococcus in their feces and diagnosis in intermediate host depends on the detection of the larval cyst which infects almost any organ, particularly the liver and lung [5].

Echinococcosis has greater public health importance and economic impact in countries where livestock industry is an important segment of the agriculture sector and when livestock production is based on mainly extensive grazing system. Hence, the objective of this study was to estimate the prevalence of cystic echinococcosis (Hydatidosis) in cattle slaughtered at Jimma municipal abattoir and to assess the localization, fertility and viability of the cyst.

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MATERIALS AND METHODS

Study Area Description: The study was conducted from November 2009 to February2010 in Jimma municipal abattoir, Oromiya regional state, western Ethiopia. According to CSA [6] the estimated cattle population of Jimma zone is 2,267,701. The annual average rainfall and temperature lies between 1200 to 2000 mm and 7°C to 30°C, respectively.

Study Design and Animals: A cross sectional study was employed for the study, which involved active abattoir survey of cattle presented to the abattoir from surrounding area. All animals slaughtered in the abattoir were male and slaughtered animals were randomly sampled and all the necessary data were recorded.

Sample Size Determination: Sample size was determined according to Thrusfield [7] by taking 31.4 % prevalence [8], 95% confidence level and 5% desired absolute precision (d =0.05). Thus according to the formula 331 animals were sampled. However, to increase precision a total of 564 cattle were sampled.

Study Methodology: Ante and post-mortem inspection: During antemortem inspection data like age, sex, breed and body conditions of each animal was recorded. The body condition score was ranked as poor, medium and good [9]. At postmortem, a thorough visual inspection, palpation and systematic incision of each visceral organ particularly the liver, lung, kidney, heart and spleen were carried out according to procedures recommended by FAO/WHO [10].

Examination of Cyst Fertility and Viability of Protoscolices: Infected organs were taken to the laboratory and hydatid cysts found in the organs are randomly collected to conduct cyst count, cyst size measurement, cyst fertility test and viability of protoscolices. In the laboratory the cyst wall was penetrated with hypodermic needle and opened with scalpel blade and the contents were transferred in to sterile test tubes. The cyst volumes were arbitrary classified into three categories: small (Less than 6 ml), medium (Between 6 and 20 ml) and large (More than 20 ml). Based on the presence or absence of brood capsule containing protoscolices in hydatid fluid, cysts were identified and classified as fertile or infertile. The infertile cysts were also further classified as sterile (Fluid filled cyst without any protoscolices) or calcified (Cyst already calcified) as per the procedure given by Macpherson [11].

Data Analysis: Collected data entered in to Microsoft Excel spread sheet and summarized by means of descriptive statistics. Then analyzed by using chi-square test for the considered factors. For the analysis STATA 11 [12] was used.

RESULTS

Over All Prevalence of Hydatidosis: Of 564 heads of cattle slaughtered and examined at Jimma municipal abattoir, 36.3% were found harboring hydatid cyst. The proportions of hydatid cyst for age and body conditions group were shown in Table 1.

Number of Affected Organs Related to Hydatid Cyst Prevalence: During this study the lung was found to be the most predominantly affected organ followed by the liver. The percentage of hydatid cyst in different internal organs was recorded as 92.7%, 53.2%, 1.5%, 0.5% and 0.5% in lung, liver, kidney, spleen and heart respectively (Table 2). With regards to the size of the cyst: the highest incidence was observed as small cyst (54.5%), followed by medium size cyst (25.5%) and large cyst (20.1%) (Table 3).

Fertility and Viability of Hydatid Cyst: The fertility status in different organs also recorded and lung had 23.5% fertile, 53.9% sterile and 22.6% calcified cysts, whereas liver had 14.5% fertile, 27.4% sterile and 58.1% calcified cysts. The viability of cyst is higher in lung (23.5%) than liver (14.5%) whereas cysts from kidney spleen and heart were unfertile (Table 4).

Table 1: Prevalence of cattle hydatidosis according to different animal attributes

Categories		No. examined	No. positive	Percentage	χ^2 value	P-value
Age	≤ 5 yrs	29	7	24.1	-	-
	> 5 yrs	535	198	37.0	2.09	0.166
Body condition	Poor	54	29	53.7	-	-
	Medium	350	121	34.6	7.47	0.008
	Good	160	55	34.4		
Total		564	205	36.3		

Table 2: Organ distribution of hydatid cyst of cattle

Organs	No. examined	No. of cases	Percentage
Lung	564	190	92.7
Liver	564	109	53.2
Kidney	564	3	1.5
Spleen	564	1	0.5
Heart	564	1	0.5

Table 3: Distribution of hydatid cyst in different organs with respect size

	Size of cyst			
Organ	Small	Medium	Large	Sub total
Lung	151 (50.5%)	82 (27.4%)	65 (21.7%)	299 (81%)
Liver	47 (70.2%)	11 (16.4%)	9 (13.4%)	67 (18.2%)
Kidney	1 (50%)	1 (50%)	-	2 (0.5%)
Spleen	1 (100%)	-	-	1 (0.3%)
Heart	1 (100%)	-	-	1 (0.3%)
Total	201 (54.5%)	94 (25.5%)	74 (20.1%)	369 (100%)

Table 4: Types of hydatid cyst in different organs

	Type of cyst			
Organ	Fertile	Sterile	Calcified	Total
Lung	51 (23.5%)	117(53.9%)	49 (22.6%)	217(62.9%)
Liver	18 (14.5%)	34(27.4%)	72 (58.1%)	124(35.9%)
Kidney	-	2 (100%)	-	2 (0.6%)
Spleen	-	1(100%)	-	1 (0.3%)
Heart		1 (100%)		1 (0.3%)
Total	69 (20%)	155 (44.9%)	121 (35.1%)	345 (100%)

DISCUSSION

The prevalence of hydatid cyst (36.3%) observed in this study was comparable to the reports of Tolessa *et al.* [8], Berhe [13], Kebede *et al.* [14] and Amuamuta *et al*. [15] in various parts of the country. But it was lower than the report of Kebede *et al.* [16], Getaw *et al.* [17] and Regassa *et al.* [18]. However, this prevalence was higher than the report of Kebede *et al.* [19], Kebede *et al.* [20] and Bekele and Butako [21]. This variation in prevalence of hydatidosis could be due to differences in animal husbandry system, illegal slaughtered of animals, lack of proper disposal of infected carcass and the presence stray dog and their relations with animals.

In this study lungs were found to be the most commonly affected organs (92.7%) followed by liver (53.2%), kidney (1.5%), spleen (0.5%) and heart (0.5%). Similar findings were recorded by Berhe [13], Kebede *et al.* [14], Kebede *et al.* [16], Kebede *et al.* [18], Regassa *et al.* [19], Kebede *et al.* [20], Bekele and Butako [21], Kebede [22], Debas and Ibrahim [23], Guadu *et al*. [24] and Bekele *et al*. [25]. This might be due to the presence of greater capillary beds in the lung than other organs.

Body condition significantly affected the prevalence of hydatidosis (X^2 = 7.47, $P< 0.05$) and animals with poor body condition were with higher prevalence of hydatidosis. The differences between body conditions score may be due to animals with poor body condition have low immunity to hydatid disease. Moderate to severe infection the parasite may cause retarded growth; reduce meat and milk production as well as live weight [26].

Higher number of large and medium sized cyst were found in lung, this is due to softer consistency of the lung that allows the development of the cyst [27] while, small and calcified cyst is higher in liver due to higher

reticuloendothelial and abundant connective tissue reaction of the organ [28], which encapsulates the cyst with in fibrous wall up to 13mm thick. The higher proportion of small cyst may be due to immunological responses of the host which might preclude expansion of cyst [29].

The result of this study showed less number of fertile cysts when compared with that of sterile and calcified cysts showing that most of the cysts in cattle are infertile. The percentage of fertile cysts observed in this study is higher in lungs than in liver. This finding is in agreement with the work of Berhe [13], Kebede *et al*. [14] and Kebede *et al*. [19], in Mekelle, Bahir Dar and Wolaita Sodo, respectively. This is due to the relatively softer consistency of lung tissue which allows the easier development of the cyst.

Cystic echinococcosis is one of the most important zoonotic diseases in Jimma and its surrounding. This is associated with backyard slaughtering with throwing of visceral organs every where and keeping dogs in close association with animals and humans.

REFERENCES

1. Eckert, J., M.A. Gemmell, F.X. Meslin and Z.S. Pawłowski, 2002. Echinococcosis in Humans and Animals: a Public Health Problem of Global Concern WHO/OIE Manual. Paris, France.
2. Gottstein, B. and A. Hemphill, 1997. Immunopathology of Echinococcus. In: Freedman, D.D. (ed) Immunopathogenetic Aspects of Disease Induced by Helminth Parasites. Switzerland: Chem Immunol Basel Karger, 66: 177-208.
3. Soulsby, E.J.L., 1982. Helminths Arthropoda and Protozoa of domestic animals 7th (ed). Phailadelphaialea and Febiger, U.S.A.
4. Dent, C.H.R. and J.D. Kelly, 1976. Cestode parasites of the dog in the Central Tablelands of New South Wales, Australia Veterinary Journal, 52(8): 386-388.
5. OIE, 2008. Echinococcosis/hydatidosis. In; manual of diagnostic tests and vaccine for terrestrial animal 5th ed. Office of international Desepizootics, Paris.
6. CSA, 2012. Agricultural Sample Survey, report on livestock and livestock characteristics Volume II Federal Democratic Republic of Ethiopia, Addis Ababa, Ethiopia.
7. Thrusfield, M., 1995. Veterinary Epidemiology. 2nd ed. University of Edinburgh, Black well science, pp: 180-188.
8. Tolosa, T., W. Tigre, G. Teka and P. Domy, 2009. Prevalence of bovine cysticercosis and hydatidosis in Jimma municipal abattoir, South West Ethiopia. Onderstepoort J. Vet. Res., 76: 323-326.
9. Nicholson, M.J. and M.H. Buttrworth, 1986. A guide condition scoring of zebu cattle international livestock center for Africa, Addis Ababa, Ethiopia.
10. FAO/WHO, 1994. Guidelines for echinococcosis/hydatidosis surveillance, prevention and control. FAO, Rome., 29: 147.
11. Macpherson, L.N.L., 1985. Epidemiology of hydatid disease in Kenya. A study of domestic intermediate hosts in Masaialand, Transactions of the Royal Society of Tropical Medicine and Hygiene, 79: 209-217.
12. Stata Corporation, 2006. Intercooled stata 9.2 for windows 98/95 NT 4905 Lake wayry Drive, College station, Texas 77845. U.S.A.
13. Berhe, G., 2009. Abattoir survey on cattle hydatidosis in Tigray region of Ethiopia. Tropical Animal and Health production, 41(7): 1347-1352.
14. Kebede, N., A. Mitiku and G. Tilahun, 2009. Hydatidosis of slaughtered animals in Bahir Dar abattoir, northwestern Ethiopia. Tropical Animal and Health production, 41(1): 43-50.
15. Amuamuta, A., B. Akalu and M. Chanie, 2012. Major Causes of Lung and Liver Condemnation and Financial Impact in Cattle Slaughter at Bahir Dar Municpial Abattior. African Journal of Basic & Applied Sciences, 4(5): 165-171.
16. Kebede, N., A. Abuhay, G. Tilahun and A. Wossene, 2009. Financial loss estimation, prevalence and characterization of hydatidosis of cattle slaughtered at Debre Markos municipality abattoir, Ethiopia. Tropical Animal and Health production, 41(8): 1787-1789.
17. Getaw, A., D. Beyene, D. Ayana, B. Megersa and F. Abunna, 2010. Hydatidosis: Prevalence and its economic importance in ruminants slaughtered at Adama municipal abattoir, Central Oromiya, Ethiiopia. Acta Trop., 113: 221-225.
18. Regassa, F., A. Molla and J. Bekele, 2010. Study on the prevalence of cystic hydatidosis and its economic significance in cattle slaughtered at Hawassa municipal abattoir. Tropical Animal and Health production, 42(5): 977-984.
19. Kebede, N., H. Mokonnen, A. Wossene and G. Tilahun, 2009. Hydatidosis of slaughtered cattle in Wolayita Sodo abattoir southern Ethiopia. Tropical Animal and Health production, 41(4): 629-633.

20. Kebede, W., A. Hagos, Z. Girma and F. Labago, 2009. Echinococcosis/hydatidosis: its prevalence, economic and public health significance in Tigray region, North Ethiopia. Tropical Animal and Health production, 41(6): 865-871.
21. Bekele, J. and B. Butako, 2011. Occurrence and financial loss assessment of cystic echinococcosis (hydatidosis) in cattle slaughtered at Wolayita Sodo municipal abattoir, Southern Ethiopia. Tropical Animal and Health Production, 43(1): 221-228.
22. Kebede, N., 2010. A retrospective survey of bovine hydatidosis in three abattoirs of Amhara National Regional State, northwestern Ethiopia. Tropical Animal and Health production, 42(3): 323-325.
23. Debas, E. and N. Ibrahim, 2013. Prevalence and Economic Importance of Hydatidosis in Cattle Slaughtered at North Gonder Elfora Abattoir. European Journal of Applied Sciences, 5(1): 29-35.
24. Guadu, T., Y. Gebremicael and M. Chanie, 2013. Economic and Zoonotic Importance of Bovine Hydatidosis in Shire Municipal Abattoir, North West Zone, Tigary Region, Ethiopia. Acta Parasitologica Globalis, 4(3): 92-98.
25. Bekele, J., W. Kebede, S. Shimelis and D. Shiferaw, 2013. Prevalence and Financial Loss Estimation of Cystic Echinococcosis in Cattle Slaughtered at Mizan Teferi and Teppi Municipal Abattoirs, South-Western Ethiopia. European Journal of Applied Sciences, 5(1): 12-18.
26. Polydorou, K., 1981. Animal health and economics case study: Echinoccosis with reference to Cyprus. Bull. Int. Epizoot, 93(5): 981-992.
27. Hubbert, W.T., W.F. Culloch, Sclnurredn and A.A. Beger, 1975. Disease Transmitted from animal to man. 6th ed., Choreler C. Thomas Publisher, Spring Filk Illinosis.
28. Gemmel, M.A., 1978. Perspectives on option for hydatidosis and cysticercosis control. Veterinary Medical Review, pp: 3-48.
29. Torgerson, P., 2002. Transmission dynamics of taeniid parasites in animal hosts. In: P. Craig and Z. Pawlowski (Ed.), Cestode zoonoses: Echinococcosis and cysticercosis, an emergent and global problem. The Netherlands, Amsterdam IOS press, pp: 221-235.