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Full Length Research Paper

Prevalence and financial loss estimation of hydatidosis of cattle slaughtered at Addis Ababa abattoirs enterprise

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The study was undertaken from November, 2009 to April, 2010, at Addis Ababa Abattoir Enterprise with the aim of determining the prevalence of bovine hydatidosis and to have realistic estimate of the financial loss attributed to organ condemnation as a result of hydatidosis disease. Of the 484 examined animals, 196 (40.5%) harbored hydatid cysts. Observation during the survey period also revealed that the infection rate among different age groups of examined animals were found to be statistically significant (p<0.05) with the highest in old aged cattle (56%) followed by adult (37.11%) and young (9.3%). There was no statistically significant difference between infection rate and breeds, sex and body condition score of the animals. Of the total 474 recovered cysts from condemned organs, 197(41.56%), 127(26.79%), 37(7.8%) and 113(23.84%) were small, medium, large, and calcified, respectively. Of the total 474 cysts, 79(16.66%) fertile, 282(59.5%) sterile and 113(23.74%) were calcified cyst. Calcification was found higher in the liver than the lungs, while most of fertile cysts were recovered from the lungs. The financial loss from organ condemnation due to bovine hydatidosis at Addis Ababa Abattoir Enterprise was estimated to be 19,847,704.5 (ETB). It can be stated that hydatidosis is one of the most economically important cattle disease in the area warranting for serious attention.

Key words: Abattoir, *Addis Ababa,* cattle, cyst, financial loss, hydatidosis, prevalence.

INTRODUCTION

Echinococcosis (hydatidosis) are the terms usually applied interchangeably to the cyclozonootic infection caused by the adult and larval stage (metacestode) of cestodes of the genus echinococcus family taenidae (FAO/UNEP/WHO, 1982). Of the four accepted species in the genus *Echinococcus*, namely *Echinococcus granulosus*, *Echinococcus multicelularis*, *Echinococcus vogeli* and *Echinococcus oligan*, the first two species are of veterinary medicine and public health significance. *E. granulosus* is found in the small intestine of carnivores (particularly the dog) and the metacestode (hydatid cyst) is found in a wide variety of ungulates (sheep, cattle, pigs, goats, horse and camels) and man (Thompson and Lumbory, 1995).

Morphologically adult *Echinococcus* is only a few millimeters long (rarely more than 10 mm) and usually has no more than six segments (Soulsby, 1982). Anteriorly, an adult echinococcus possesses a specialized attachment organ. The scolex that has four muscular suckers and two rows of hooks, one large and one small; on the rostellum, the body or strobila is segmented and consists of reproductive units (proglotids), which may vary in number from two to six (Dwight and Bow, 1995).

The incidence of hydatidosis has extensively been studied from the time of its recognition as one of the

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major health hazard among animals and human beings. Nelson (1986) reported a brief account of events for highest incidence of clinically recognizable hydatidosis in man. He reported dogs and jackals were mainly the final host for *E. granulosus* and sheep, goat, cattle and camel were intermediate hosts. One incidence usually varies from as low as 0.00092% (Dada and Belino, 1977) to as high as 86.4% (Deka et al., 1988). This parasitic problem is present in every continent with which the cestode occurs in all major climates (Soulsby, 1982).

The global distribution of the parasite is due in part to its ability to adapt to wide variety domestic and wild intermediate hosts. The disease occurs throughout the year as long as final hosts are available (Hagos, 1997).

The importance of hydatidosis can be evaluated both from economic loss in livestock productivity and public health hazard view points. The economic importance of hydatidosis in livestock is due to the condemnation of edible offal's primary liver and lung. In sever infection the parasite may cause retarded performance and growth, reduced quality and yield of meat and milk. Condemned organs or even the whole carcass, represent a high financial loss in many countries. The importance of these losses depends largely on the characteristics of the tanning or livestock industry in a particular country (Annon, 1990). Hydatidosis is one of the major causes of organ condemnation in most Ethiopian abattoirs and slaughter houses (Kebede et al., 2009; Tolosa et al., 2009; Getaw et al., 2010; Fromsa and Jobre, 2011) and leads to huge economic losses. Human cases of hydatidosis are frequently reported from different corner of the country (Biluts et al., 2006; Kebede et al., 2009) and the disease is much more common in the rural areas of Ethiopia where dogs and domestic animals live in a very close association (Fromsa and Jobre, 2011). Despite these, the recent status of hydatidosis in livestock and its economic impact is not well known in Addis Ababa Abattoir enterprises. Therefore the objectives of this study were to determine abattoir prevalence of hydatidosis in cattle slaughtered at Addis Ababa Abattoir Enterprise and to estimate financial loss due to hydatidosis.

MATERIALS AND METHODES

Study area

The study was under taken from November 2009 until April 2010 at Addis Ababa Abattoirs Enterprise on the cattle brought from all parts of the country. Addis Ababa, the capital city of the country, is located on elevation of 2000 to 3000 m.a.s.l.; the mean annual rainfall is 1800 with a bimodal pattern while the days mean annual minimum and maximum temperature are 14 and 21°C respectively (CSA, 2010).

Study population

The study population constitutes of local, cross and exotic cattle breed originating from different localities and markets of the country. Majority of breed slaughtered were local breeds however relatively few cross and exotic breeds were also slaughtered. According to the information obtained from abattoir, averagely 700 cattle, 250 sheep, 70 goats and 30 pigs were slaughtered per day.

Study design

A cross sectional study design was employed to determine the prevalence rate and to estimate financial loss due to hydatidosis.

Sample size determination

The sample size was calculated according to Thrusfield (1995) by considering 36.3 (Yimer, 2002) expected prevalence and 95% confidence level with a 5% desired absolute precision. Thus:

$$n = \frac{1.96^2 \times pexp\ (1\text{-}pexp)}{d^2}$$

where, n= required sample size; p ex = expected prevalence, and d = desired absolute precision

Even though the required sample size was 355, additional 129 samples were included to increase the precision and a total of 484 animals were included in the study.

Study methodology

Ante mortem examination

Regular visits (2 days per week) were made to Addis Ababa Abattoirs enterprise during the period from November 2009 to March 2010. Averagely around 12 animals were examined per day. Before the animals were slaughtered, ante mortem inspections were conducted on individual animals. The age of the animal was estimated on the basis of the dentitions and conventionally grouped in to three; young, adult and old whereas the body condition scoring was done according to Nicholson and Butter Worth (1986).

Post mortem examination

The organs of systematically selected cattle were examined by visual inspection and palpation. Organs of each slaughtered animals infected with hydatid cyst were identified systematically following the standard routine post mortem inspections procedure. The inspected organs were collected for close examination and then registered. Incision was also made when necessary to confirm doubtful cases.

Cyst characterization

Individual cyst was grossly examined for any evidence of degeneration and calcification. Cysts size measurement, cyst counting, cyst fertility and viability determination was also conducted. The size of the diameter of hydatid cyst was measured and classified as large (diameter >10 cm), medium (5 to 10 cm) and small (diameter < 5 cm) (Oostburg et al., 2000; Kebede et al., 2009). The collected cysts were carefully incised and examined for protoscolices, which looks like white dots on the germinal epithelium, in hydatid fluid so as to classify cysts as fertile or infertile(Kebede et al., 2009). Fertile cysts were further subjected to viability test. A segment containing protoscolices was placed on the

microscope glass slide and covers with cover slip and observed for amoeboid like peristaltic movement with (40x) objective. For clear vision, a drop of 0.1% aqueous eosin solution was added to equal volume of protoscolices in hydatid fluid on microscope slide with the principle that viable protoscolices should completely or partially exclude the dye while the dead ones take it up (Dalimi et al., 2002).

Financial loss assessment

An attempt was made to estimate the annual economic losses from hydatidosis in cattle taking into account losses from cost of organ condemnation and from carcass weight. The retail market price of average size offal (lung, liver, kidney, heart and spleen) and the cost of one kg beef were obtained from information gathered from local butchers. Annual economic loss due to organ condemnation was determined by considering annual slaughter rate of cattle and prevalence of hydatidosis per organ and an estimated 5% carcass weight loss (Getaw et al., 2010) was considered. Average carcass weight of Ethiopian local breed cattle is estimated as 108 kg (Negassa et al., 2010). The total economic loss was calculated as the summation of cost of offal condemned plus the cost of carcass weight losses (Kebede et al., 2009; Getaw et al., 2010).

Data management and analysis

Collected data was entered into the Microsoft excel program of the computer and analyzed using STATA 7.0. The overall prevalence and the prevalence on the basis of age, breed, sex and body condition score were computed. The person χ^2 was used to test the existence of association and ($p<0.05$) was considered as significant.

RESULTS

On ante mortem examination, all examined animals were normal and passed for slaughter. On post mortem, out of total 484 heads of cattle, 196 (40.5%) were infected with hydatid cyst (Table 1) harboring one or more cyst involving different visceral organs.

Age based prevalence has showed a statistically significance variation ($p<0.05$, $\chi2=33.7$). This shows that the prevalence rate increases when the age of cattle advances but there was no statistically significant difference between the prevalence of the disease and breeds, sex and body condition score of the slaughtered animals (Table 1)

In majority of animals harboring hydatidosis, the cysts had the tendency to be located more in lungs and liver than in other organs such as heart spleen and kidneys (Table 2).

As the data on the size of cysts is analyzed and summarized, most of the recovered cysts were small in size and some were calcified. Only few medium sized and large sized cysts were found (Table 3).

The number of cysts recovered from each cattle varied between 1 and 13 cysts. The number and percentage of fertile, sterile and calcified cysts was summarized and presented in Table 4.

Estimation of financial loss

The economic loss due to hydatidosis was the summation of the loss due to carcass weight and the loss due to organ condemnation. Therefore, the estimated economic loss in cattle slaughtered at Addis Ababa Abattoir Enterprise due to hydatidosis was estimated to be 19,847,704.5 Ethiopian birr (ETB) (equivalent of 1,167,512 US dollar).

DISCUSSION

The current study revealed that the prevalence of bovine hydatidosis at Addis Ababa Abattoirs Enterprise was found to be 40.5%. Reports show that bovine hydatidosis is wide spread in Ethiopia. The prevalence of 61% in Assela (Koskei, 1998); 46.5% in Debre Zeit (Jobre et al., 1996); 34.05% in Bahir Dar (Nigatu et al., 2009); 22% in Tigray region (Kebede et al., 2009), and 32% at Mekelle Municipal Abattoir (Berhe, 2009) was documented. The current finding is indicative of a high prevalence and comparable to some of these reports from different parts of the country. The occurrence of such a high prevalence in the current site might have resulted from increase in flow of cattle from areas of high prevalence through market.

This study showed that the infection rate increases as the age increases; it was found that there was positive correlation between the age of cattle examined and infection rate ($p<0.05$). Thus, the reason for the lower prevalence rate of hydatidosis in younger cattle may be early culling of the infected young cattle through selling or slaughtering before they reach old age.

Out of the 196 infected cattle, 49 (41.52%) were females and 147 (40.5%) males were positive with $p>0.05$ which suggests that there is no significance association between sex and prevalence of the disease. Regarding the breed, out of 484 cattle 163 (41.47%) local, 24(38.7%) cross and 9 (31.03%) exotic were positive ($p>0.05$), which also showed no association between breeds and body condition. The result has similarly registered by Temesgen (2008).

The given result indicated that the occurrence of cyst was highest in the lungs than in liver and other organs, hence liver cysts is less frequent in cattle (Table 5).

Similarly result had been obtained in the same abattoir by Fekadu (1997) and Wubet (1987). Other similar reports from abroad also indicated that lungs were found to be the most infected organs in cattle, buffalo and sheep (Pandey et al., 1988; Maharjan, 1999; Kumari et al., 2000; Manandhor, 2005). Therefore the findings in this study were in conformity with previous studies made in Ethiopia and abroad.

The finding of 59.50% sterile, 16.6% fertile and 23.84% calcified cyst may generally imply that most of the cysts in cattle are sterile. The variation of infertility rate among different species and in different geographical zone could

Table 1. Prevalence of hydatidosis based on different variable categories.

Variable categories	No. examined	No. positive	Prevalence (%)	χ^2	p-value
Age					
Young	43	4	9.30		
Adult	291	108	37.11	33.7	0.00
Old	150	84	56		
Total	484	196	40.5		
Breed					
Local	393	163	41.47	1.31	0.051
	62	24	38.70		
Cross					
Exotic	29	9	31.03		
Total	484	196	40.5		
Sex					
Male	366	147	40.16	0.068	0.79
Female	118	49	41.52		
Total	484	196	40.5		
Body condition					
Poor	96	42	43.75		
Medium	209	91	43.54	3.31	0.19
Good	179	63	35.19		
Total	484	196	40.5		

Table 2. Distribution of hydatid cysts in different visceral organs of infected cattle.

Infected organs	Number	Percent
Lungs only	114	58.16
Liver only	27	13.77
Lungs and Liver	48	24.48
Lungs and heart	1	0.51
liver and kidney	2	1.02
Lungs and kidney	1	0.51
liver and spleen	1	0.51
Lung, liver and heart	2	1.02

Table 3. Sizes of cysts from slaughtered cattle in the study abattoir.

Size of cysts	Frequency	Percent
Small	197	41.56
Medium	127	26.79
Large	37	7.80
Calcified	113	23.84
Total	474	100.00

Table 4. Proportion of fertile, sterile and calcified hydatid cysts.

Condition of cysts	Number	Percent (%)
Fertile	79	16.66
Sterile	282	59.50
Calcified	113	23.74
Total	474	100

Table 5. Viable and Fertile cyst with respect to the organ involved.

Type of organ	Fertile cyst		Viable cyst	
	No.	%	No.	%
Lungs	54	14.95	35	64.81
Liver	25	6.92	14	56
Total	79		49	

be due to the differences in strain of *E. granulosus* (Mcmannus and Smith, 2006). The higher fertility rate in lungs than liver is due to the fact that relatively softer consistency of lung tissue allows easier development of the cyst.

Fertility rate of hydatid cysts may show a tendency to increase with advancing age of hosts (Himonass, 1987). The result showed that the highest number of cysts is small in size; which may be because of the fact that the infected cattle are slaughtered before the cysts become

larger in size. Soulsby (1982) described that in the intermediate hosts, the characteristic lesions of hydatidosis are fluid filled cysts which grow slowly over several months and large size cysts are often found in older animals.

The study revealed that in relation to other organs, lungs and liver are the most commonly affected and rejected from local market place, and costing too much loss to the livestock industry of the area. The rejection rate of heart, spleen and kidney was however not as significant as that of lungs and liver.

The annual financial loss incurred (19,847,704.5 ETB) in this study is higher than most of those reported by other investigators in different areas of Ethiopia. This is due to high demand of edible offals and beef in the study area and the current situation of market price in the country.

Conclusion

The current study on hydatidosis in cattle slaughtered in Addis Ababa Abattoirs Enterprise revealed the high prevalence of the disease. It was found that the liver and lung were the most affected organs than other visceral organs. In this study, hydatidosis were found to be the major causes of organ condemnation which leads to huge financial loss.

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