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Hydatidosis: Prevalence and financial loss of bovine hydatidosis from cattle slaughtered at Adama Municipal Abattoir, South Eastern Ethiopia

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A cross-sectional study was carried out from November, 2013 to April, 2014 at Adama municipal abattoir to determine the prevalence of bovine hydatidosis and assess its direct financial loss due to organs condemnation. Postmortem examination, hydatid cyst characterization and direct financial loss estimations were conducted on slaughtered animals by systematic random sampling technique. Out of 450 local zebu cattle slaughtered, 54% were found to be positive for Bovine hydatidosis and the infestation among different age groups of examined animals were vary and found to be statistically significant ($p<0.05$), with the highest in old aged cattle (>5 years) (64.5%) and adult (3 to 5 years) (45.6%). There was statistically significant difference between infection rate and body condition score of the animals with (62.9%) lean, (50.28%) medium and (39.74%) fat body condition. The anatomical distribution of the cysts indicated as lung 241 (47.55%), liver 183 (40.66%), spleen 8 (1.77%) and Kidney 3 (0.66%). Out of the total cyst identified, 567 were found in lung, 444 in liver, 23 in spleen and 11 in kidney. Out of the total counted, 451 of the cyst were small, 363 were medium, 77 were large and 154 were calcified. The total annual direct financial loss was estimated to be ($45, 968.12) 89, 6378.4 Ethiopian Birr. The present study indicated that Bovine hydatidosis was highly prevalent and it causes a huge financial loss. Thus, veterinary activities such as improvement of slaughter hygiene, proper meat inspection, and proper disposal of condemned offals as well as awareness creation among animal owners are recommended.

Key words: Abattoir, Adama, cattle, financial significance, prevalence, zebu.

INTRODUCTION

Echinococcosis is a zoonotic infection caused by adult or larval (metacestode) stages of cestodes belonging to the genus *Ehinococcus* and the family *Taeniidae* (Thompson and McManus, 2002). Echinococosis has a worldwide distribution; mainly due to its ability to adapt to a wide variety of domestic and wild intermediate hosts (OIE, 2008). *Echinococcus granulosus* and *Echinococcus multilocularis* are moderately significance to veterinary medicine but highly significant to public health (Khuroo, 2002; Zhang et al., 2003). The lifecycle of these parasites is indirect, requiring two mammalian hosts. The adult worm, which lives in the small intestine of dogs and other

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canids (definitive hosts), lays eggs that are excreted with the feces of the infected animal, contaminating the environment (Zhang et al., 2003; Guillermo et al., 2012). Domestic or wild ungulates (Intermediate hosts) acquire the infection through accidental ingestion of the eggs which in turn develop into the parasite's larval stage (metacestode) in internal organs and ultimately cause the pathology associated with cystic echinococcosis (CE). The transmission cycle is completed when definitive hosts eat these infected organs (Budke et al., 2006). A wide variety of animal species, both domestic and wild, act as intermediate hosts have made *E. granulosus* to be widely distributed across the globe and at least 10 genetically distinct populations exist within the complex *E. granulosus* (Thompson and McManus, 2002; Khuroo, 2002). The outcome of infection in livestock causes severe disease and death in humans and results in economic losses in the form of treatment costs, lost wages and livestock annual production loss (Fromsa and Jobre, 2011). The incidence of human hydatid disease in any country is closely related to the prevalence of the disease in domestic animals and is highest where there is a large dog population and high sheep production (Abebe and Jobre, 2011). This might be attributed to backyard slaughter practice, an increase in the population of stray dogs and the absence of the control program (Schantz et al., 1995). Socio-economic and cultural characteristics are among the best defined risk factors for human infection with CE throughout its broad global range Krauss et al., 2003).

Control of echonococcosis is much more difficult because of the wildlife cycle between foxes and rodents, but reduction in transmission has been achieved by use of praziquantel baits for foxes and dosing of owned dogs where spill over into the dog population occurs (Eckert and Deplazes, 2004). Treatment in humans include surgery and the use of long term chemotherapy with Antihelmintics to kill larvae or prevent from growing after surgery and the best control and preventive measure of the disease to interrupt the life cycle of the parasite (Jobre et al., 1996). Cystic echinococcosis is prevalent in rural communities because of close proximity with dog and/or cats and it represented a considerable economic and public health significance in different countries including Ethiopia (Azlaf and Dakkak, 2006; Elshazly et al., 2007; Christodoulopoulos et al., 2008; Kebede, 2008; Sissay et al., 2008; Kebede et al., 2011; Kebede et al., 2009; CSA, 2007).

One of the major parasitic zoonotic diseases prevailing in the area is hydatidosis occurring both in humans and domestic animals causing huge financial loss due to organ condemnation. Hence, knowledge on the prevalence of hydatidosis and financial loss in zebu cattle would have significant importance in justifying the need of an effective control scheme. Therefore, this study was aimed at assessing the prevalence of hydatidosis, and estimating the direct financial losses associated with hydatidosis in cattle slaughtered at Adama municipal abattoir.

MATERIALS AND METHODS

Study area

The study was conducted in Adama municipal abattoir of east Shoa zone of Oromia Regional state. Adama city is located 99km east of Addis Ababa with altitude of 1712 m above sea level. The city is located geographically at 08'32'29'' north latitude and 39'16'08 east longitude. It receives annual rain fall of 40 to 800 mm with a mean annual maximum and minimum temperature of 27.7°c and 13.9°c respectively. There is about 356,112 livestock population (Thrusfield, 1995). How many cattle are slaughtered per day in average

Study animals

The study was conducted on local zebu cattle originated from areas like Arsi, Assella, Kareyu, Wolinchite, Wonji, Boku Shanani and Ganda Gara. The majority of cattle that were slaughtered in the Adama municipal abattoir were adult male from 3 to 5 years and older than 5 years and few females. The cattle in these areas are managed under extensive management system which was characterized by grazing on pasture.

Study design and sample size determination

A cross-sectional study was conducted from November, 2013 to April, 2014 to determine the prevalence of hydatid cyst by considering animals' sex, age, body condition, origin and proportion organs infected and economic loss due to organ condemnation. Using systematic random sampling methods and 95% confidence interval with required 5% precision, the sample size was determined by the following formula (Kelly, 1975).

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

Where n=required sample size
Pexp = expected prevalence
d=required precision

The expected prevalence of the echinococosis is 50% with required precision (d) of 5% (0.05). When it was calculate in the above formula, this sample size was gotten:

$$n = \frac{1.96^2 \times 0.5(1-0.5)}{0.05^2} = 384$$

However, to increase the precision of the study a total of 450 cattle were randomly sampled and examined for the presence of hydatid cyst.

Study methodology

Ante-mortem examination

During ante-mortem inspection in a lairage, animals which show clinical sign of illness and some pathological alterations,

checkup and treatment were carried out. The age of the sampled animals' was determined by dental eruption (Nicholson and Butterworth, 1986). The body condition scoring was conducted by looking at the back and flank which was classified as lean, medium and fat (Kebede et al., 2008).

Post-mortem examination

Three days per week visits were made to Adama Municipal Abattoir and a thorough examination of visceral organs like lungs, liver, heart, kidneys and spleen was done by inspection, palpation and incision for presence of hydatid cyst (OIE, 2008) and total numbers of hydatid cysts were collected and counted per infected organ. After all cysts in an organ were counted they were subjected to systematic size measurement (diameter) using a ruler and classified as small cyst (<3 cm), medium cyst (3 to 5 cm) and large cyst (>5 cm) and recorded systematical on designed sheet (Oostburg et al., 2000; Ogunrinade and Ogunrinade, 1980).

Financial loss

Annual cost of the condemned organs due to bovine hydatidosis was assessed (Regasa et al., 2010). The mean retail market price of condemned organs due to hydatidosisi was established by asking, 10 different meat sellers and two meat inspectors for the price per unit organ and the average organ price was determined and used to calculate the loss (Torgerson et al., 2001. The financial loss of the parasite was determined by multiplying the average retail market price of the organs by the percent number of condemned organs and mean annual slaughtered cattle (STATA Corporation, 2001).

Data analysis

The collected data during Ante-mortem, postmortem and direct financial loss estimation were entered and analyzed by using STATA 7.0 version (Regasa et al., 2010).

RESULTS

Over all prevalence and distribution of hydatid cyst

Out of the total 450 heads of cattle slaughtered at Adama municipal abattoir; 243 (54%) were infested with hydatid cyst, harboring at least one or more cysts involving different visceral organs (lung, liver, spleen and kidney). The distribution of hydatid cysts involved lung, liver, spleen and kidney. Among 243 cattle harboring hydatid cyst, lung, liver, spleen and kidney harbored 47.6, 40.7, 1.8 and 0.66% in that order as a single organ infestation whereas the remaining 9.24% occurred in more than one organ. Large proportion of cattle (47.6%) had cysts only on their lung followed by liver (40.71%) (Table 1).

Prevalence of hydatid cysts on basis of body condition score and age

Prevalence of hydatid cyst was found significantly associated with body condition score in that cattle having poor body condition had the highest prevalence (62.9%) followed by medium (50.3%) and good (39.7%) scores. Rate of infection in different age groups (<5 years and more than 5years) was assessed and also shown a statistically significant variation ($p<0.05$) with older group having higher infections compared to adults (Table 2).

Financial loss assessment

In this study, the direct annual financial losses due to condemnation of affected organs were estimated to be $ 45,968.12 (896378.4 ETB).

DISCUSSION

The present study revealed the prevalence of Bovine hydatidosis was 54% (95% CI=48.34-60.00%). The finding is higher than the previous works in Hawassa (52.69%) (Kebede et al., 2009), Bahir Dar (34.05%) (Jobber et al., 1996), Debre-Zeit (46.5%) (Kebede et al., 2009), Debre-Markos (48.9%) (Berhe, 2009), Mekele (32.1%) (Dechassa et al., 2012) and Tigray (22%) (Jobber et al., 1996).

However, the current finding is lower than prevalence study in other areas like 72.44% in Assella (Jobber et al., 1996), 59.9% in Bahir-Dar and 62.96% around Bale (Polydorous, 1981). This may be attributed to differences in environmental condition, livestock movement that contribute to the difference in prevalence rates. Besides these, factors like difference in social activity and attitude to dogs in different regions might have contributed to this variation. In this study, a significant variation was observed in the rates of infection between age groups where animals above 5 years of age were highly infected. The difference in infection rate could be mainly due to longer exposure time to *E. grannulosus* eggs in addition to weaker immunity to compact against the infection. In addition, most of the slaughtered animals were culled animals due to less productiveness and hence were exposed to the disease over long period with an increased possibility of acquiring the infections. The prevalence of hydatidosis was higher in cattle having poor (lean) 62.9% followed by medium (50.3%) and fat (39.7%). In moderate to severe infection, the parasite may cause retarded performance and growth, reduced quality of meat and milk, as well as live weight (Endiras et al., 2010). The direct annual financial losses due to condemnation of affected organs were estimated to be $ 45, 968.12 (896378.4 ETB). This is remarkable for countries like Ethiopia whose per capita income is less than one USD. This finding is higher than reports done in different areas of the country (Kebede et al., 2008; Kebede, 2009; Endiras, 2010). The difference may be due to variations in retail market prices, increased in

Table 1. Distribution of hydatid cysts in different organs and proportion of organs involved in 450 (n) cattle slaughtered at Adama abattoir, 2014.

Organs affected	No. of organ(s) affected	%
Lungs	214	47.6
Liver	183	40.7
Spleen	8	1.8
Kidney	3	0.7
Lung only	55	22.6
Liver only	29	11.9
Heart only	0	0.00
Spleen only	0	0.00
Kidney only	0	0.00
Lung and liver	151	62.1
Lung and spleen	5	2.1
Lung, liver, spleen and kidney	3	1.2
Total	243	100.00

Table 2. Prevalence of hydatid cyst in cattle slaughtered at Adama municipal abattoir on basis of body condition score and age, 2014.

Factors	Examined animals	No. infected	%	P-value
Body condition score				
Lean	197	124	62.9	0.000
Medium	175	88	50.3	
Fat	78	31	39.7	
Total	450	243	54	
Age groups (years)				
2-5yers(adult)	250	114	45.6%	0.002
>5 years (old)	200	129	64.5%	

prevalence of the disease, mean annual slaughter rate and unstable currencies.

CONCLUSION AND RECOMMENDATIONS

This study indicated that prevalence of bovine hydatidosis is high in Adama area. This result gave an important clue on the public health implication of the disease. This high infection in cattle with a huge financial loss justifies a program of hydatidosis control in the area that may involve due attention on veterinary activities such as improvement of slaughter hygiene, proper meat inspection and proper disposal of condemn organs. It is also advisable to create awareness for farmers in the area on the epidemiology and life cycle of the disease.

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Conflicts of interest

The authors have not declared any conflict of interests.

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