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Prevalence of Hydatidosis and Organ Level Distribution of Hydatid Cyst, at Dilla Municipal Abattoir, Southern Ethiopia

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Abstract: A cross sectional study was undertaken from October, 2013 to April, 2014 at Dilla municipal abattoir with the aim of determining the prevalence of bovine hydatidosis. Of the 400 examined animals, 83 (20.75%) harbored hydatid cyst. Observation during the survey period revealed that the infection rate among different age groups and sex of examined animals were found to be statistically significant ($p<0.05$). The abattoir survey showed that the hydatid cyst was highest in old aged cattle (41.9%) followed by adult (17%) and young (16.5%). The analysis result showed that the hydatidosis was high in females. Regarding organ level distribution, from the examined organs, lungs took the highest proportion among the other organs infected with hydatid cyst followed by liver; kidney took the smallest proportion among the other organs infected with hydatid cyst. In a nut shell, the finding of present study reflects the high prevalence of hydatid cyst in the study area. Therefore, serious attention should be given by various stalk holders to break down the life cycle of Echinococcosis and hence reduce its impact on the public health and economy.

Key words: Abattoir · Cattle · Dilla · Hydatidosis · Prevalence

INTRODUCTION

Hydatidosis or cystic Echinococcosis, caused by the larval stages of the tape worm *Echinococcus granulosus*, is known to be one of the most important parasitic infections in livestock worldwide and one of the widest spread parasitic zoonosis [1, 2]. Two hosts are involved in the completion of the life cycle of *E. granulosus*. The definitive hosts are carnivores which harbor mature tape worm in the intestine [3, 4] and excrete the parasite eggs along with their feces, while livestock and humans are the main intermediate hosts [5, 6]. Dog plays a major role in the epidemiology of the disease. The dog in the close association with man and domestic herbivores, feeding on scraps and offal of wild herbivores hunted by his master or domestic herbivores bred for butchering. Infected dog soils with excrements the floors of houses, villages and the village areas, eggs are ingested by intermediate hosts, in which the metacestode stages and protoscolices develop. The cycle is completed when an intermediate host or its infected organ is eaten by a suitable carnivore [7] and man is usually dead end intermediate host [4]. The outcome of infection in humans and animals is the development of hydatid cyst in lung, liver or other organs [8]. The wide variety of animal species both domestic and wild, which act as intermediate hosts, have made *Echinococcus granulosus* to be widely distributed across the globe and at least 10 genetically distinct populations exist within the complex *E. granulosus* [7, 9].

Cystic *Echinococcus* is a public health problem in different geographical areas of the world, particularly in Asia, South America, Central America and Africa [10]. Spain and other Mediterranean countries are considered as a hyper endemic area of cystic Echinococcosis [9]. It is considered as an emerging and reemerging disease in central Europe and China [11]. In addition, Eckert *et al.* [12] described the endemic occurrence of cystic *Echinococcosis* in livestock, dogs and humans in North America and the Mediterranean. The remarkable biotic potential of *E. granulosus* is known by the fact that a heavily infected dog may carry as many as 40, 000 tape

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worms shedding approximately 1000 eggs every two weeks [13]. When released, the eggs are presumed to be fully embryonated and infective to a suitable host (sheep, cattle, man or other intermediate hosts). Echinococcosis eggs are extremely resistant to a wide range of temperature [14]. Cystic Echinococcosis is an endemic and public health problem in sheep herding areas of the world, including Ethiopia [15]. In Ethiopia, hydatidosis is the major cause of organ condemnation [16] causing huge economic losses. Therefore, the aim of this study is to estimate the prevalence of hydatidosis and the organ level distribution of hydatid cyst at Dilla municipal abattoir, Southern Ethiopia.

MATERIALS AND METHODS

Study Area: The study was conducted starting from October 2013 to April 2014 in Dilla municipal abattoir, Southern Nations Nationalities and peoples Region. Dilla is the capital of Gedeo zone which is located at a distance of 365 km south of Addis Ababa and it lies at an altitude of 1800 meter above sea 1evel. The main highway that stretches from Addis Ababa to Moyale Town (which borders the country 1800 meter above sea 1evel) passes through the Dilla town. The mean annual temperature of the town is 30.2°C and the mean annual rainfall is 1333.1 mm. Based on figures from the Central Statistical Agency, Dilla has an estimated total population of 61, 114 of whom 31, 329 were males and 29, 785 were female. It was part of Wonago district and is currently surrounded by Dilla Zuria district. It remains a major center of the coffee trade.

Study Population: The study animals included were cattle which were brought to the abattoir from various origins.

Study Design: A cross-sectional study type was employed to estimate the prevalence and organ level distribution of the cyst.

Sampling Method and Sample Size Determination: A systematic random sampling technique was followed to select the study animals. During sampling, age, sex and body condition of the animals was recorded. Age of the study animals was estimated based on the De-Lahunta and Habel [17]. Body condition for each cattle was estimated based on Nicholson and Butterworth [18] ranging from score 1 (emaciated) to 5 (obese). The sample size for this study was calculated by using the formula given by Thrusfield [19]. To calculate the sample size, the prevalence of 52.69% of hydatidosis previously as studied by Koskei, [20] and 95% confidence level and 5% precision was used and accordingly the sample size (n) was 383. But to increase the precision of the study a total of 400 samples were collected.

Study Methodology

Ante Mortem Examination: During ante mortem examination each study animal was given identification and the age, sex, breed and body condition of the animal was recorded. The body condition of the animal was categorized in to poor, medium and good.

Postmortem Inspection: In the abattoir, thorough meat inspection was carried out on different organs of each of the slaughtered animals, particularly lung, liver, spleen, kidney, heart. Each organ was assessed macroscopically by visual inspection and palpation and where necessary one or more incisions were made to detect small hydatid cysts [21].

Data Management and Analysis: The data collected from the study site was stored in the format developed for this purpose and then entered in to Microsoft Excel and analyzed using STATA .The effects of each risk factor on the hydatidosis occurrence was summarized by descriptive statistics and then analyzed chi-square and logistic regression tests.

RESULTS

Of the 400 heads of cattle slaughtered and examined at the abattoir, 83(20.75%) cattle were positive for hydatidosis. The important risk factors for the prevalence of hydatidosis are described in Table 3. The high prevalence of hydatidosis is recorded in old animals. There is also difference of hydatidosis between female and male cattle of the studied animals. The proportion of hydatid cyst was highest in the lungs (15%) followed by liver (13.25%). The prevalence of hydatidosis is different in different body condition scores. The prevalence of cattle with poor body condition score is 14.29%; those with medium body condition score has the prevalence of 23.53% and the prevalence of cattle with good body condition score is 16.77% of the studied cattle in Dilla municipal abattoir.

Table 1: Distribution of hydatid cyst in different organs of infected cattle, Dilla abattoir

Organs	No. of organs affected	Proportion (%)
Lung	60	45.8%
Liver	53	40.46%
Spleen	12	9.16%
Kidney	6	4.58%
Total	131	100%

Table 2: Distribution of hydatid cyst in organs of infected cattle slaughtered in Dilla abattoir

Infected organs	Number infected	Percent infected
Lung only	17	28.3%
Lung and liver only	39	67.24%
Lung, liver and spleen only	3	5.17%
Lung and spleen only	-	-
Lung, spleen and kidney only	-	-
Lung, liver and kidney	1	1.7%
Total	60	100%

Table 3: Logistic regression analysis of risk factors associated with the occurrence of hydatidosis at Dilla municipal abattoir

Risk factors		No. examined	No. positive	95% CI	χ^2	P- value
Sex	Female	50	19 (38%)	24.4-51.6	10.34	0.001
	Male	350	64 (18.3%)	14.2-22.4		
Age	3-6 yrs	103	17 (16.5%)	9.3-23.7		
	7-9yrs	235	40 (17.0%)	12.2-21.9		
	≥ 10y	62	26 (41.9%)	29.5-54.4	20.04	<0.001

DISCUSSION

The prevalence of hydatidosis in cattle recorded in the study area (20.75%) is agreed with the findings in Eastern Ethiopia (20.5%) of Thoams *et al*. [22], in Mekele (19.9%) Zelalem *et al*. [23], Addis Ababa (19.7%) Kebede *et al*. [24] and slightly agreed with the report of Jobre *et al.* [25] (16%) in Wolaita sodo, Tigist [26] (24.3%) in Gonder and Njoroge *et al.* [27] (19.4%) in Turkana, Kenya. However, it showed variation with the findings of Alemayehu, [28] (36.58%) in Bahir-Dar, Wuobet, [29] (54.8%) in Assela, Jobre *et al.* [25] (48.9%) in Debra Markos. This may be ascribed to differences in environmental conditions, livestock stocking intensity and livestock movement that contribute to the differences in prevalence rates [27]. On top of that, differences in animal husbandry system, backyard slaughtering of animals, lack of proper disposal of infected organs and presence of stray dog could attribute for the variation in prevalence of hydatidosis [30]. Furthermore differences in culture, social activities and attitudes to dogs in different regions may contribute for variation [31].

Almost all livestock owners and urban dwellers keep dogs for the purpose of safeguarding their properties from wild carnivores and thieves in the study area. In general, the wide spread practice of offering dogs with uncooked infected offal, the absence of well-constructed security which prevents the entrance of stray dogs and wild carnivores and the absence of well-built abattoir are important factors that favor the maintenance and wide spread of the disease in the study area. Most of the slaughtered animals were adults, which were most likely culled due to inefficiency for draught purpose. Old animals are likely to have a higher possibility of acquiring infection due to their longer exposure to infection and lower immunity to combat infection. The current study showed high prevalence of disease in females (38%) than males (18.28%).As experimental studies have suggested that parasite survival may be longer in females due to the potential link between sexual hormones and the response of the immune system [32]. An alternative explanation may lie in the fact that females are slaughtered at older age as they are retained for reproductive purposes [33, 34]. Therefore, a longer life expectancy increases the probability of exposure and infection. Consequently, higher prevalence is usually found in older animals [34, 35].

The current study showed that lungs (15 %) were the most preferred predilection site for hydatid cysts followed by liver (13.25%). This might be due to the fact that cattle are slaughtered at older age, during which period the liver capillaries are dilated and most onchosphores pass directly to the lungs. It is also possible for the hexacanth embryo to enter the lymphatic circulation and be carried

via the thoracic duct to the heart and then trapped in the lungs [36]. Furthermore, the lungs and liver possess the first great capillaries encountered by the migrating *Echinococcus* onchosphores (hexacanth embryo) which adopt the portal vein route and primarily negotiate hepatic and pulmonary filtering system sequentially before any other peripheral organ is involved [11].

CONCLUSION

The observed prevalence of bovine hydatidosis in the study area is relatively higher, indicating the potential hazard to the human population dwelling in this area. Backyard slaughtering with a tendency to give condemned visceral organs to dogs, keeping untreated dogs in close association with cattle and humans and the opened abattoir for dogs and other wild canids are the major factors which favor the life cycle to continue and hence a higher infection rate in cattle.

Based on this study and other facts about the prevalence of the disease; the following recommendations were forwarded:

- There should be strict routine meat inspection of slaughtered animals
- Proper disposal of infected organs should be practiced in order to break the life cycle of *Echinococcus granulosus*.
- Awareness should be created in the public particularly on the risk of backyard slaughtering of food animals and offering infected offal to dogs and close association of dogs and cattle.

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