

## Prevalence and Characterization of Hydatid Cyst in Cattle at Halaba Kulitto Municipal Abattoir, South Ethiopia

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**Abstract:** A cross sectional study was conducted from October 2012 to July 2013 to determine the prevalence of hydatidosis in cattle slaughtered at Halaba kulitto municipal abattoir. A total of 384 cattle organ were examined and the result revealed an overall hydatidosis prevalence of 24.21% (93/384). The distribution of hydatid cysts in different internal organ were 12.8% (49/384), 3.1% (12/384), 0%, 0.5% (2/384), 1.3% (5/384), 4.7% (18/384), 0.8% (3/384) and 1.0% (4/384), respectively in lungs, liver, kidney, heart, spleen, lung and liver, lung, liver and spleen and in lung and spleen. The lung was the most affected organ followed by the liver. Sex and age of the animal did not have statistically significant effect ( $P>0.05$ ). A total of 70 cysts were examined for viability and fertility test. Accordingly, 82.86% (58/70) and 53% (37/70) cysts were fertile and viable, respectively. The findings of the present study disclosed that hydatidosis was prevalent in cattle of the study area and responsible for high level of condemnation of different organs. Hence, an integrated control approach involving strategic de-worming of the final hosts with strong surveillance system and good management practice of animals are essential for the reduction of the parasite prevalence.

**Keywords:** *Cattle; Hydatidosis; Municipal Abattoir; Organs; Prevalence*

### Introduction

Ethiopia possesses the largest livestock population in Africa (CSA, 2014). However, the contribution of the livestock sector to the national economy has been reported to be small compared to its potential. One of the main causes of the mismatch between herd population size and production output from livestock in Ethiopia is undoubtedly the widespread occurrence of a multitude of infectious and parasitic diseases, causing morbidity, mortality and market restrictions, which drastically reduce animal production (Shapiro *et al.*, 2015).

Hydatidosis is one of the major parasitic problems of domestic animals and a zoonotic disease that cause considerable economic losses and public health problems worldwide (Ekert and Deplazes, 2004). Echinococcosis is a zoonotic infection caused by adult or larval (metacestode) stages of cestodes belonging to the genus *Echinococcus* and the family Taeniidae. Hydatidosis, which is a cystic echinococcosis, also known as hydatid disease, is an infection caused by the larval stage of the flatworm *Echinococcus granulosus*. It has a cosmopolitan distribution and is one of the most widespread parasitic zoonoses. Hydatidosis is of importance since humans serve as incidental intermediate hosts (Jones *et al.*, 2012).

Echinococcosis has greater public health and economic impact in countries where livestock production is based on extensive grazing system and is major component of the agriculture sector. Previously there was no any data on the prevalence of the disease and its rate in different organs in the study area. Hence, the objective of this study was to estimate the prevalence of hydatidosis in cattle slaughtered at Halaba kulitto municipal abattoir.

### Materials and Methods

#### *Study Area*

The study was conducted from October, 2012 to July, 2013 in Halaba district municipal abattoir southern part of Ethiopia. Halaba district is located 315 kms west to Addis Ababa in Southern Nation Nationalities People Regional State. The geographical location of the district is 7° 17' N latitude and 38° 06' E longitude. The altitude ranges from 1100 meters to 1200 meter above sea level. The annual rainfall varies from 900mm to 1200mm while the minimum and maximum temperatures are in the order of 21°C and 29°C; 18°C and 24 °C in low and highland, respectively. The area is also characterized by two seasons, the wet season from May to October and the dry season from November to April (IPMS, 2005). The livestock population of Halaba district is cattle 166,871, sheep 60,475, goats 67,163, poultry 160,515, donkey 39,379, mule 227 and horse 61,123 (CSA, 2014).

#### *Study Animals*

The study was conducted on 384 local breed cattle sourced from neighboring district such as Kulito, Arsi Negelle, Ropi, Beshno and Guba. During the study period 10 heads of cattle were slaughtered per day on average.

#### *Study Design*

A cross-sectional study were carried out from October 2012 to July 2013 by collecting data on events associated with hydatidosis in cattle slaughtered at Halaba district municipal abattoir. Sampled animals were selected using simple random sampling method from cattle registered for slaughter. The data were collected at an interval of 10 days and 20 animals were investigated at each data

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collection day. Information such as body condition and age of the slaughtered animals was determined based on Nicholson and Butter Worth (1986) and De-Lahunfa and Habel (1986), respectively.

### Sample Size Determination

There was no information available in the district before this study. Hence, the sample was calculated based on the formula given by Thrusfield (2005). Accordingly, assuming 50% expected prevalence of bovine hydatidosis, the required sample size was 384 cattle at 95% confidence level and 5% expected error.

### Study Methodology

**Ante-mortem Examination:** During ante-mortem examination details of sex, age, and origin of each individual animal was recorded. Sources of cattle for slaughter were identified based on unique identification marks made on the body of each animal using ink from source markets and the markings were transferred to all carcasses and visceral organs after slaughter.

**Post-mortem Examination:** During post-mortem examination organs of the abdominal and thoracic cavities, namely, liver, lung, heart, spleen and kidney were systematically inspected for the presence of hydatid cyst by applying routine meat inspection procedures which consists primary examination followed by a secondary examination when evidence of hydatid cyst were found. The primary examination involves visualization and palpation of organs and muscles, whereas secondary examination involves further incisions in each organ in case where a single or more hydatid cyst observed. When cysts were present the number of the cysts per organ per animal were recorded (FAO, 1994).

### Examination of cysts for fertility and viability:

Individual hydatid cysts were carefully incised and examined for the presence of protoscolices, which resembled white dots on the germinal epithelium. Such cysts were characterized as fertile cysts. Fertile cysts were

further subjected to viability test (Daryani *et al.*, 2007). A drop of the sediment containing the protoscolices were placed on the microscope glass slide and covered with cover slip and observed for amoeboid like peristaltic movements 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 absorb it (Macpherson *et al.*, 1985). Furthermore, infertile cysts were classified as sterile or calcified. Sterile hydatid cysts were characterized by their smooth inner lining usually with slightly turbid fluid in their content. Typical calcified cysts produce a gritty-sound heard at incision (Soulsby, 1982).

### Data Processing and Analysis

The data was entered in to MS-Excel code and analyzed using SPSS-16.0 version and descriptive statistics like percentage were used. The relative frequencies of cysts detected in various organs were calculated. Cattle harbored hydatid cyst were categorized by the number of organs involved and cysts found in different organs. Chi-square ( $\chi^2$ ) was used to test the existence of association between factors and prevalence. Significant association between variables was considered if the p-value is less than 0.05.

### Results

The number of animals infected with hydatid cysts with respect to origin is presented in table 1. The highest prevalence was recorded for animals sourced from Arsi Negele and Kulito.

The prevalence of hydatidosis was 24.21% (93/384) (Table 2). Postmortem examination of visceral organs revealed 12.8% (49/384), 3.1% (12/384), 0%, 0.5% (2/384), 1.3% (5/384), 4.7% (18/384), 0.8% (3/384), and 1.0% (4/384), respectively in lungs, liver, kidney, heart, spleen, lung and liver, lung, liver and spleen and in lung and spleen. The present study showed the presence of hydatidosis in all origins of cattle (Table 2).

Table 1. Number of cattle infected by hydatidosis in relation to their origins

Origin	No. of Animals examined	Positive	Prevalence (%)
Kulito	77	24	31.17
Arsi Negla	77	28	36.36
Ropi	77	16	20.78
Beshno	76	11	14.47
Guba	77	14	18.18
Total	384	93	24.2

Table 2. Distribution of hydatid cyst in different organs

Organs examined	No. of organs infected	Percentage of infection (%)
Lung	49	12.8
Liver	12	3.1
Kidney	0	0
Spleen	5	1.3
Heart	2	0.5
Lung and Liver	18	4.7
Lung, liver, spleen	3	0.8
Lung, spleen	4	1.0
Total	93	24.2

The occurrences of bovine hydatidosis in different organs according to the two age group of animals slaughtered at the abattoir were 8.3% (1/12) in less than

5 years and 2.4% (92/372) in greater than 5 years of age, respectively (Table 3).

Table 3. The prevalence of hydatid cyst on different organs based on age

Organ examined	Age	No of examined animals	No of infected animals	Percentage	$\chi^2$	P value
Lung	< 5 years	12	1	8.3	0.218	0.622
	$\geq$ 5 years	372	48	12.9		
Liver	< 5 years	12	0	0	0.400	0.379
	$\geq$ 5 years	372	12	3.2		
Heart	< 5 years	12	0	0	0.065	0.721
	$\geq$ 5 years	372	2	0.5		
Spleen	< 5 years	12	0	0	0.163	0.572
	$\geq$ 5 years	372	5	1.3		
Lung and liver	< 5 years	12	0	0	0.609	0.279
	$\geq$ 5 years	372	18	4.8		
Lung, liver and spleen	< 5 years	12	0	0	0.098	0.662
	$\geq$ 5 years	372	3	0.8		
Lung and spleen	< 5 years	12	0	0	0.130	0.61
	$\geq$ 5 years	372	4	1.1		

The percentage distribution of hydatid cysts in different organs on sex group was depicted in table 4. The number of female animals is very small as compared to males and may not show the actual situation.

Among the 113 hydatid cysts observed, 70 were in liver, 33 in lungs, 8 in spleen and 2 in heart. Of these, 36 (31.86%), 18 (15.92%) and 16 (14.16%) and 43 (40.70%) were small, medium, large and calcified, respectively.

Out of the 70 cysts subjected to fertility test, 58 (82.86%) and 2 (17.14%) were fertile and sterile, respectively. The viability test indicated that 37 (53%) to be viable. Organ wise fertility of the hydatid cysts was higher for lung, followed by liver, spleen and heart in that order, while viability of the fertile cysts were higher for liver followed by lung, spleen and heart.

Table 4. The prevalence of hydatid cyst on different organs based on sex

Organ examined	Sex	No of examined animals	No of infected Animals	Percentage	$\chi^2$	P- value
Lung	Male	377	48	12.7%	0.015	0.0904
	Female	7	1	14.3%		
Liver	Male	377	12	3.2	0.230	0.503
	Female	7	0	0		
Heart	Male	377	2	0.5	0.037	0.786
	Female	7	0	0		
Spleen	Male	377	5	1.3	0.094	0.667
	Female	7	0	0		
Lung and liver	Male	377	18	4.8	0.351	0.410
	Female	7	0	0		
Lung, liver and spleen	Male	377	3	0.8	0.056	0.739
	Female	7	0	0		
Lung and spleen	Male	377	4	1.1	0.075	0.700
	Female	7	0	0		

## Discussion

The findings of this study showed the existence of high prevalence of hydatidosis disease in cattle slaughtered at Halaba Kulitto municipal abattoir. This high prevalence of hydatidosis may be because of the presence of high number of stray dogs in the animal origin area. The high number of cyst in the lungs and liver may be due to the fact that these organs possess the first great capillaries sites which are encountered by migrating *Echinococcus* oncosphere which adopt the portal vein route and primarily dwell in the pulmonary and hepatic filtering system sequentially before any other peripheral organ is involved (Ekert and Deplaszes, 2004). Similar finding was reported by Getachew and Jelalu (2014) with higher prevalence in lungs (19.53%) and heart (12.63%) in Addis Ababa Kara-alo PLC abattoir.

The result of this study is comparable to other findings reported in different regions of Ethiopia and other countries (Baldock *et al.*, 1985; Alemu, 2010). The prevalence recorded in the present study was greater than 11.9% reported by Zerihun (2011) from cattle in Mizan municipal abattoir, 8.28% in Al Baha region, Saudi Arabia (Ibrahim, 2010) and 11.9% by Zerihun (2011) in Mizan municipal abattoir, but lower than 54.4% reported by Ndirangu *et al.* (2004) for cattle in Kenya, 38.3% in cattle slaughtered in the Ardabil province of North West Iran (Daryani *et al.* 2007), 38.9% for cattle in Pakistan Khan *et al.* (1990) and 32% in Niger Delta (Arene, 1985). 59% for cattle in Gondar abattoir (Nigatu, 2002); 32.1% in Tigray region (Gebretsadik, 2009); 48.9% in Debre markos municipal abattoir (Nigatu, 2009). The difference in the prevalence of hydatidosis among the different areas could be related to geography, dog population, source of cattle, dog management, de-worming practices, offal disposal habits and age of cattle slaughtered.

In this study 53% of the tests were viable. Organ wise fertility of the hydatid cysts was 45.8%, 34.2%, 12.4% and 7.6%, for lung, liver, spleen and heart, respectively. While viability of these fertile cysts were 37.84%,

45.95%, 2.7 and 13.5 from lung, liver, heart and spleen, respectively. About 27.3% fertile, 72.7% infertile, 37.8% viable and 62.2% non-viable cysts were recorded in Kara-alo PLC abattoir (Getachew and Jelalu, 2014) which is higher in all cases than the present finding.

Higher infection of hydatidosis was registered in adult cattle (>5 years old) compared to young cattle (<5 years) with variable prevalence among different organs examined. This is in line with Regassa *et al.* (2010) and Endrias *et al.* (2010) who found significantly higher prevalence of the disease in adult cattle. This could be due to immune status and longer exposure to the eggs of the parasite in adult than young animals.

## Conclusion and Recommendations

The present study showed hydatidosis to be a prevalent disease in the study area. Lung and liver were the major organs harboring hydatid cyst than other visceral organs and most of the cysts were found to be fertile. Moreover, the prevalence of hydatidosis is somehow varied among animals from different sources. Hence, an integrated parasitic control including treatment of final hosts of the parasite should be practiced in the area.

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## Conflict of Interests

The authors declare that they have no competing interests.

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