

# Prevalence of Hydatidosis in Cattle Slaughtered at Sebeta Municipal Abattoir, Central Ethiopia

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## Abstract

A cross-sectional study was conducted from November 2011 to March 2012 to assess the status of cystic hydatidosis in cattle slaughtered at Sebeta Municipal abattoir. Out of the total 395 cattle examined visually and manually (palpation and incision), 97 (24.5%) were found harboring hydatid cysts. Accordingly, prevalence of hydatidosis showed that there was significant difference between animals origins ( $p=0.01$ ) where animals originated near to Addis Ababa had high prevalence as compared to Western region that includes Jimma, Beddele and Wellega around these area. Age group above 10 years, poor body condition showed significantly high prevalence ( $p<0.05$ ) than other age groups, medium and good body condition scores. On the other hand, there was no difference between the sexes of the animals. Thus, hydatidosis was more prevalent in animals from surrounding Addis Ababa (29.2%) when compared to animals originated from Shewa (25.3%) and western region (13%); The hydatidosis was more prevalent in old animals (42.5%) than young animals (20%) and more prevalent in poor body condition (61.54%) than medium (27.17%) and good body condition (6.45%). Out of the organs examined, the highest proportion of the fertile and viable cyst were observed in the heart 4 (40%) followed by lung 15 (17%), kidney 3 (11.1%), and liver 2 (10.2%), whereas fertile and dead were observed in the kidney 4 (40%) and heart 4 (40%) followed by lung 20 (23%) and liver 1 (5.2%), accordingly. Out of the organs examined, the highest proportion of the non-fertile or sterile cyst observed in the lung and kidney. Calcified hydatid cyst was higher in proportion in spleen followed by liver, kidney and lung. The current results suggest that a thorough investigation that leads to a disease control strategy is required to reduce the economic and public health consequences of the hydatidosis.

**Keywords:** Abattoir, Hydatidosis, Prevalence, Cattle, Ethiopia

## 1. INTRODUCTION

Hydatidosis is a parasitic infection caused by a tapeworm larva called echinococcus. The type and severity of symptoms is determined by the location of the infestation. The most common site for the larval cysts is the liver and lungs incriminated by scholars. The most common symptoms are due to compression of nearby organs or blood vessels due to increasing size of the cyst. The larva may incubate for months or even years. Cystic echinococcosis (CE) is an important problem for public health and the economy in many parts of the world. It is one of the most important zoonotic diseases and it is of great social importance (Benito *et al.*, 2006; Daryani *et al.*, 2007; Garippa *et al.*, 2004). The disease affects livestock and human being and has both economic and public health significance. It is associated with severe morbidity and disability, and is one of the world's most geographically widespread zoonotic diseases. The Pathogenecity of hydatidosis heavily depends on the extent and severity of infection, and the organ on which it is situated. The occasional rupture of hydatid cysts often leads to sudden death due to anaphylaxis, haemorrhage and metastasis. Previous studies have shown that cystic echinococcosis represented considerable economic and public health significance in different countries (Azlaf and Dakkak, 2006; Christodoulopoulos *et al.*, 2008).

In Ethiopia, studies conducted in different abattoirs indicated that cystic hydatidosis is prevalent and considerable economic loss is associated with it. Certain deep-rooted traditional activities have been described as factors associated with the spread and high prevalence of the disease in some areas of the country. These can include the wide spread backyard slaughter of animals, the corresponding absence of rigorous meat inspection procedures, the longstanding habit of feeding domesticated dogs with condemned offal and the subsequent contamination of pasture and grazing fields. This can facilitate the maintenance of the life cycle of *Echinococcus granulosus*, which are the causative agent of cystic hydatidosis and consequently the high rate of infection of susceptible hosts (Jobire *et al.*, 1996).

The economic importance of echinococcosis in livestock is due to the condemnation of edible carcasses and offal such as liver, lung and heart. In severe infection, the parasite may cause retarded performance, growth, reduced quality and yield of meat and milk. Additionally, fertility and the value of fleece are reduced due to infection. For example, in Yugoslavia a 10% reduction in milk yield and 5% in carcass weight due to hydatidosis has been described (Polydorou, 1981). Condemned organs or even the whole carcasses represent a high financial loss in many countries (Sariozkan, 2009; Torgerso *et al.*, 2000). The importance of these losses depends largely on the characteristics of the farming or livestock industry in a particular country (Anon and FAO, 1981). Few reports are available on the prevalence and economic importance of hydatidosis in Ethiopia. The

public health importance of hydatidosis is also considerable in Ethiopia.

Therefore, the objectives this study was undertaken to determine the prevalence of hydatidosis in cattle slaughtered in Sebeta municipal abattoir and to associate the prevalence with assumed risk factors.

## 2. MATERIALS AND METHODS

### 2.1. Study area

The study was conducted at Sebeta in the period from November 2011 to March 2012. Sebeta town is located in Oromia special zone called surrounding Finfine, Southwest of Addis Ababa, Ethiopia, approximately 25 kms Southwest of Addis Ababa. Sebeta town is located at altitude of 3380m.a.s.l. The minimum and maximum mean temperature ranges from 11.3<sup>o</sup>c to 28<sup>o</sup>c with relative humidity of 49.3%. The area receives annual rainfall ranges from 860mm to 1200mm.

### 2.2. Study animals

The study animals were cattle that were presented to Sebeta municipal abattoir for routine meat inspection. Sample size was calculated based on the formula given by (Thrusfield, 2005) using systemic random sampling method.

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

Where, n = required sample size  
P<sub>exp</sub> = expected prevalence  
d = desired absolute precision

Expected prevalence of 50% was considered, as there was no previous information for the area. The sample size was calculated to be 384 based on 95% confidence interval and with desired precision levels of 0.05. However, few numbers were added during study period, which does not bring significant effect on time as well as cost wise. Therefore, a total number of 395 samples were inspected in the study period.

### 2.3. Active Abattoir survey:

Study animals were selected during ante mortem inspection and the related risk factors such as age, sex, breed, body condition and origin of the animals were recorded on specially designed sheet before slaughtering. During active abattoir survey, detail meat inspections have been conducted at the abattoir on the 395 selected cattle. All positive samples were transported to National animal health diagnostic and investigator center (NAHDIC) for conformation of cyst viability. Hydatid cyst, individual cysts were grossly examined for any evidence of degeneration and calcification, and then checked by transferring in to a sterile container and examined microscopically (40X) for the presence of protoscolices. Based on the presences or absence of protoscolices in hydatid fluid, cyst were identified and classified as fertile and non-fertile. The fertile cysts were also further study for viability. Protoscolices viability was assessed by the motility of flam cells as well as staining with 0.1% aqueous solution of eosin. Live protoscolices did not take up the stain, unlike the dead ones (Macpherson, 1985).

### 2.4. Data management and analysis:

Abattoir data was collected and recorded on specially designed forms and preliminary analysis was done by Microsoft Excel. The outcome variables for the abattoir study were cases of hydatid cyst detected during routine post-mortem inspection at the abattoir. Logistic regression was employed to analyze the association of the occurrence of the hydatid cyst with the potential risk factors like origin, breed, body condition, age and sex using (Stata Corp, 2001). Odds ratios were analyzed to see the degree of association between the risk factors and the disease occurrence. The association considered significant when the value of *p* is less than 0.05.

## 3. RESULTS

Out of 395 cattle examined 97 (24.55%) were found to be positive for hydatidosis. Table 1 and 2 shows the association between the prevalence of hydatidosis in cattle and risk factors (body condition, origin, sex, and age). Accordingly, prevalence of hydatidosis showed that there was significant difference between animals origins (*p*=0.01) where animals originated near to Addis Ababa had high prevalence as compared to Western region. Area categorization was based on the distance from the site of slaughterhouse and accordingly, grouped into three areas as shown in Table 1. Age group above 10 years showed significantly high prevalence than other age group (*p*=0.04). Significantly high hydatid cyst prevalence was observed in poor body condition scored animals (*p*=0.00) than medium and good body condition score. On the other hand, there was no difference between the sexes of the animals. Thus, hydatidosis was more prevalent in animals from surrounding Addis Ababa (29.2%) when compared to animals originated from Shewa (25.3%) and western region (13%); The hydatidosis was more prevalent in old animals (42.5%) than young animals (20%) and more prevalent in poor body condition (61.5%) than medium (27.2%) and good body condition (6.45%).

Table 1. Logistic regression analysis of risk factor based on origin of animals associated with the occurrence of hydatid cyst in organ inspected at Sebeta municipal abattoir during the study period

Origin	No. sample	No. positive	Prevalence	OR and 95% CI	P. value
*Near to A.A	137	40	29.2%	1	1
**Shewa	189	48	25.3%	1.21[0.74, 1.98]	0.45
***West region	69	9	13%	2.7 [1.25, 6.09]	0.01

\* Animals originated from A.A (Alamgana, Adaberga, Butajira, Dima, Holota, Meta, sebeta, Sendafa, and walate). \*\* Animals originated from Shewa (Ambo, Awash, Ginchi, Jeldu, Gedo, Waliso, Taji, Tafki, and Tulubolo)

\*\*\* Animals originated from West region (Bedelle, Gimbi, Iluababor, Jimma, and Wellega)

Table 2. Logistic regression analysis of risk factors associated with the occurrence of hydatid cyst in organ inspected at Sebeta municipal abattoir during the study period.

Risk factor	No. sample	No. positive	Prevalence [95% CI]	OR [95% CI]	P- value
Sex					
Female	22	7	31.8[14.7,54.9]	1	1
Male	373	90	24.1[19.9,28.8]	1.47 [0.6, 3.7]	0.42
Age					
3-5years	35	7	20.0[9.1,37.5]	1	1
6-10years	320	73	22.8[18.4,27.9]	1.18 [0.49, 2.8]	0.71
> 10years	40	17	42.5[27.4,58.9]	2.96 [1.04, 8.4]	0.04
BCS					
Poor	26	16	61.5[40.7,79.1]	1	1
Medium	276	75	27.2[22.1,32.9]	4.3 [1.9, 9.9]	0.01
Good	93	6	6.5[2.7,14.1]	23.3 [7.4, 73.0]	0.01

Table 3 shows the proportion of hydatid cyst in organs inspected. A total of 142 organs were infected either in mixed form or in single. In this study, it was found that five visceral organs have been affected at various levels. Among these organs examined, the highest proportion of the hydatid cysts was recovered in the lungs (61.3%) followed by kidney (14.8%), liver (13.3%), hearts (7%) and spleen (4%).

Table 3. Proportion of organs infected with hydatid cyst

Organ inspected	No. positive	Proportion
Lung	87	(61.3%)
Liver	19	(13.3%)
Heart	10	(7%)
Kidney	21	(14.8%)
Spleen	5	(4%)
Total	142	1 (100%)

Table 4 displays the anatomical distribution of different status of hydatid cysts. Fertility-viable, fertility-dead, non-fertile or sterile and calcified hydatid cysts were observed in different organ at different frequency. Out of the organs examined, the highest proportion of the fertile-viable were observed in the heart 4 (40%) followed by lung 15 (17%), kidney 3(11.1%), and liver two (10.2%), whereas fertile/dead were observed in the kidney 4 (40%) and heart four (40%) followed by lung 20(23%) and liver one (5.2%), accordingly. Out of the organs examined, the highest proportion of the non-fertile or sterile observed in the lung and kidney. Calcified hydatid cyst was higher in proportion in spleen followed by liver, kidney and lung as shown in the Table.

Table 4 Proportion of organs infected and viability of hydatid cyst in different organs

Organ	No. positive	No. calcified (%)	No. fertile/dead (%)	No. fertile/viable (%)	No. non-fertile (%)
Lung	87	6 (6.9)	20 (23)	15 (17.2)	46 (52.9)
Liver	19	13 (68.4)	1 (5.2)	2 (10.2)	3 (15.8)
Heart	10	0	4 (40)	4 (40)	2 (20)
Kidney	21	3 (11.1)	4 (40)	3 (11.1)	11 (52.3)
Spleen	5	5 (100)	0	0	0

#### 4. DISCUSSION

Hydatid disease is an important medical and veterinary problem in the world. Domestic intermediate hosts (cattle, sheep, goats and buffaloes) are major reservoirs for the disease in humans. The widespread distribution and nature of the life cycle of *E. granulosus* suggest that there will always be a risk of re-introducing the cestoda as

long as live animals are imported (Lightowlers *et al.*, 2000).

In this study, the prevalence of hydatidosis in cattle slaughtered at Sebeta municipal abattoir was 24.6%, which was lower compared with 53.5% prevalence in Assela reported by Ararso (1997), but greater than the 15.0% in Gondor (Mezgab, 2003), and Yemane (1990) in Nazareth abattoir who reported a prevalence of 6.6%. Possible reason for the difference in the prevalence of hydatidosis might be due to contact between large numbers of stray dogs with herd and humans in the study area. Dogs, which are the primary predisposing factor for the disease transmission are used as guards for herders and are routinely fed with uncooked offal, which deemed unfit for human consumption (Mezgab, 2003).

Different results on the prevalence of hydatidosis reported from different regions of the country. The prevalence of hydatidosis in cattle slaughtered at Sebeta municipal abattoir from surrounding Addis Ababa 29.2%, from Shewa 25.3%, from Western region 13%, which is lower than Wubet (1988) reported 63% bovine hydatidosis from robe; Alemayehu (1990) reported 54.8% bovine hydatidosis in the Arsi region; Yilma (1984) recorded 46.5% bovine; Yemane (1990) also reported 37.7% hydatidosis in Adama. Although there was minor difference in prevalence, it indicates that there is a favorable epidemiological environment for the sustainable life cycle of the parasite, where there is a strong linkage between dogs and cattle, which indicates that there is tradition to keep dogs as a guard. Provide raw offal, which is unfit for human consumption. The problem seems to continue for the future unless countrywide control strategy implemented.

The general trend of age prevalence shows that, the infection increase as the age of animals' increases, where age group 3-5 years old had 20%, 6-10 years old had 22.8% and greater than 10 years were 42.5%. The reason behind this might be older animals may gain access to infection due to long exposure for years they stayed on the field than younger age groups.

Body condition significantly affects the prevalence of hydatidosis in the present study ( $p < 0.05$ ) and those animals with poor body condition showed higher prevalence of echinococcosis. Different workers (Abebe, 2007; Zelalem, 2008; Yechale, 2008; Alemta, 2009; Tigist, 2009) observed the similar result which also similar with the present study. The differences between body conditions score may be due to animals with poor body condition have low immunity to hydatid cyst disease.

The present study in Sebeta municipal abattoir showed that the lung was more frequently infected than kidney, liver, heart and spleen with the prevalence of 61.3%, 14.8%, 13.3%, 7%, 5%, respectively in cattle. This finding is in agreement with the result of Kebede *et al* (2009) which revealed that most of the infected cattle showed (66.7%) hydatid cyst in lung and livers. Giannetto *et al* (2004) in Sicily and by Azlaf and Dakkak (2006) also reported similar prevalence in Morocco and by Yemane (1990) who reported hydatidosis 61.2% in lungs and 29.6% livers in bovine. The lung and liver are the most commonly affected organs. This could be due to the fact that the lungs and livers possess the first great capillaries sites encountered by migrating echinococcus oncospheres (hexacanth embryo) which adopt the portal vein route and primary negotiate hepatic and pulmonary filtering system sequentially before any other peripheral organ is involved. In addition, the lungs were predominantly infected with hydatid cyst than other organs probably due to the presence of greater capillary beds in the lung than other organs which is agreement with Kebede *et al.* (2009). The kidney, heart and spleen are the least affected organs in the study animal. Various workers also obtained similar findings and it indicated that the liver and lungs are the most commonly affected organs with hydatid cyst due to the reason that there are the first large capillary fields encountered by the blood borne oncospheres. However, development hydatid cyst occurs occasionally in other organs and tissue when oncospheres in to the general systemic circulation (Urquhart *et al.*, 1996). Asrat (1996) in South Wollo, Ethiopia obtained similar findings. This may be due to the relatively soft consistency of the lung, which allows easily growth of cysts. Similarly, in the rare sites such as abdominal cavity, where unrestricted growth is possible, the hydatid may grow very large and contain several liters of fluid (Urquhart *et al.*, 1996).

In the survey, hydatidosis conducted by Kebede *et al.* (2009) in the definite host (dogs) conducted in different sites of Mekele, revealed the occurrence of the adult parasite *E. granulosus* in small intestine of three (16.7%) out of 18 dogs examined. The dog is most likely the principal source of both human and animals' echinococcosis in Ethiopia indicated several prevalence studies in dogs in the country. Therefore, it is wise to design countrywide strategy in order to control the disease in question, which has high economic and zoonotic importance. Education of the community how to manage dogs and other strategy should be in place promptly.

## 5. CONCLUSION AND RECOMMENDATION

Echinococcosis is one of the most important parasitic diseases with economic public health significance. The result of the present and past studies conducted by different researchers indicates higher prevalence of hydatid cyst in different parts of country. It is also one of the most important diseases in sebeta and its surrounding, warranting serious attention for prevention and control. In Ethiopia, the prevalence of echinococcosis is significant due to several factors of which keeping dogs in close association with animals and humans are the most one. Owners to look after herds of animals and to protect houses of their masters from robbers keep dogs.



Moreover, backyard slaughtering is widely practiced with throwing of visceral organs everywhere, which increase the risk infection in dogs by hydatid disease after ingesting hydatid cyst containing protoscolices. Cystic hydatidosis should always be considered in the differential diagnosis of any cystic mass, regardless of its location, also in epidemiological contests less suggestive of the disease. The diagnosis should be achieved by taking into consideration the clinical aspects, the epidemiology of the disease, the imaging and immunological tests but, as demonstrated in this case, without neglecting the numerous possibilities offered by new serological devices and modern day molecular biology techniques. Based on the result of this finding the following recommendations are forwarded:

- The problem seems to continue for the future unless countrywide control strategy implemented.
- Keeping dogs in close association with animals and humans should be stopped on the other hand, if the trend is to continue dogs should be treated regularly.
- Feeding of infected offal to dogs and canine species should be stopped and all infected visceral organs should be buried.
- Reduction of stray dogs population to reduce the risk of hydatidosis to animals and humans.
- Further studies on prevalence of hydatidosis should be encouraged with control measures.

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