

Occurrence and fertility rates of hydatid cysts in sheep and goats slaughtered at Modjo Luna Export Slaughter House, Ethiopia

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Abstract

In Ethiopia very limited studies were conducted in small ruminant hydatidosis compared to cattle. A cross-sectional study was conducted at Modjo Luna Export Slaughter House from December 2009 to February 2010 to determine the prevalence and fertility of hydatid cysts. A total of 325 sheep and 440 goats were examined. Examination of lung, liver, kidney, heart and carcass was conducted following standard postmortem procedures. Fertility of hydatid cysts was tested by absence or presence of motility and staining with 0.1% aqueous eosin solution. Out of 325 sheep and 440 goats examined 25 (7.7%) sheep and 27(6.13%) goats had hydatid cysts. The prevalence was high in sheep compared to goats although the difference was not statistically significant ($P > 0.05$). The organ distribution of hydatid cyst in sheep was 15 (60%) in lung, 9 (36%) in liver and 1 (4%) both the liver and lungs. In goats, hydatid cysts were recovered from 19 (70%) of the lung, 5 (18.5%) of the liver, 1 (3.7%) of the kidney, 2 (7.4%) of the heart and 2 (7.4%) of the muscle. In both sheep and goats the infection was more in lungs, followed by liver. Eighty percent of the cysts found in the lung of sheep were fertile, while there was no fertile cyst detected in the lung of goats and the difference was statistically significant ($P < 0.05$). In Ethiopia, to break the life cycle of echinococcosis/hydatidosis, public education on habit of feeding condemned organs to dogs should be undertaken.

Keywords: hydatid cyst, prevalence, fertility, sheep, goat, Modjo Luna Export Slaughter House

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Introduction

Echinococcosis/hydatidosis is a zoonotic disease that occurs throughout the world and causes considerable economic losses and public health problems in many countries. Sheep, goats, cattle, camels, buffaloes, pigs, horses and donkeys have been repeatedly found infected with hydatid cysts (Dalimi *et al.*, 2002; Lahmar *et al.*, 2004; Daryani *et al.*, 2006; Acosta-Jamett *et al.*, 2010). The global hydatidosis infection prevalence rates reported were 22.98% in cattle, 10.58% in sheep, 12.03% in camels, 17.80% in equines and 1.88% in goats (Azlaf and Dakkak, 2006). According to Dakkak (2010) in his review of published data prevalence of hydatidosis is high in North Africa, Turkey, Greece and in several regions of Italy and Spain. Previous reports indicated that the prevalence of hydatidosis is high in sheep compared to goats. In sheep, it ranges from 10.6% to 75% and in goats 1.88% to 6.3 % (Dalimi *et al.*, 2002; Azlaf and Dakkak, 2006; Scala *et al.*, 2006; Christodoulopoulos *et al.*, 2008 ; Nigatu Kebede *et al.*, 2009; Acosta-Jamett *et al.*, 2010; Omer *et al.*, 2010). In Ethiopia hydatidosis is the major cause of organ condemnation in most abattoirs (Gebretsadik Berhe, 2009; Nigatu Kebede, 2010; Feyesa Regassa *et al.*, 2010) and leads to huge economic losses. It is also a disease of public health importance in Ethiopia where in Tigray Regional State nine cases of human hydatidosis were reported since 2000 (Nigatu Kebede *et al.*, 2009). While there are several works done in bovine species, little attention is paid to investigate the prevalence and economic significance of hydatidosis in small ruminants in Ethiopia. It is also important to study the fertility of hydatid cysts as it will help to understand the risk of spreading of the disease both to domestic animals and humans. The main objectives of this study were therefore to estimate the prevalence of hydatidosis in small ruminants slaughtered at Modjo Luna Export Slaughter House and determine the fertility of the cysts.

Materials and Methods

Study area

The study was conducted at Modjo Luna Export Slaughter House, which is located 70 km south east of Addis Ababa, the capital city of Ethiopia. Modjo Luna Export Slaughter House is the first and the largest abattoir in Modjo town. It is established in 2002 and an average of 22,000 sheep and goats are slaughtered every month for export purpose.

Study animals

All sheep and goats slaughtered were males. The origins of the animals were different areas in the country including Wollo, Metehara, Afar, Ogaden, Bale and surrounding areas of the slaughter house. The animals were purchased from farmers on weight basis and those below 10-12 kg were rejected. The husbandry practice for these animals was mainly grazing. The age of the slaughtered sheep and goats ranges from one to two years.

Study type and sample size determination

The study was a cross-sectional study. The study animals were small ruminants (325 sheep and 440 goats) slaughtered at Modjo Luna Export Slaughter House between December 2009 and February 2010. The required sample size was determined as described by Thrusfield (2005). The expected prevalence of hydatidosis was taken from previous work of Lobago (1994, unpublished) at Konso abattoir which was 9.3% in sheep and 18.8% in goats. And by setting 95% confidence level and 5% desired level of precision; the sample size was calculated to be 130 sheep and 235 goats. However, 325 sheep and 440 goats were sampled so as to increase the precision of the study.

Postmortem examination

Postmortem examination was conducted three days per week and the days were selected on the basis of number of animals slaughtered during those days. Visual inspection, palpation and systematic incision of each visceral organ particularly the liver, lung, heart, kidney and carcass were carried out according to procedures recommended by FAO (1994). Spleen was not examined in this study due to inconvenience in the arrangement of the abattoir for sampling during the study.

Examination of cyst fertility

Cyst fertility was examined according to Daryani *et al.* (2006). Briefly, individual cysts were grossly examined for degeneration, then according to the size (not too small) hydatid cysts in sheep and goats were selected for fertility study. To reduce intracystic pressure, the cyst wall was penetrated, using needle and it was cut with scalpel and scissors. The contents were then transferred into a sterile container. The cysts were classified as sterile (fluid filled cyst without any protoscoices), calcified, non viable (cysts with dead protoscoices) and viable or fertile (cysts with live protoscoices). To determine viability of the protoscolices, a drop of cyst fluid was placed on a microscopic glass slide and

cover slip was applied and observed for the motility of flame cells activity like peristaltic movement. When it becomes doubtful for motility, a drop of 0.1% aqueous eosin solution was added and examined under a light Microscope for taking the dye. Live protoscolices did not take the dye whereas, the dead ones did.

Data analysis

Descriptive statistics was used to summarize the data. For comparison of prevalence of hydatidosis in sheep and goats and viability of cysts between lung and liver χ^2 and Fisher exact using Intercooled Stata 7.0 were used.

Results

Prevalence of hydatidosis

Out of 325 sheep examined, 25 had hydatid cysts in various organs, giving an overall prevalence of 7.7 %. Twenty seven goats out of 440 (6.13%) were found positive for hydatid cysts (Table 1). The prevalence was higher in sheep compared to goats but the difference was not statistically significant ($P > 0.05$).

Table 1: Prevalence of hydatidosis in sheep and goats slaughtered at Modjo Luna Slaughter House from December 2009 – February 2010.

Species of animal	No. Examined	Hydatid positive	Prevalence (%)
Sheep	325	25	7.7
Goats	440	27	6.13
Total	765	52	6.8

By organ distribution hydatid cyst was found more often in lung and liver. Out of 25 sheep with hydatid cysts, 15 (60 %) harbored hydatid cysts in lung, 9 (36 %) in liver and 1(4 %) involved both lung and liver. Similarly in goats, out of 27 with hydatid cysts, lungs accounted for 19 (70 %), liver 5(18.5 %), kidney 1(3.7 %), heart 2 (7.4 %) and 2 (7.4 %) harbored hydatid cysts in muscle (Table 2).

Table 2: Distribution of hydatid cysts in different organs of infected sheep and goats slaughtered at Modjo Luna Slaughter House from December 2009 – February 2010.

Animals	No. Examined	Lung	Liver	Kideny	heart	Muscle	Liver and lung
Sheep	325	15(60%)	9(36%)	0	0	0	1(4%)
Goat	440	19(70%)	5(18.5%)	1(3.7%)	2(7.4%)	2(7.4%)	0

Hydatid cyst fertility

In sheep, a total of 25 cysts were examined to identify cyst fertility or viability. From those 5 (20%), 5(20%), 9 (36%) and 6 (24%) were identified as fertile, non viable, sterile and calcified, respectively. Fertile cysts were mostly detected in lung which were 4 (80%) of the whole fertile cysts. However, most of cysts in the liver 3 (50%) were found calcified (Table 3). Viable cysts were higher in lungs compared to liver although not statistically significant ($p > 0.05$). In goats, a total of 27 cysts were examined to identify cyst fertility. From those 6 (22.20%), 9 (33.30%), 5 (18.5%), 10(37.03%) were identified as fertile, non viable, sterile and calcified, respectively. From a total of 19 lung cysts there was no fertile cyst detected in goats. Rather non-viable cysts in goats were found mostly in lungs which were 7(36.8%) of the whole cysts (Table 3). Generally, there was no significance difference in viability of hydatid cysts between sheep and goats (20% in sheep and 22.20% in goats) ($\chi^2 (1) = 0.0403$ $P = 0.841$). However, the proportion of viable cysts found on lung were high in sheep 4 (80%) and there was no viable cyst found in goat's lung and the difference was statistically significant ($P < 0.05$).

Table 3 Classification of hydatid cysts collected from sheep and goats slaughtered at Modjo Luna Slaughter House from December 2009 – February 2010 based on viability of cysts.

Organs	Viable		Non Viable		Sterile		Calcified		Total	
	Sheep	Goats	Sheep	Goats	Sheep	Goats	Sheep	Goats	Sheep	Goats
Liver	1	1	2	1	3	2	3	1	9(36%)	5(18.5%)
Lung	4	0	3	7	6	3	2	9	15(60%)	19(70.4%)
Liver and lung	0	0	0	1	0	0	0	0	1(4%)	0
Kidney	0	1	0	0	0	0	0	0	0	1(3.7%)
Heart	0	2	0	0	0	0	0	0	0	2(7.4%)
Muscle	0	2	0	0	0	0	0	0	0	2(7.4%)

Discussion

Hydatidosis is known to be livestock and public health important disease and for establishment of a control strategy, detailed information on local epidemiology and significance of the disease must be known. In the current study, the prevalence of hydatidosis in sheep was found to be 7.7%. A slightly higher prevalence (10.6%) was reported at Bhir Dar, Ethiopia (Nigatu Kebede *et al.*, 2009). In Libya Dalimi *et al.* (2002) reported a prevalence rate of 8.7% comparable to the present finding. In sheep prevalences ranging from 10.6% to 75% were reported in different countries (Dalimi *et al.*, 2002; Azlaf and Dakkak

2006; Scala *et al.*, 2006; Woldegeorgis Kebede *et al.*, 2009; Omer *et al.*, 2010; Christodouloupoulos *et al.*, 2008 ; Acosta-Jamett *et al.*, 2010). These variations of the infection rates could be due to the variations in the temperature, environmental conditions, and the way of raising of these animals. In goats Tariku Jebat *et al.* (2008) in Ethiopia reported 1.7% prevalence lower than the current study (6.13%). The global hydatidosis infection prevalence rate was 1.88% in goats (Azlaf and Dakkak, 2006). The available literature mentioned in this manuscript or elsewhere showed that the prevalence of hydatidosis is high in sheep compared to goats. This may be due to the difference in feeding habits that goats are browsers.

In the present study, lungs were found to be more involved in sheep (60 %) and goats (70%) followed by liver which goes with the findings of Khan *et al.* (2001) and Dalimi *et al.* (2002) who had reported that lungs were the most affected organ compared to liver. Other workers had also found results in support of the present finding (Islam *et al.*, 2003; Nigatu Kebede *et al.*, 2009). The reason for higher prevalence of cysts in lung might be due to softer consistency of lungs.

Hydatid cyst, though known to occur in many areas of the body, is rare in skeletal muscle. Echinococcosis of muscle is caused by the larval stage of *Echinococcus granulosus* or, rarely, by the more aggressive *Echinococcus multilocularis*. Hydatidosis of muscle appears to be uncommon, as muscle is involved in only 3% of echinococcal infection (Latino *et al.*, 1999). In the present study 4% of echinococcal infection was involved in goat muscle. The findings in the present study correspond to the earlier observations with regard to organ involvement of hydatidosis.

With regard to fertility of cysts, in sheep (lung, 80% and liver, 20%) fertile cysts were common. In agreement with the present study Alemian *et al.* (2007) have reported that the fertility of pulmonary cysts in sheep was higher than those of hepatic cysts. Anwar *et al* (1993) reported the fertility rate of 80.95% in sheep (81.62% in lungs, 78.92% in liver). Scala *et al.* (2006) and Ahmed *et al.* (2006) also showed that in sheep, pulmonary fertile cysts were higher than those in liver. However, Dalimi *et al.*, (2002) reported that the fertility of cysts in liver of sheep (36.9%) in western Iran was higher than that in the lungs (25.2%). Gusbi *et al* (1987), Kamhawi *et al* (1995), and Saeed *et al* (2000) have also reported that the hepatic cysts of sheep were more fertile than those in the lungs. Khan *et al.* (2001) reported that in sheep the fertility of cysts in the liver was similar to that of the cysts in the lungs. Variation in fertility rate

among the organs might be due to the difference in tissue resistance among of the organs (Arene, 1985).

In conclusion the present study on sheep and goats revealed that hydatidosis is a major cause of organ and carcass condemnation and financial loss to Modjo Luna Export Slaughter House in particular and to the country at large. The prevalence rate of hydatidosis was high in sheep compared to goats and in both species lung was the most frequently affected organ by hydatid cyst followed by liver. The cysts found in the lung of sheep were fertile, while there was no fertile cyst detected in the lung of goats. In Ethiopia, it is a common practice to feed dogs condemned organs which would maintain the life cycle of the disease and therefore public education has to be considered.

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