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Full length Research Paper

Prevalence of hydatid cysts in goats and sheep slaughtered in Soroti Municipal Abattoir, Eastern Uganda

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Hydatidosis is a significant public health problem especially in developing countries such as Uganda where sanitation is poor and people live in close proximity with each other and with animals. An abattoir based study was conducted to determine the prevalence of hydatid cyst in sheep and goats slaughtered at Soroti Municipal Abattoir from March to April 2014. A total of 454 animals comprising 294 goats and 160 sheep of both sexes were examined at postmortem for the evidence of hydatid cyst through visual inspection, incision and palpation of organs and viscera. The overall infection rate of 33.33% in goats and 42.50% in sheep were observed. The result of the study revealed that goats and sheep more than three years old had the highest prevalence. In conclusion, the observed prevalence was high; an indicator that the human population is at risk. The prevalence levels warrant further epidemiological studies, stricter abattoir hygiene, and restricted domestic slaughter of livestock. Dog population control by killing of stray dogs and sterilization of owned dogs is urgently required. De-worming of ruminants and owned dogs in conjunction with mass community sensitization about the dangers of having the dog faeces inadvertently in the human food chain is required.

Key words: Prevalence, Hydatid cysts, goats, sheep.

INTRODUCTION

Hydatid cyst is a larval stage of a dog tapeworms belonging to the genus *Echinococcus* (Family Taeniidae) causing Echinococcosis disease (Gottstein and Reichen, 2003). Echinococcosis is a cosmopolitan helminthozoonosis of medical and economic importance (Dumitru et al., 2011, Schantz et al., 1995, Serefettin et al., 2005**).** It is characterized by long-term growth of metacestode (hydatid) cysts, unilocular fluid-filled bladders in the intermediate host (herbivores such as sheep, horses, cattle, pigs, goats, rodents and camels) and humans (Fromsa *et al.,* 2011, Bouree, 2001; Craig *et al.*, 2007; Tappe *et al*., 2008). Male dogs are more likely to be infected than females and roaming ones are more likely to be affected than restricted ones (Budke *et al*., 2005). The four major species of medical and public health importance are *E. granulosus* (which causes cystic echinococcosis), *E. multilocularis* (which causes alveolar echinococcosis), *E. vogeli* and *E. oligarthrus* (which cause polycystic echinococcosis) (Bekci, 2012, Abdulahi *et al.,* 2011). However, even among species are several intra-specific variants which show differences in the gene sequences (Cringoli *et al*., 2006; Eckert and Thompson,

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1997; Torgerson and Budke, 2003). Hydatid cyst develop mainly in the liver (70%), but also lungs (20%) and 10% of cysts can occur almost anywhere in the body (e.g., brain, body musculature, wall of the heart, kidneys, orbit of the eye, marrow cavity of bones) (Grosso *et al.,* 2012; Himonas *et al*.,1987).

Hydatidosis is more important in developing countries such as Uganda where there is poor sanitation and people live in close proximity with each other and animals especially in nomadic pastoral tribes. Echinococcal cysts are spread by dogs and other canids such as wolves and foxes which are definitive host. In Uganda the number of dogs is estimated at 1.6 million with Eastern region having about 312,010 dogs (UBOS, 2008). The number of stray dogs is overwhelmingly high in Soroti with Soroti municipal abattoir alone estimated to host over 40 stray dogs where they litter the holding grounds and pasture around with their faeces.

Interaction of dogs with goats and sheep is exercabated by the fact that domesticated dogs are used to control the movements of sheep and goats during grazing. UBOS (2008) also estimates that Soroti district has 114,299 goats and 17,241 sheep and that 50.6% and 11.8% of the households in the district rear goats and sheep respectively.

The population comprises local, cross and exotic goats and sheep breeds. Goats and sheep in these communities are very vulnerable to hydatids because anthelmintic prophylaxis or vaccination is rarely provided even among the domesticated dogs. The present study was designed to determine the prevalence of hydatid cyst infestation in goats and sheep slaughtered at Soroti Municipality Abattoir.

MATERIALS AND METHODS

The study was conducted at Soroti municipal abattoir, located in Akisim cell, Soroti Municipality in North-eastern Uganda. It is a grade C abattoir with an average of 80 small ruminants slaughtered daily (Record from the Abattoir, 2014). Most of the animals slaughtered come from within Soroti District although few are received from surrounding districts of Kaberamaido, Amuria, Katakwi, Kumi, Dokolo, Serere, Karamoja and Lango sub region. A total of 454 goats and sheep were examined in the present study during the month of March and April, 2014. Sex, age and breed were determined during ante mortem inspection. Age was determine from the dental formula as follows; Eruption of 1st ,2nd ,3rd and 4th pairs of large permanent incisor indicates 1 year, 2years,3years and 4 years respectively. Erosion and eventual lost of teeth indicated age of 5years and above. Postmortem examination involved visual inspection, incision and palpation of organs and viscera. Omentum, mesentery, peritoneal cavity, liver, lungs, kidneys, spleen, striated muscles, heart and subcutaneous area of each carcass were examined for the presence of hydatid cyst.The abdominal, thoracic and pelvic cavities as well as muscle surfaces were also examined for presence of cysts. Prevalence by origin was determined by tagging each animal to the Sub-county of origin. Data were compiled in a spreadsheet (Microsoft Excel, Version 2007) and analyzed as appropriate using descriptive statistics. Pvalue was calculated using Chi-square test. A P-value <0.05 was considered statistically significant.

RESULTS

A total of 294 goats and 160 sheep were examined for the prevalence of hydatid cyst on post mortem inspection. The number of sheep and goats examined by Sub-county of origin was reflected in Table 1.

Hydatid Cysts Prevalence by Species and Age of Sheep and Goats

Out of 294 goats and 160 sheep, 98(33.33%) goats and 68(42.50%) sheep were infected with hydatid cyst, habouring one or more cyst on different visceral organs. Statistical analysis showed no significant difference between sheep and goats hydatid prevalence. (X^2=1.821, df=1, p=0.177). The prevalence by age was shown in Table 2.

The results showed that in sheep, animals between 2-3 years were 0.46 times more likely to harbor the hydatid cysts than those less than 1 year (P =0.03) while those above 3 years were 0.75 times more likely to be infected despite lack of strong stastical evidence to support it. The rate of infestation was highest in animal above three years of age.

Prevalence of Hydatid Cysts by Sex

Out of 168 male goats and 126 female goats examined, 61(36.31%) male goats and 37(29.36%) female goats are infected with hydatid cyst (Table 3).

Female goats were 1.37 more likely to harbor hydatid cysts than male goats. In sheep; 79 male sheep and 81 female were examined out of which 28(35.44%) males and 40(49.38%) females were positive. Female sheep were 0.56 more likely to harbor hydatid cysts than male sheep. The result showed no significant differences in the prevalence of hydatid cysts between males and females in both species.

Association between Prevalence and Sub-County of Origin

The study revealed that Asuret Sub-county had the highest prevalence of hydatid cyst in sheep 25(51.02%) and the least prevalence was reported in Arapai, 9 (29.03%). Prevalence in goats was highest in Arapai 24 (40.68%) and the least in Gweri 17 (30.9%) (Figure 1). The differences were not statistically significant in both species (X^2=3.906, df=3, P=0.272, CI=95%).

Table 1. Number of goats and sheep sampled by sub-county.

Sub county	Number of goats and sheep		
	Goats	Sheep	Total
Asuret	101	49	150
Arapai	59	31	90
Gweri	55	38	93
Kamuda	79	42	121
Total	**294**	**160**	**454**

Table 2. Logistic regression analysis on the prevalence of hydatidosis by age group in sheep and goats slaughtered in Soroti Municipal abbatoir, North-eastern Uganda.

Species	Age category	No. examined	Prevalence (%)	OR (95% CI)	P-value
Goats	0-1yr	158	44(27.85%)	1	
	2-3 years	87	31(35.63%)	0.70 (0.38,1.27)	0.25
	>3 years	49	23 (46.94%)	0.61(0.29,1.36)	0.21
Sheep	0-1yr	88	29(32.95%)	1	
	2-3 years	50	26(52.0%)	0.46(0.21,0.98)	0.03
	>3 years	22	13(59.10%)	0.75(0.24,2.31)	0.62

OR=odds ratios, CI=Confidence intervals.

Table 3. Univariate analysis of the prevalence of hydatid cyst in goats and sheep by sex.

Species	Sex	No. examined	Prevalence (%)	OR (95% CI)	P-value
Goats	Male	168	61 (36.31%)	1	
	Female	126	37 (29.37%)	1.37(0.81,2.33)	0.26
Sheep	Male	79	28 (35.44%)	1	
	Female	81	40 (49.38%)	0.56(0.28,1.11)	0.08

DISCUSSION

The observed prevalence of hydatid cysts in goats and sheep examined at the abattoir was found to be 42.50% in sheep and 33.33% in goats. The finding was in agreement with 34.7% prevalence in goats observed in Ngorongoro district, Tanzania and 37.9–50.9% reported among Libyan sheep (Ernest *et al*., 2009; Ibrahem and Gusbi, 1997).This high prevalence was possibly because of the high dog population and the practice of backyard slaughter. Soroti municipal abattoir is not fenced and the district has no dog population control strategy. Most dogs are raised as scavengers and move long distances to access areas where backyard slaughter is done or where animals have died. Rural areas do not have gazetted slaughter places. This results in contamination of pasture with dog faecal matter. The prevalence in Soroti was lower than that observed in Italy where a prevalence of 47%-81.18% in sheep and 71.97% in goats were reported (Grosso *et al*., 2012). The surprisingly higher prevalence in Italy was thought to be because of illegal slaughter of high numbers of sheep and stray dogs in Italy (Garippa *et al*., 2004).The parasite prefers temperate climates (Pedro *et al*., 2009) and this possibly explains why Italy among other temperate regions had a higher prevalence than Soroti which is a tropical region. Higher prevalences were also observed in Eastern Ethiopia, Greece, North Western Iran, Turkey and Central Peruvian Andes (Daryani *et al*., 2007; Menkir *et al*., 2008; Yildiz and Gurcan, 2003; Dueger and Gilman, 2001; Himonas *et al*., 1994). Although specific reasons are not clear, illegal slaughter and uncontrolled dog population and movement could play a role. The higher prevalence in sheep compared to goats could be explained by the nature of feeding; sheep tend to graze and goats are browsers therefore sheep are more likely to pick echinococcal eggs. For unknown reason however, the prevalence of 42% observed among goats was significantly higher than the 24% in sheep in the Niger Delta (Arene, 1985).

The result of the study revealed that goats and sheep more than three years old had the highest prevalence (Table 2). This was in agreement with the studies done in the Benghazi area of Eastern Libya, North Jordan and in the Central Peruvian Andes (Tashani *et al*., 2002; Dueger and Gilman, 2001; Sami *et al*., 1986). Higher age reflects a much longer period of risk of infection and the chances of detecting cysts at meat inspection are higher in aged

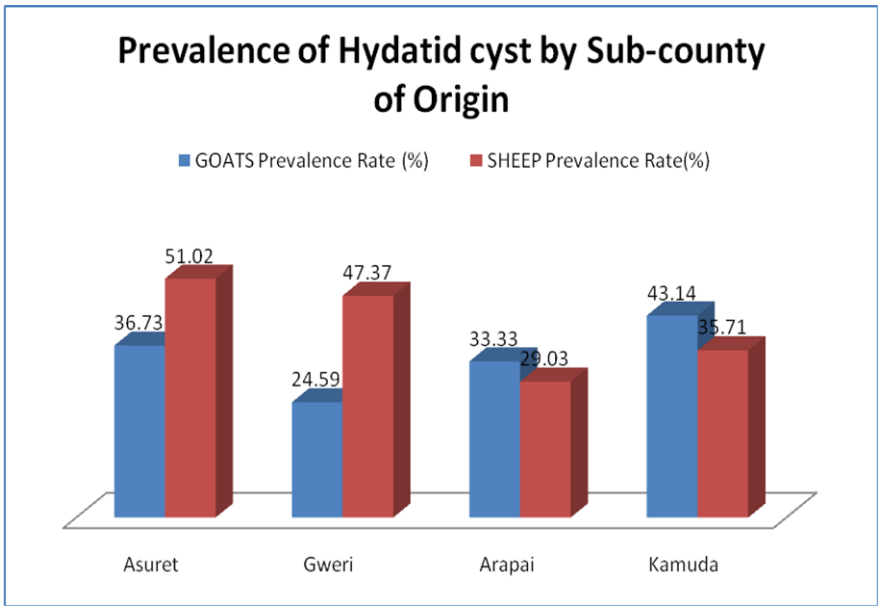

Figure 1. Relationship of hydatid cyst prevalence and Sub-county of origin.

animals due to the bigger size of the cyst (Pandey *et al*., 1988). However, the differences of prevalence among age groups were not statistically significant. There was higher prevalence in male (36.31%) than female 29.37% in goats while it was contrary in sheep where males had the prevalence of 35.44% and female 49.38% (Table 3). There was no significant difference between males and females. The highest ovine hydatid prevalence was observed in Asuret sub-county at 51.02% and the lowest was in Arapai sub-county at 29.03% while the highest goat hydatid prevalence was observed in Arapai sub-county at 40.68% and the lowest was in Gweri sub-county at 30.9% (Figure 1). Although there was no significant association between the ruminant hydatid prevalence and sub-counties of origin due to the common grazing grounds, there were possibly variations of the level of contact of ruminants with shepherd dog faecal matter in pastures among the hunting communities. In conclusion, the observed prevalence was high; an indicator that the human population is at risk. The prevalence levels warrant further epidemiological studies, stricter abattoir hygiene, and restricted domestic slaughter of livestock. Dog population control by killing of stray dogs and sterilization of owned dogs is urgently required. De-worming of ruminants and owned dogs in conjunction with mass community sensitization about the dangers of having the dog faeces inadvertently in the human food chain. Vaccination against hydatidosis in sheep is advisable.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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