Prevalence of Cysticercosis among Small Ruminant Animals Slaughtered in Iganga Municipal Abattoir

Mwanja Simon[1], Kulaka Ali Tariq[1]

Department of Animal Science, Faculty of Agriculture and Animal Sciences, Buistema University, P.O. Box 203, Soroti, Uganda.

ABSTRACT

This study aimed to determine the prevalence of Cysticercus tenuicollis and hydatid cysts in goats and sheep slaughtered at Iganga District Municipal Abattoir, Uganda.

A cross-sectional study was conducted involving postmortem examinations of 212 livestock (106 goats and 106 sheep). Metacestodes were identified through visual inspection, incision, and palpation of organs.

The prevalence of Cysticercus tenuicollis was highest in adults (>3 years, 68.4%), followed by middle-aged (2-3years, 30.2%) and young animals (<2 years, 7.9%). Similarly, hydatid cysts were more prevalent in adults (15.8%) than middle-aged (9.4%) and young animals (0.0%).

Prevalence of Cysticercus tenuicollis was similar in males (18.9%) and females (18.8%), while hydatid cysts were slightly higher in males (4.2%) than females (3.4%), but these differences were not statistically significant ($p = 0.979$ and $p = 0.764$, respectively).

Both parasites were most prevalent in poor body conditioned livestock (Cysticercus tenuicollis: 46.5%, hydatid cysts: 16.3%), followed by medium (15.2% and 0.9%) and good (5.2% and 0.0%) body conditioned animals. Prevalence varied across sub-counties, being highest in Bulamagi (25% and 6.4%) and lowest in Nakalama (14.3% and 0.0%), though differences were not statistically significant ($p = 0.458$ and $p = 0.370$). Hydatid cysts were predominantly located in the liver rather than the lungs in both sheep and goats.

The high prevalence of these metacestodes causes economic losses and public health risks, highlighting the need for further studies and public education on prevention and control of E. granulosus and Cysticercus tenuicollis.

Key words: Cysticercosis, Hydatid cysts, Small ruminants, Prevalence, Organ distribution

INTRODUCTION

Small ruminants are among the most commonly kept livestock species in East Africa primarily reared for meat, milk, fiber, and other products (Armson et al., 2021). They are often referred to as the "cow of the poor" due to their numerous advantages. Unlike cattle, goats and sheep require relatively little feed, occupy minimal space, can withstand harsh environmental conditions, and still provide sufficient milk to sustain an average household (Hautbout et al., 2025). Consequently, the affordability and adaptability of small ruminants have made them increasingly popular as an accessible alternative to cattle for resource-limited families.

However, small ruminant production is constrained by several challenges, especially parasitic infections, which not only hinder productivity but also pose risks to public health (Salem et al., 2025). Among these, metacestode infections are particularly significant, with small ruminants serving as intermediate hosts. Sheep and goats become infected by ingesting Taeniid eggs, which develop into different larval stages (metacestodes), including Cysticercus ovis (larval stage of Taenia ovis), Cysticercus tenuicollis (Taenia hydatigena), Coenurus cerebralis (Taenia multiceps), and hydatid cysts (Echinococcus granulosus) (Yusuf, 2024)

Metacestodes form fluid-filled cysts that act as space-occupying lesions, often leading to organ condemnation during meat inspection. Livestock reared in close contact with stray dogs are at particularly high risk of acquiring these infections (Py et al., 2025). Cysticercosis leads to considerable economic losses due to condemnation of affected organs. Beyond these economic impacts, certain metacestode infections, such as hydatid cysts, also present serious zoonotic risks, especially in communities where livestock and dogs interact closely(Moje et al., 2014).

Despite its recognized impact on livestock productivity and human health, information on the prevalence of cysticercosis among small ruminants in Iganga abattoir is scarce. Therefore, this study aims to determine the prevalence and organ distribution of cysticercosis in small ruminants slaughtered in Iganga, providing essential baseline data for the development of effective control and prevention strategies.

MATERIALS AND METHODS

The study was conducted from May to June 2019 at Iganga District Municipal Abattoir, Uganda. Iganga is a major livestock production area, making it ideal for assessing the prevalence of parasitic infections in goats and sheep.

A stratified random sampling procedure was used to select 212 livestock (106 goats and 106 sheep) for postmortem examination. Animals were stratified by species, age, and sex to ensure representative sampling across these subgroups.

Each carcass underwent a detailed postmortem examination, with careful inspection, palpation, and incision of visceral organs and tissues in the abdominal, thoracic, and pelvic cavities to detect Cysticercus tenuicollis *and* Echinococcus granulosus cysts. Organs inspected included the liver, lungs, heart, kidneys, and mesentery.

Data collected for each animal included sex, age, body condition score (poor, medium, or good), and sub-county of origin**.** Age was determined based on rostral dentition (Oltenacu, 1999), and animals were categorized into three age groups: Group A (<2 years), Group B (2–3 years), and Group C (>3 years). Body condition was assessed using visual appraisal and palpation of key muscle and fat deposits.

All findings were recorded systematically for subsequent statistical analysis to determine prevalence and associations between parasite occurrence and animal characteristics.

DATA ANALYSIS

The data collected was entered into a Microsoft excel sheet and analyzed using STATA version 14. Then **Chi-square (χ^2) test** was used to establish the relationship between Cysticercus tenuicollis and hydatid cyst infection with age, sex, species and body condition score of the slaughtered animals. In all the analyses, confidence level was held at 95% and $p < 0.05$ set for significance

RESULTS

The study revealed that the prevalence of Cysticercus tenuicollis was higher in goats (22.6%) than in sheep (15.1%). However, this difference was not statistically significant (p = 0.160), indicating no association between species and prevalence of Cysticercus tenuicollis. Similarly, the prevalence of hydatid cysts was slightly higher in goats (4.7%) compared to sheep (2.8%), but the difference was also not statistically significant (p = 0.471), suggesting no correlation between species and prevalence of hydatid cysts

Table1.prevalence of cysticercus tenuicollis and hydatid cysts in relation to species

Disease	Species	Number examined	Number infected	Prevalence (%)	X^2	p-value
Cysticercus tenuicollis	Goats	106	24	22.6	1.9721	0.160
	Sheep	106	16	15.1		
Hydatid cysts	Goats	106	5	4.7	0.5196	0.471
	sheep	106	3	2.8		

The prevalence of Cysticercus tenuicollis was highest in adult animals (>3 years, 68.4%), followed by middle-aged (30.2%) and young animals (7.9%). This difference was statistically significant (p = 0.000), indicating a strong association between age and prevalence of Cysticercus tenuicollis. Similarly, hydatid cysts were more prevalent in adults (15.8%) than in middle-aged animals (9.4%), while young animals (<2 years) showed no infection (0.0%). The variation across age groups was also statistically significant (p = 0.0001), confirming that age is an important risk factor for the occurrence of hydatid cysts in small ruminants.

Table2. Prevalence of Cysticercus tenuicollis and hydatid cysts in relation to age

Disease	Age	Number examined	Number infected	Prevalence (%)	X^2	p-value
Cysticercus tenuicollis.	<2	140	11	7.9	46.0025	0.000
	2-3	53	16	30.2		
	>3	19	13	68.4		
Hydatid cysts	<2	140	0	0.0	17.7214	0.0001
	2-3	53	5	9.4		
	>3	19	3	15.8		

The study assessed the effect of sex on the prevalence of Cysticercus tenuicollis and hydatid cysts. The prevalence of Cysticercus tenuicollis was nearly identical in males (18.9%) and females (18.8%), with no significant difference (p = 0.979). Similarly, hydatid cysts were slightly more common in males (4.2%) than females (3.4%), but the difference was not statistically significant (p = 0.764). Since both p-values were greater than the 0.05 threshold, sex was not associated with the prevalence of either metacestode.

Table3. Prevalence of Cysticercus tenuicollis and hydatid cysts in relation to sex

Disease	Sex	Number examined	Number infected	Prevalence (%)	X^2	p-value
Cysticercus tenuicollis	Male	117	22	18.8	0.0007	0.979
	Female	95	18	18.9		
hydatid cysts	Male	117	4	3.4	0.0905	0.764
	Female	95	4	4.2		

The prevalence of Cysticercus tenuicollis and hydatid cysts in relation to body condition scores (BCS) of shoats is summarized in Table 4. A significantly higher prevalence of Cysticercus tenuicollis was recorded in poorly conditioned animals (46.5%), compared to medium (15.2%) and good (5.2%) body condition groups. This difference was statistically significant (p = 0.00), indicating a strong association between body condition and Cysticercus tenuicollis infection. Similarly, the prevalence of hydatid cysts was highest in poorly conditioned animals (16.3%), followed by medium-conditioned animals (0.9%), while no cases were detected in well-conditioned animals (0.0%). The difference was statistically significant (p = 0.00), demonstrating a clear relationship between body condition and hydatid cyst prevalence.

Table 4 prevalence of cysticercus tenuicollis and hydatid cyst in relation to Body condition score

Disease	BDCs	Number examined	Number infected	Prevalence (%)	X^2	p-value
Cysticercus tenuicollis	Poor	43	20	46.5	29.4875	0.000
	Medium	111	17	15.3		
	Good	58	3	5.2		
Hydatid cysts	Poor	43	7	16.3	23.3163	0.000
	Medium	111	1	0.9		
	Good	58	0	0		

Based on the sub-counties of origin, the prevalence of Cysticercus tenuicollis was highest in Bulamagi (25%) and Nabitende (21.4%), compared to Nakigo (15.3%) and Nakalama (14.3%). However, the calculated p-value (0.458) was greater than the standard significance level (0.05), indicating no statistically significant difference in prevalence across sub-counties (Table 5).

Similarly, the prevalence of hydatid cysts was higher in Bulamagi (6.4%), followed by Nabitende (5.4%) and Nakigo (3.4%), while no cases were detected in Nakalama (0.0%). The calculated p-value (0.370) also exceeded the standard threshold (0.05), confirming no significant difference among sub-counties. These findings suggest that the prevalence of both metacestodes was not influenced by sub-county of origin.

Table5; prevalence of cysticercus tenuicollis and hydatid cysts in relation to Sub County of origin

Disease	Sub county of origin	Number examined	Number infected	Prevalence (%)	X^2	p-value
Cysticercus tenuicollis	Nakigo	59	9	15.3	2.5943	0.458
	Nakalama	49	7	14.3		
	Nabitende	56	12	21.4		
	Bulamagi	48	12	25		
Hydatid cysts	Nakigo	59	2	3.4	3.1429	0.370
	Nakalama	49	0	0		
	Nabitende	56	3	5.4		
	Bulamagi	48	3	6.3		

The study revealed that hydatid cysts were predominantly found in the liver rather than the lungs in both sheep and goats, as shown in Table 6 below.

Table 6; showing organs distribution of hydatid cysts in goats and sheep slaughtered in Iganga abattoir

Organ with hydatid cyst	**Sheep (n=106)**		**Goats (n=106)**	
	Number infected	Infection rate (%)	Number infected	Infection rate (%)
Liver	02	66.7	03	60
Lungs	01	33.3	01	20
Liver & Lungs	00	00	01	20
Total	03	2.83	05	4.7

DISCUSSION

The present study revealed that sheep and goats slaughtered at Iganga Municipal Abattoir were commonly infected with Cysticercus tenuicollis, with an overall prevalence of 18.9%—22.6% in goats and 15.1% in sheep. The study demonstrated that the prevalence of Cysticercus tenuicollis was higher in goats than in sheep, a difference that may be attributed to variations in grazing behavior and management practices. Nonetheless, the prevalence recorded in this study was lower compared to findings from previous studies in other countries for instance the works of Bejiga *et al*.,(2016) in Small Ruminants Slaughtered at Addis Ababa Abattoir, Ethiopia who reported 39%, Abdulatif & Mammo et al .,(2015) with goats (53.9%) and 118 sheep (45.0%) , 24.6% (Mekuria *et al*., 2013) in Ethiopia and 37.85% (Guadu *et al*., 2012) at Hashim Nur's Meat Export Abattoir, Debre - Zeit, Ethiopia 1Tadesse. The lower prevalence may be attributed to geographical, environmental, and meteorological factors such as climate, soil characteristics, relative humidity, season, and rainfall which play a crucial role in the life cycle of helminths(Addy *et al*., 2012).

The study revealed that the prevalence of Cysticercus tenuicollis was higher in adult animals compared to young ones. This finding is consistent with the reports of Adl *et al*.,(2016) in slaughtered livestock in Upper Egypt governorates, and Al,(2012) at Ninevah Governorate-Iraq

The study indicated that the prevalence of Cysticercus tenuicollis was slightly higher in females than in males. This difference in infection rates may be explained by slaughter patterns, since males are usually slaughtered at younger ages, whereas females are often kept longer and slaughtered at older ages. Consequently, older animals have greater exposure to infective eggs and a higher likelihood of acquiring the infection (Bejiga *et al*.,2016). These results are compatible with previously reported mean infection rate of cysticercus tenuicollis by Al-kardhi, (2018) at -AL-Qadissyia governorate abattoir and Haddawee *et al*.,(2018) at Karbala abattoir in Iraq

In this study, the omentum was identified as the predominant predilection site of Cysticercus tenuicollis in both goats and sheep. Similar findings were reported by (Radfar et al., 2005) in Iran, Mohammad, Firmino *et al*., (2017) in Paraíba, northeastern Brazil

The overall prevalence of hydatid cysts (3.8%) in the present study is consistent with previous findings in different corners of Uganda and other parts of the World, such as the works of Ochi et al (2015) in Juba South Sudan who reported a 3.9% prevalence, (Kassa 2012) with a 3.1% prevalence, Roostaei *et al*, (2017) in Hamadan Abattoir, Western Iran with an over roll prevalence of 3.0%. However, the prevalence of hydatid cysts observed in sheep in this study represents a relatively low level of infection when compared to the higher prevalence rates reported in previous studies by Nyero *et al*,(2015) in Soroti Municipal Abattoir, Eastern Uganda with a prevalence of 42.50%, Addy *et al*.,(2012) in maasailand in Kenya with 16.5% . The occurrence of such a low prevalence in the current study might be due to the reduced backyard slaughter practice and decrease in the population of stray dogs (Addy *et al*.,2012)

In the current study, the prevalence of hydatid cysts in sheep and goats was found to higher in the Liver than in other visceral organs. This is in agreement with the previous findings of Damet & Egene,(2013), Ahmed et al.,(2006) in Quetta, Pakistan, Umur,(2003) in Slaughtered Ruminants in Burdur, Turkey, Marshet *et al*.,(2011) in his study carried out among small ruminant animal slaughtered in Addis Ababa municipal abattoir also reported that the liver had more infestation than other visceral organs . This could be due to the fact the liver is the first organ to which blood flows having left the digestive system, which results into the greater parts of the oncospheres being filtered in it. The ones that are not trapped in the liver are passed to the lungs and to the other organs (Al-khalidi, 1998)

The discrepancy and similarity in the prevalence between the various sub county of origin (Nakalama, Nakigo, Bulamagi and Nabitende) might be attributed to difference in the low level of awareness of a community with regards to methods of transmission of the parasites. People used to slaughter small ruminants at home and throw offals to the dogs around in their villages. Furthermore, difference in culture, social activity and attitude to dogs and dog populations in different regions might have contributed to such inconsistency (Al-Shaibani *et al.*, 2015).

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