

## Research Article

# Occurrence and Risk Factors for *Taenia Multiceps* Coenurosis in Small Ruminants Slaughtered in Kiteto District -Manyara, Tanzania

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## Summary

*Taenia multiceps* coenurosis is a fatal parasitic infection in small ruminants threatening food security in pastoralist communities in sub-Saharan Africa. Fatal cases presenting with nervous signs are increasingly being reported in small ruminants in Tanzania. The study was conducted to determine the prevalence of *T. multiceps* coenurosis in slaughtered goats and sheep in Kiteto district and predisposing factors for the infection. To establish the prevalence, brains of slaughtered goats and sheep were examined for presence of *Coenurus cerebralis* cysts and a questionnaire complemented with observation was administered to assess the factors for the parasite transmission. A total of 162 brains; 54 goats and 108 sheep were examined and 126 livestock keepers and 48 butcher men were interviewed. Overall, 36 (22.22%) of small ruminants were infected, of these 19(52.8%) were goats and 17(47.2%) were sheep. Generally, the livestock keepers and butcher men were ignorant on the source of the infection in animals, the livestock keepers had no deworming programs for their dogs, slaughter facilities had no fence, only one slaughter facility had decomposition pit hence roaming dogs were feeding on condemned offal. The study recorded high occurrence of *T. multiceps* coenurosis in the study area compromising the health of animals and food security. Lack of knowledge, absence of dogs deworming programs and feeding dogs with condemned offal were likely associated with presence of the infection in small ruminants in the area. To control the parasite, health education and regular mass deworming of dogs should be considered.

**Keywords:** Helminth; Taeniasis; Sheep; Goats; Dog; Tapeworm; Food insecurity

## Introduction

Small ruminants play a significant role in improvement of rural livelihood and ensuring food security in many pastoralist communities around the globe. This is because of their low initial inputs requirements and ability to produce in marginal lands with poor pasture [1]. However, the productivity of small ruminants is affected by diseases and inadequate nutrition [2,3]. The helminths are among the diseases impacting small ruminants' productivity [4]. Among the helminths, larvae of *Taenia multiceps* known as *Coenurus cerebralis* has emerged a serious and fatal disease resulting to great economic losses particularly in sheep and goats in many sub-Saharan Africa countries [5].

The parasite indirect life cycle involves ruminants the intermediate host and canid species the final hosts. The intermediate hosts become infected after ingestion of eggs from pastures or water contaminated with the feces from infected canids. The life cycle is completed when the definitive host ingests the *Coenurus* cysts containing the mature

protoscoleces when consuming the brain of infected small ruminants [6,7]. Cerebral coenurosis is a fatal paralytic neurological disease infecting brain and spinal cord of ruminants the intermediate hosts [8,9]. The parasite has little clinical effect on the definitive hosts which are domestic dogs (*Canis lupus familiaris*) and wild canids such as wild dogs (*Lycan pictus*), foxes (*Vulpes App*) and jackals (*Canis Spp*) [9,10]. Important clinical signs are neurological signs in intermediate hosts hence the synonymy "stagger" or "gid" in acute and chronic forms, respectively [11,12]. Although rare, human can acquire coenurosis through accidental ingestion of the tape worm eggs [13,14].

In animals, postmortem examination remains the golden standard in diagnosis of Cerebral Coenurosis [15]. Imaging techniques like radiology, ultrasonography and CT scan, Immunodiagnosis tests such as immuno-electrophoresis, indirect haemagglutination antibody test and ELISA tests are commonly used for experimental studies [16].

The risk factors include climate, where rainfall facilitates the dog feces to spread contaminating pasture and water sources hence increasing the chances of disease transmission [17]. Slaughter of infected animals with coenurosis signs without control facilitate to high prevalence of the disease in endemic areas. Feeding dogs with raw offal and lack of regular deworming in domestic dogs are important factors facilitating the infection outbreaks. The knowledge of community regarding the parasite might also influence its control [9].

In Tanzania high prevalence of the disease in small ruminants in some pastoral communities has been reported [9,18,19]. The reasons for the high magnitude of the disease being unknown, however, highly populated un-dewormed dogs could be one of the reasons. The parasite causes alarming concern on the food security and livelihood

**Citation:** Chacha M, Kasika M, Mkupasi EM. Occurrence and Risk Factors for *Taenia Multiceps* Coenurosis in Small Ruminants Slaughtered in Kiteto District -Manyara, Tanzania. World J Vet Sci. 2024; 4(1): 1021.

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**Publisher Name:** Medtext Publications LLC

**Manuscript compiled:** May 22<sup>nd</sup>, 2024

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to pastoralist communities in the country. There is a need to collect epidemiological information on the infection to influence the collective efforts in planning the control of the disease. This study was conducted to determine the occurrence and magnitude of coenurosis and assessed factors for the infection in sheep and goats slaughtered in Kiteto district.

## Materials and Methods

### Study area

The study was conducted in Kiteto district in Manyara region, Tanzania in September and October, 2023. The study area was purposively selected following reported unknown fatal disease affecting small ruminants presenting with central nervous signs and which does not respond to antibacterial treatment. The involvement of Coenurosis has been suspected following reports of the disease in nearby Ngorongoro district. The district is located between 4°45' South, 37°0' East with the human population of 1,425,131 (NBS, 2012). Livestock keeping and crop farming being the major economic activities in the district. Data was collected from five (5) official slaughter places which are Partimbo and slaughter places in livestock markets which included Dosidosi, Laiseri, Sunya and Njoro.

### Study design and study animals

The study was cross-sectional. Study animals involved all small ruminants slaughtered at the slaughter facility during the study period.

### Data collection

Head examination for coenurosis detection: After slaughter the animal heads were detached and opened by using metal hand saw to expose the intact brain and examined for the presence of *Coenurosis cerebralis* cyst in the brain. The slaughtered animals were recorded basing on the name of the ward/slaughter facility, species (ovine or caprine), presence of the central nervous signs, and presence of the *Coenurosis cerebralis* cyst in the brain (positive) and the absence of the cyst in the brain (negative).

Risk factors assessment: To explore the factors for transmission of the infection the questionnaire and observational check list were used. The questionnaire targeted the slaughter men and pastoralists to explore the knowledge regarding the infection. Information enquired included sex, age, educational level, occupation, knowledge about the biology of the parasite, how domestic animals contract the disease, how to control, how to treat and effect of the infection. Also, the information of owning dogs and deworming practices. In addition, using a check list the presence of dogs around slaughter facilities, fencing of slaughter facilities and presence of decomposition pit were noted.

### Data analysis

Data was presented in tables, analyzed by Microsoft excel and the magnitude of the infection was calculated by the disease frequency=[Number of animals affected with *Coenurosis cerebralis* cysts/total number of small ruminants examined] \* 100. Descriptive statistics were computed to establish the frequencies of responses on risk factors.

## Results

### General description

A total of 162 (108 sheep and 54 goats) clinically health animals were slaughtered and the heads removed and examined for presence

of *Coenurosis cerebralis* cysts. A total of 36 (22%) were found positive for the infection with 17 sheep and 19 goats. Structured questionnaires were administered to 126 livestock keepers and 48 butcher men for the assessment of risk factors for the parasite emergency. All participants were male, 7.9% of livestock keepers and 41.6% of butcher men completed primary education. Observation revealed lack of fence, dogs scavenging around the slaughter place and being directly fed with *T. multiceps* cysts.

### Magnitude of *Taenia multiceps* coenurosis to slaughtered small ruminants

The infection status per slaughter facility of *T. multiceps* coenurosis in slaughtered sheep and goats were as presented in Table 1.

### Risk factors assessment

Questionnaire results for risk factors from the livestock and butcher man for *T. multiceps* transmission is summarizes in Table 2 and Table 3.

**Table 1:** Prevalence of Cerebral coenurosis in slaughtered sheep and goats per slaughter facility.

Slaughter slab	Animal	Total number of animals slaughtered and examined	No. of positive animals found	Proportions
Partimbo	Sheep	19	0	0
	Goat	11	0	0
Dosidosi	Sheep	9	3	33.33
	Goat	6	2	33.33
Laiseri	Sheep	36	3	8.33
	Goat	11	6	54.55
Sunya	Sheep	44	11	25
	Goat	15	7	46.67
Njoro	Sheep	0	0	0
	Goat	11	4	36.36
Total		162	36	22.22

**Table 2:** Livestock keepers' response on risk factors for *Taeniamulticeps* transmission (n=126).

S/N	Variable	Response	
		YES	NO
1	Have seen the small ruminant with signs	126	0
2	Do you know the name of the disease	126	0
3	Do you know the animal acquires the disease	0	126
4	Is the disease treatable	10	116
5	Is the disease can also infect human	2	124
6	Are the dogs involved in the transmission of the disease	2	124
7	Do you own the dogs	126	0
8	To deworm your dog regularly	5	121

**Table 3:** Butcher men response on risk factors for *Taeniamulticeps* transmission (n=48).

S/N	Variable	Response	
		YES	NO
1	Do you know the disease named "Omillo"	48	0
2	Have seen the small ruminant with signs	48	0
3	Do you know the animal acquires the disease	10	38
4	Is the disease treatable	0	48
5	Is the disease can also infect human	0	48
6	Are the dogs involved in the transmission of the disease	20	28
7	Do you own the dogs	40	8
8	To deworm your dog regularly	10	38

## Discussion

The study conducted to determine prevalence and risk factors associated with cerebral coenurosis in Kiteto district. The results

revealed high occurrence of cerebral coenurosis in clinically health slaughtered sheep and goat in the district. The condition is fatal to the infected animals with no effective treatment implying high economic losses and also existing public health risk in the area if control measures are not taken.

Regarding the animal species, both are equally susceptible although in this study goats had a higher infection rate (35.19%) compared to sheep (15.74%). The differences could be caused by low number of examined sheep and or occurred by chance. This is contrary to observation made in Ngorongoro district where more or less the same magnitude of the infection was reported [20].

The overall prevalence of Cerebral coenurosis in Kiteto was 22.22% which is nearly half the prevalence reported in Ngorongoro district [18], but higher than 15.1% recorded at slaughter points in Northern Tanzania from different districts [9]. The variation might be due to differences in number of examined animals. In this study, the number of positive cases varied among the slaughter facilities with Laiseri slaughter slab leading followed by Sunya while in Partimbo was the only slaughter slab where there was no animal found to be infected. This suggested that slaughtered animals were locally sourced.

All slaughter facilities were found to have no fence, Partimbo is the only slaughter facility having decomposition pit for condemned organs and carcasses. Partimbo has no infection may be due the following reasons; low number of stray dogs, being located near to the district headquarter, most of the livestock keepers, get extension services including advices and deworming of the dogs with the appropriate drug to control the parasite as reported in the study that few dogs' owners deworm their dogs using an appropriate deworming drug for taeniids such as praziquantel [9].

Laiseri and Sunya have high prevalence of the condition may be explained by the fact that they are in the remote areas with limited extension services, large number of stray dogs with no deworming programs and absence of decomposition pits. Some studies have explained the same risk factors associated with the disease in the community such as lack of extension services and human resources to conduct meat inspection [9,21]. This may lead to unsupervised backyard slaughter practices which are common in most rural settings in Tanzania.

The demonstrated poor community knowledge to livestock keepers and butcher men about the source of *Coenurus cerebralis* infection in animals is strong risk factor for the disease transmission. All have heard about the disease with local name "omillo" as a mysterious disease infecting animal's in particular small ruminants and that had no cure. However, almost all were ignorant on how the sheep and goats acquired the infection making them exercise risky practices. Similarly, it has been observed that inadequate community knowledge on how the disease is transmitted, improper disposal of abattoir condemned material can be linked to poor management of offal, brain material from infected small ruminants feeding to dogs directly or may be poorly disposed and rendered accessible to dogs [9,18].

Lack of sensible ownership leads to dogs roaming freely coupled with lack deworming programs perpetuate the disease transmission in the area contributing to the observed high magnitude of the infection. This observation is similarly reported elsewhere [9,18].

Majority of the pastoralists reported to use their dogs to

accompany when animals are taken for grazing. Lack of deworming increases the risk of contaminating the pasture hence contributing to the observed high occurrence of the disease. Frequently feeding of dog with raw viscera, trimmings and heads of butchered animals exacerbate the parasite transmission [22,23].

## Conclusion

The study recorded high prevalence of *T. multiceps* coenurosis in the study area compromising the pastoralist food security and public health. Poor community knowledge about the disease lead to risky practices such as lack of dog deworming programs and feeding dogs with raw condemned offal which were associated with presence and endemicity of the infection in the study area. To control the parasite, health education and regular mass deworming of dogs should be considered. In addition, the mandatory dogs' ownership should be encouraged.

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