



## Prevalence of Tenuicollosis Among Livestock Slaughtered at Ninevah Governorate-Iraq

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### ABSTRACT

The prevalence of *Cysticercus tenuicollis* metacestode infections of sheep, goats and cattle was carried out during 2009 and 2010 at Mosul abattoir and nearby meat selling shops. All inspected carcasses were of local breed, apparently healthy. They were divided according to their ages and sexes into two categories. The first group included males less than one year old while the second group involved females more than one year old. A routine parasitological method by visual inspection of the cysts was followed for researching of the cysts within the internal cavities of the carcasses. Of 2000 sheep, 400 goats and 300 cattle examined preslaughter, 40 carcasses of each sheep and goats and 18 carcasses of cattle harbored the cysts, representing infection rates of 2, 10 and 6%, respectively. There were no significant differences in the infection rates between males less than one year and older female sheep. However, there were significant difference between male goats less than one year old and older female goats ( $P < 0.05$ ) in favor of females. In cattle, the cysts were only found in **male** calves with 6.5% infection rate. In males, the omentum followed by the mesentery and then the liver are the commonest sites, while in the females; the mesentery presented the most frequent locations of the cysts. Number of the cysts ranged between 1-4, 3-6 and one cyst in sheep, goats and cattle, respectively. Cyst's size was 2-7 cm in sheep, 4-6 cm in goats and 5 cm in cattle. It has been observed that most of the cysts are of evaginated type in sheep carcasses and ivaginated shape in goats and cattle and  $< 70\%$  were viable; however,  $> 1\%$  was caseated in the liver of lambs. It can be concluded that the goats play greater role in dissemination of the disease followed by cattle and sheep.

**Keywords:** *Cysticercus tenuicollis*, prevalence, livestock, Mosul, Iraq.

### 1. Introduction

*Cysticercus tenuicollis* is larval stage of a canine cestod *Taenia hydatigena* lodging the small intestine of the dog which represents the definitive host (Soulsby, 1982). *C. tenuicollis* is a cyst of different size filled with a clear fluid loosely attached to the abdominal and thoracic cavities of the herbivores and typically to the ruminants (Kaufmann, 1996). The adult worm of these larvae is *T. hydatigena* which is recorded earlier by many Iraqi authors (Abul-Eis, 1982; Al-Khalidiet al., 1988; Abdullah and Jarjees, 2001) in Mosul area and lately by Abass and Rahif (1999) in Baghdad,. The characteristic features of tenuicollosis is its adaptation to

wide spectrum of intermediate hosts involving a variety of domesticated ruminants and herbivores (Soulsby, 1982), non- domesticated swine (Solaymani-Mohammadi *et al.*, 2003), white tailed deer (Schurr *et al.*, 1988) and game cervid (Letkova *et al.*, 2008). In contrast to the harmless effect of the adult tape worm to the canine, the metacestodes have serious impacts on their intermediate hosts (Flisser *et al.*, 1982). The veterinary significance of the parasite is due to the economic losses arising from huge condemnation of infected offal's, livers or even the whole carcasses (Thompson and Lymbery, 1995). However, the available literature refer that the thin long – necked cysts are responsible for high morbidity and mortality of sheep (Radfar *et al.*, 2005). Also, it may cause traumatic hepatitis and death in heavily – infected livers of the lambs (Soulsby, 1982). Unfortunately and apart from the rejections of affected livers, these larvae may act as predisposing factors of black disease (Blood *et al.*, 1989). Worldwide, the prevalence of *C. tenuicollis* was between 8.3 – 34.2% in goats and 21.4% in sheep (Folaranmi *et al.*, 1984; Dada and Belino, 1978; Nwosu *et al.*, 1996) or even more reaching 37.1 – 79% in sheep and 53% in goats (Bekele *et al.*, 1988; Sissay *et al.*, 2007). However, in Iraq the overall infection rates of all animals slaughtered locally range from 0.8 – 18% (Abbas and Rahif, 1999; AL-Sultan *et al.*, 1999; Ghaffar, 2011).

The current work aims to determine the prevalence, locations, size of *C. tenuicollis* with relation of age and sex of animals slaughtered at Mosul abattoir.

## 2. Materials and Methods

To determine the incidence of *C. tenuicollis*, an abattoir survey was carried out on 2700 animal (sheep, goat, cattle) at Mosul municipal slaughterhouse. Irregular multiple visits were performed to the abattoir as well as different places of meat marketing and individual butcher shops. The work was conducted during years 2009 and 2010. All slaughtered livestock were of local breeds, were of different ages and weights. Intended animals were apparently healthy as being informed by the meat inspector. Body cavities including the thorax, abdomen and pelvis were carefully inspected for the possible detection of the cyst which could be found in the pleura, visceral and peritoneum either within these organs or suspended (Soulsby, 1982). Identification of *C. tenuicollis* from hydatid cysts was followed according to the description mentioned by others (Jubb *et al.*, 2007). Visual routine examination of the cyst was carried out post slaughter in the contracted carcasses. The cysts were transferred for further parasitological investigation in the laboratory. The viability of the cysts was carried out using electric compound microscope (Olympus). The cysts after examination were measured using standard classroom ruler (cm) as described by Al- Sultan *et al.* (1999).

## 3. Results

The mean infection rates with *C. tenuicollis* in sheep, goats and cattle were 2%, 10% and 6%, respectively. Out of 2000 sheep, the cysts were observed in 40 animals representing an infection rate of 2% (Figs. 1, 2&3). The data also revealed no effect of age and sex on the prevalence of the disease among examined sheep. Out of 400 goats of different ages and sex examined, a total of 40 goats had contracted the cysts with 10% an overall infection rate. The cysts were more in older female goat than young male ones indicating a significant influence of sex and age on their infection rates. It was evident that goats represent a typical host

reflected by higher infection rate as compared with sheep and cattle. Regarding the cattle, out of 300 cattle slaughtered, only 18 carcasses of young bulls harbored the cysts with its absence in cow and old aged bulls. The overall infection rate was 6% which is higher of what observed in sheep but lower in goats.

Fig.(4) showed the locations of the cysts in the infected animals, the highest sites of the cysts were detected in the omentum followed by intestinal mesentery, livers and other visceral organs of all male – infected animals. However, in the females, the most frequently – occurring cysts were observed in the intestinal mesentery. Figs. (5&6) showed the cysticerci in different locations of the abdominal cavity in slaughtered sheep. A single cyst was hidden in the mesosalpinx of an older cow. Table (1) explains number and size of the cysts and type of evagination as well as the viability of the cysts. It was clear that number and size of the cysts were semi – similar in both sheep and goats. However only a single cyst was seen in cattle carcass of 5 cm in diameter. In sheep, most of the obtained cysts were evaginated while the reverse was correct in goats and cattle. Viability of the cysts denoted that most cysts had live scolices with few degenerated cysts in liver parenchyma of some young lambs.

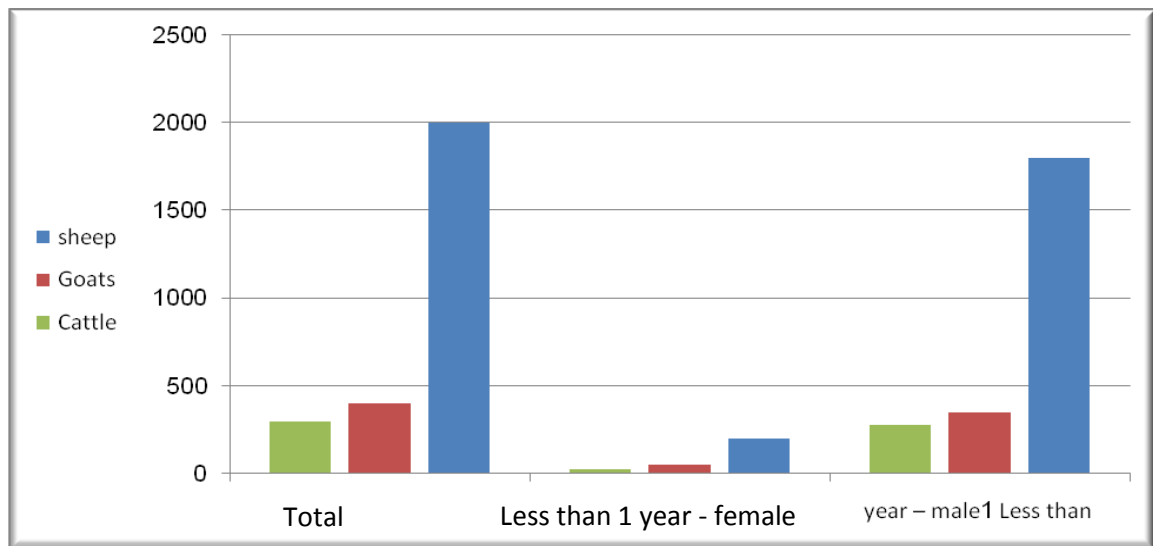


Fig. 1: The inspected number of tenuicollosis in different age group for both sexes of slaughtered livestock.

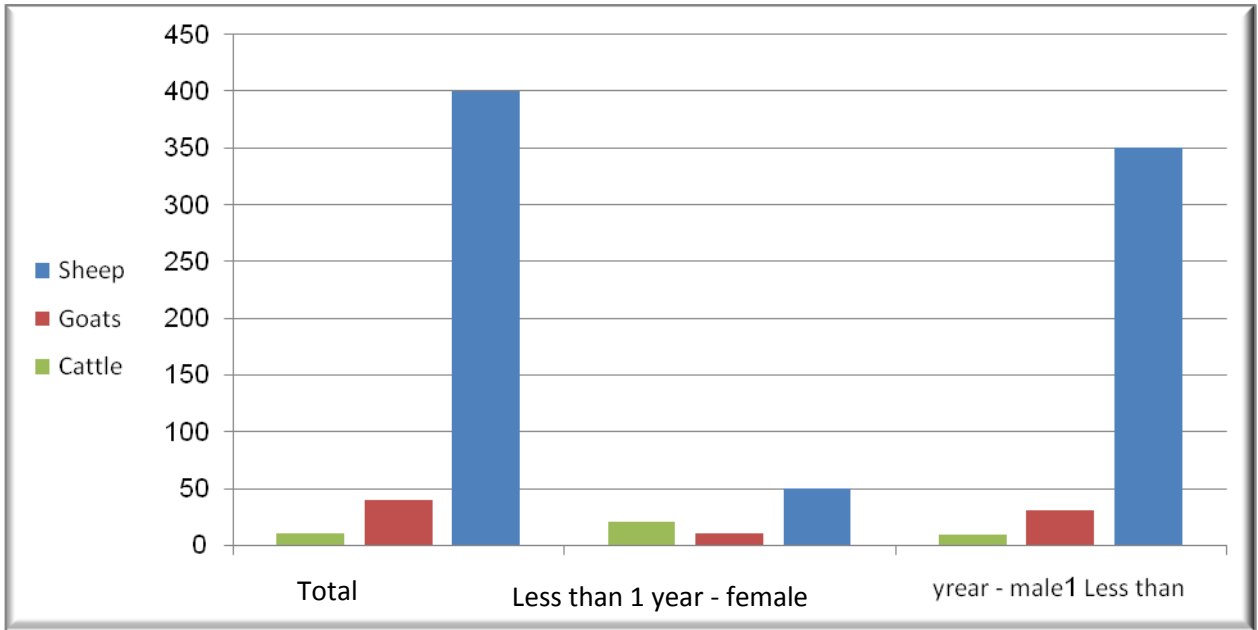


Fig. 2: The infection number of tenuicollosis in different age group for both sexes of slaughtered livestock.

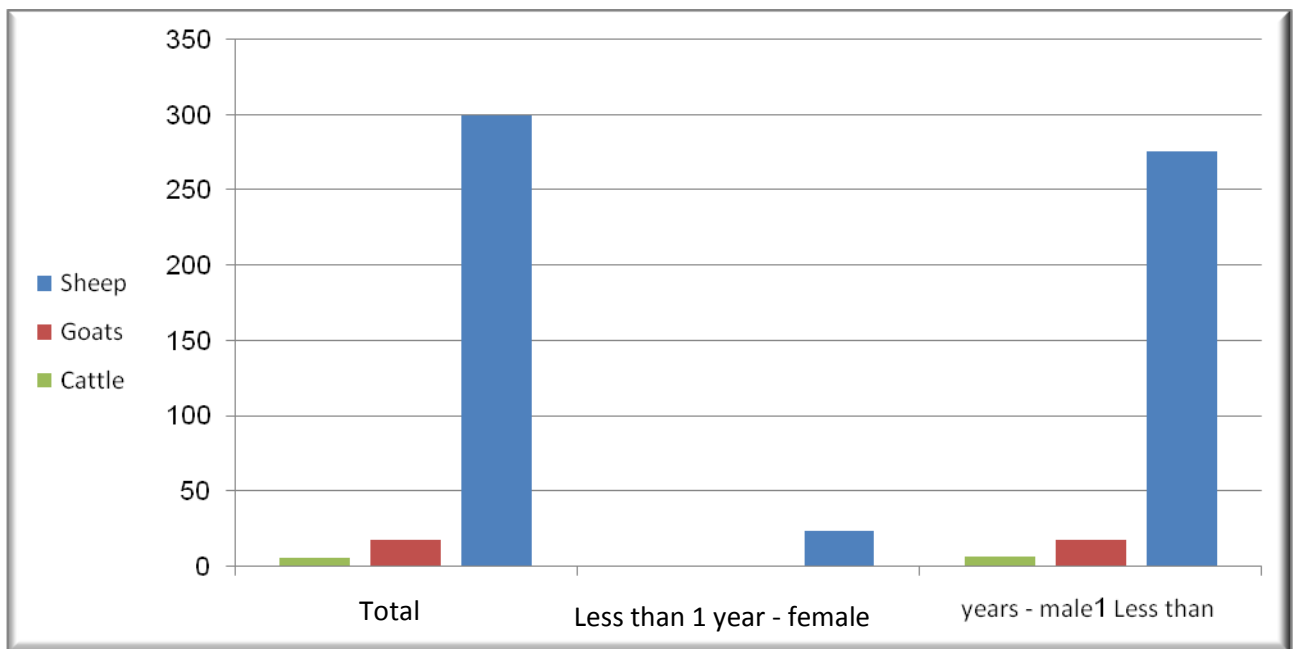


Fig. 3: The infection rates of tenuicollosis in different age group of both sexes of slaughtered livestock.

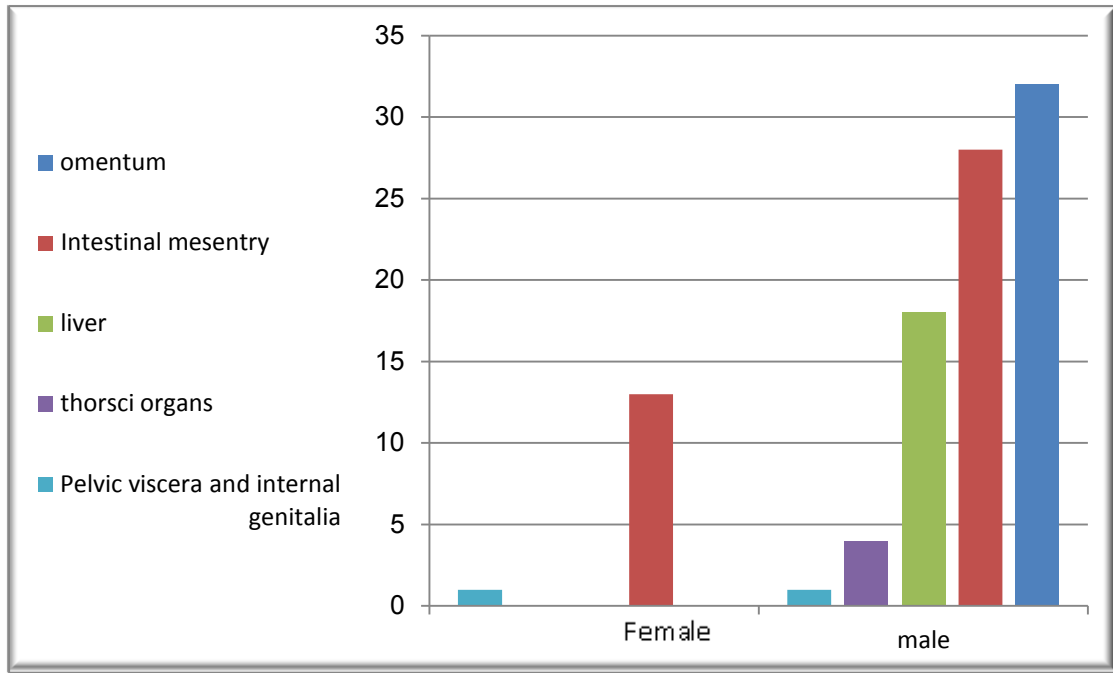


Fig.4: Presence of *C. tenuicollis* in different infected organs of slaughtered animals.

Table 1: Number, type, size and viability of detected cysts in infected animals.

Animal Species	Cyst		Types of cyst		Viability	
	Number	Size (cm)	Evaginated	Invaginated	Live	Dead
Sheep	1-4	2-7	<60%	-	<70	>1% caseated in liver
Goats	3-6	4-6	-	<60%	100%	-
Cattle	1	5	-	<65%	<70%	-



Fig. 5 *C. tenuicollis* in abdominal cavity of slaughtered sheep



Fig.6 *C. tenuicollis* in the mesentry of slaughtered sheep

#### 4. Discussion

In meat hygiene practice, tissue contracted with *C. tenuicollis* is rejected not due to zoonotic, pathological or religious clues but due to aesthetic basis, making the carcass or the infected edible offal's unfit for human consumption (Gracey *et al.*, 1999). Apart from the condemnation (Thompson and Lymbery, 1995), such metacestodes may cause death to lambs as reported early in young Russian sheep and goats (Orekhov, 1970). Comprehensive review of available literature indicated that the world wide infection rates of tenuicollosis are variable ranging from 0.2% in sheep and 0.3% of goats in Arusha- Tanzania (Mellau *et al.*, 2010) to 79% in sheep and 53% of goats in Eastern Ethiopia (Sissay *et al.*, 2007) or even more reaching 85% of sheep of Zaragoza province / Spain (Garcia – Marin and Peris – Palau, 1987). In some parts of the worlds, the infection rate is low e.g. 2% of goats and 2-5% of sheep as recorded by Goossens *et al.*, (1988) in Gambia, or even lower to be 1.9% of goats of Sultanate of Oman (Johson *et al.*, 1999). A rather low infection rates were reported in goats of Nigeria which were 8.3% (Folaranmi *et al.*, 1984) and 33.3% (Nwosu *et al.*, 1996) or 11.4-15.2% in Australian sheep (Broudbent, 1972) and 16.7% in the German sheep (Hasslinger and Weber – Werringhen, 1988). Moderate infection rates were recorded in Nigeria which were 34.2% in goats and 21.4% in sheep (Dada and Belino, 1978) or 37.03% of sheep and 27.29% of goats in India (Pathak and Gaur, 1982) or 23% in the small ruminants of Nigeria (Akinboade and Ajiboye, 1983). In the neighboring countries as Jordan, the earlier infection rates were 9.2% in sheep and 6.2% of goats (Dajani and Khalaf, 1981) or 12.87% of sheep

and 18.04 of goats in Iran (Radfar *et al.*, 2005). Studies in Turkey mentioned that the infection rates ranged between 12.13% to 56.7% (Senlik, 2008; Kara *et al.*, 2009). In our country, the infection rates of various regions between 1% in Basrah sheep (Al-Saqur and Al-Gorani, 1987) to 14.22% of sheep and 16.10% of goats slaughtered at Baghdad abattoir (Abass and Rahif, 1999), to 0.8% in sheep with absence of cyst's occurrence in both goats and cattle (Ghaffar, 2011). In Mosul, a previous abattoir survey revealed the infection rate of 15.41% in sheep and 1.03% in cattle (Al-Sultan *et al.*, 1999). It is clear that our findings were somewhat lower than in many countries. Such lower rates may be due to geographical, environmental, meteorological factors such as climate, soil properties, and relative humidity, season, and rainfall level which are crucial to the life cycle of the helminthes. Other factors play subsidiary but important roles like animal management, feeding habits and grazing pattern followed in the local pasture which ultimately decrease the infection rates. It was indicated that the male acquired more infection rates than the females which was similar to the findings of others (Abass and Rahif, 1999). Interestingly, several studies did not mention the sex of animals inspected at abattoirs. The difference in the infection rates between male and female may attributed to the fact that most males are slaughtered in young ages, while females are slaughtered older. Aged animals have more chances to pick up the eggs with subsequent possibility to acquire the infection. A Turkish study reported no significant difference between any sex groups of sheep (Senlik, 2008). Noticeably, local studies did not deal with various species of animals like goats and cattle (Ghaffar, 2011) or goats (Al-Sultan *et al.*, 1999) or cattle (Abass and Rahif, 1999). In this study, percentage of infected goats were more than sheep and cattle which were in discrepancy with the observations of Kara and Doganay (2005) when recorded that sheep is the particular ruminant contract with these cysts compared to other animals .

While, it was found that the omentum and mesentery is the commonest sites of cysts infection. This pattern and type of cyst occurrence and distribution were quite the same to many reports (Al-Sultan *et al.*, 1999; Abass and Rahif, 1999; Letkova *et al.*, 2008). However, similar observations were described by Radfar *et al.*, (2005). In addition to the "Classical" presence of the aforementioned cysts within the carcasses, a local study revealed the occurrence of these cysts, in the ovary, kidney, uterus and urinary bladders of the infected ewes slaughtered at Dohuk abattoir (Ghaffar, 2011). A Portuguese case report indicated freak and unusual location of the cyst which was within the choriollantoic membrane of seventy days pregnant ewe (Payan – Carrier *et al.*, 2008). However, such aberrant and atypical existence of the cysts is possible but not common which is rarely recorded in the literature. Numbers of the cysts were not well elucidated in the literature which ranged between 1-6 cysts. Such cyst numbers is possible in this type of parasitosis which was recorded earlier in many studies (Pathak and Gaur, 1982; Abass and Rahif, 1999). Measurements of the cysts were poorly studied which is between 2-7 cm in sheep, 4-6 cm in goats and 5 cm in cattle. In various studies, cyst diameters were recorded as 2.5-30 cm (AL-Sultan *et al.*, 1999; Abass and Rahif, 1999).

The results of cyst type indicate that high percent were evaginated in sheep and invaginated in goats and cattle. The findings were in accordance with the observations mentioned by Abass and Rahif, (1999) with sheep more than one year or ruminants younger than 12 months of age. It should be noted that the biological phenomena do not follow a

constant "proof", hence such differences are probable but acceptable. In this context, Jenson and Pierson, 1975 mentioned that *C.tenuicoliis* have the character of evagination. On the other hand, Soulsby (1982) stressed that such vesicles have invaginated scolices. In all inspected carcasses most of the cysts were alive on the basis of their viability test followed visual naked eye inspection. These observations were similarly noticed by others (Murai and Saquar, 1979; Gemmell and Lawson, 1985). In sheep both dead and live cysts were found within the same carcasses, resembled those of Abass and Rahif (1999). Such lesions can be described as dead metacestodes "larval stages" occur through their migration particularly in the liver of young herbivores namely the lambs (Gracey *et al.*, 1999).

## 5. Conclusions

Goats and cattle play important role in the spread of the disease due to their relatively high infection rates. However, sheep have secondary role in the dissemination and perpetuation of tenuicollosis. Careful condemnation of carcasses' offal's should properly carry out as well as control of stray dogs.

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