



Prevalence of *Linguatula serrata* Nymphs in Goats Slaughtered in Mashhad Slaughterhouse, Iran

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Abstract

Background: *Linguatula serrata* is a worm-like parasite which is usually well-known as the tongue worm and aberrant cosmopolitan zoonotic arthropod placed in the order *Pentastomida*. The carnivorous mammals, especially cats and dogs, are known as the final hosts of this parasite, and the adult step happens in the nasal sinuses and nasopharynx, while nymphal steps in ruminants as the main intermediate hosts can progress in several organs, mainly mesenteric and mediastinal lymph nodes. The aim of this study was to evaluate the prevalence of *L. serrata* nymphs in goats slaughtered in Mashhad slaughterhouse, Iran.

Methods: The prevalence of *L. serrata* nymphs in mediastinal and mesenteric lymph nodes (MLNs) of 400 slaughtered goats from different sexes and age groups were examined. To this end, the MLNs were longitudinally cut and microscopically evaluated for *L. serrata* nymphs. The goats were slaughtered in Mashhad slaughterhouse, Iran. The data were analyzed using SPSS software (version 16.0) and chi-square test was used for determining the significance of the differences. The *P* values less than 0.05 were considered statistically significant.

Results: As revealed by the results, the prevalence rate was 19%. The age had a noteworthy effect on the frequency rate of the mentioned parasite in the goats as was seen in 3-year old goats. A significant difference was observed in the infection frequency in two genera of male and female ($P < 0.05$).

Conclusions: Based on the results and zoonotic nature of studied parasite, preventive procedures should be considered to reduce the risk of transmission.

Keywords: *Linguatula serrata*, Mashhad, Tongue worm

Background

Linguatula serrata is a worm-like parasite which is usually well-known as the tongue worm and aberrant cosmopolitan zoonotic arthropod placed in the order *Pentastomida* (1). The carnivorous mammals, especially cats and dogs, are known as the final hosts of this parasite and the adult step happens in the nasal sinuses and nasopharynx, while nymphal steps in ruminants as the main intermediate hosts can progress in several organs, mainly mesenteric and mediastinal lymph nodes (MLNs) (2,3).

The nasopharyngeal secretions and feces of the final host contain infective eggs. Herbivorous animals swallow the feces containing infective eggs and the larvae migration happens to visceral organs. The Larvae can be infective to canine following six to nine molting (4).

The cases of human linguatulosis have been identified in different regions of the world, with higher prevalence in Africa, America, Middle East, and Southeast Asia

(1). Two forms of disease occur in human: one through ingesting the larvae which causes nasopharyngeal linguatulosis and is often identified as Halzoun syndrome or Marrara syndrome, and the other through ingesting the eggs present in the water or contaminated food which results in visceral linguatulosis (5-7).

Some preliminary work has been conducted on the incidence of infection with *L. serrata* in the animals including dogs (8,9), camels (2,10,11), buffaloes (9), sheep (9,12,13), and goats (13,14).

Objectives

We undertook this study to evaluate the prevalence of *L. serrata* nymphs in goats slaughtered in Mashhad slaughterhouse, Iran.

Materials and Methods

During a 6-month period from October 2012 to March 2013, a total of 400 goats (146 female and 254

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male) were randomly chosen from a slaughterhouse in Mashhad, Iran. The criterion for selection of goats was the eruption of permanent incisor teeth. After selection, the goats were assigned into four age groups (<1, 1–2, 2–3 and >3 years old). In the initial step, four mesenteric and MLNs from each animal were collected and then cut into small slices and immersed for 5–6 hours in the solution of normal saline (0.9% NaCl) in order to exclude the nymphs from the desired tissues. Afterward, recruited nymphs were flattened, dehydrated in ascending scores of ethyl alcohol, and cleaned in creosote for observing under a stereomicroscope. In the next step, 200 mL of digestion solution comprising 5 g pepsin and 25 mL hydrochloric acid in 1000 mL distilled water was used for digestion of negative samples. This solution was then incubated at 37°C for 24 hours (13, 14).

Statistical Analysis

Data were analyzed using SPSS software version 16.0 and chi-square test was used for determining the significance of the differences.

Results

Our results revealed that 76 out of 400 goats (19%) were infected with *L. serrata* nymphs. The occurrence of *L. serrata* nymphs in MLNs of goats for two sexes and four age groups during two seasons are represented in Tables 1 and 2.

The number of collected nymphs was different; from 1 to 30 from each infected lymph node. As many as 90 out of 254 males (35.4%) and 62 out of 146 females (44.2%) were positive for *L. serrata*. The infection percentage in MLNs was considerably greater than the infection frequency in MLNs (Table 2) ($P < 0.05$).

The infection prevalence rose in clear relation to the age ($P < 0.05$), and a significant difference was observed between 2 genera of male and female. Moreover, no significant difference could be observed in the infection rate between two seasons ($P > 0.05$).

Discussion

The prevalence of linguatulosus in goats has been determined in different parts of Iran. The prevalence has been described about 49.1% in Kerman, 29.9% in Shiraz, 0% in Shahrekord, and 68% in Urmia. The prevalence was also 28.9% and 37% in Jordan and Turkey, respectively (9,13-16).

In this study, an infection rate of 19% was detected in

goats which was higher than the infection rate reported by Oryan et al and Wahba et al (7.5% and 4.9%, respectively) (17,18). This infection rate was also less than the rates found by Tajik et al and Pourjafar et al which were 75% and 35%, respectively (19,20). Such difference in infection rates undoubtedly shows a remarkable difference in dissemination of the parasite in different parts of Iran.

Our findings showed a high infection rate of MLNs in goats (19%), selected from this particular part of the country. Most studies have reported that MLNs are the first residence of *L. serrata*. The infection of MLNs with *L. serrata* was mainly because of its position in the route of portal circulation and being infected as the first scene before the liver and other viscera (1,21).

Accordingly, likelihood of infection of MLNs is greater than that of other visceral organs (2,22). The ratio of such occurrence is considered as a chief risk factor for infection in human in this specific site. Some cases of Halzoun syndrome were previously reported in humans from Iran where linguatuliasis is endemic (23-29).

Furthermore, the frequency of infection in female goats was meaningfully ($P < 0.05$) higher than that in male goats. Similar findings were obtained by Nourollahi Fard et al in Kerman and Isfahan provinces of Iran (30). The dissimilarity in infection ratio in genders may be attributed to higher mean age of females than that of males at the time of slaughter.

Moreover, the infection proportion rose in relation with age ($P < 0.05$). This increase in infection rate can be explained by duration of nymph development which takes about 5–6 months and is related to the lesser occurrence in younger groups. The frequency of *L. serrata* nymphs in two seasons was not significantly different ($P < 0.05$).

Generally, Mashhad is considered as an endemic city for linguatuliasis in goats whose meat (mutton) is used as a rich resource of protein in many parts of Iran. Furthermore, the risk of transmission to human can be as high as the infection rate in goats, if the meat or visceral products are consumed raw or semi-cooked. The mentioned prevalence shows the life cycle of this parasite during which it is active in this region; therefore, the

Table 2. MLN Infections in Goats

Infection type	Samples	Infection Rate	Positive
Mesenteric lymph nodes	400	19%	76
Mediastinal lymph nodes	400	7.75%	31

Table 1. Prevalence of *Linguatula serrata* Nymphs in Goats

	Age (y)				Gender	Season	
	<1	1-2	2-3	>3	Male	Winter	Autumn
No. of goats	168	106	82	44	254	200	200
No. of infected goats	90(11.9)	90(16)	18(21.9)	11 (25)	90(35.4)	35(17.5)	41(20.5)

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infected final hosts are too numerous. Goats are a group of herbivorous animals; regarding this, further studies on other ruminants in Mashhad are highly recommended.

Conclusions

Based on the results and zoonotic nature of studied parasite, the preventive procedures should be considered to decrease the risk of transmission.

Conflict of interests

None.

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