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Parasitic helminth infections in native sheep (*Mehraban*) in Hamedan, Iran

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ABSTRACT

Sheep play an important role in national economy and social economy in rural areas in Iran. The main goal of this study was to investigate the fauna and frequency of parasitic helminth infections prevalent in native sheep in Hamedan, western Iran. From April 2010 to March 2011, the gastrointestinal and respiratory tracts of 100-sheep were examined using conventional parasitological methods. The overall infection rate was found as 69%. No infection was found in esophagus and rumens. *Parabronema skerjabini* (22%) and *Ostertagia circumcincta* (1%) were recorded as the maximum and minimum cases for the presence of nematode, respectively. On the other hand, the most dominant of trematode and cestode were *Fasciola hepatica* (13%) and *Monezia expansa* (13%), respectively. The highest infection rate was reported in summer (84%). The prevalence of helminth infection was varied among gender, seasons and age groups. In conclusion, this is the first report of parasitic helminth infections in sheep in Hamedan province in western Iran. Our results provide baseline information for the future studies.

Keywords

Hamedan, *Mehraban*, Parasitic helminth, Sheep

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INTRODUCTION

Sheep are proper hosts for numerous species of helminth parasites (Firouzivand et al., 2009; Lone et al., 2012). Gastrointestinal helminth parasites are considered as a one of major reasons of suboptimal productivity, economic loss, immunosuppression, causing disease and mortality of sheep worldwide (Sissay et al., 2006; Pedreira et al., 2006; Odoi and Musisi, 2007; Bersissa et al., 2011).

In ruminant, the liver and lungs are damaged, condemned and the subclinical and chronic disease usually leads to decrease production of meat, milk and wool, secondary bacterial infections, fertility problems and great expenses with anthelmintics (Daryani et al., 2006).

Ostertagia (*Teladorsagia*) *circumcincta*, *Haemonchus contortus*, *Trichostrongylus* spp. and *Nematodirus battus* are the most significant nematode species which act as a production-limiting factor of sheep in temperate climates (Soulsby, 1986). This is noteworthy that *H. contortus* is the most important species in young animals causing severe anemia (Soulsby, 1986; Zajac, 2006).

Small domesticated ruminants particularly sheep is considered as a prominent source of protein in Iran. Since sheep farming is utilized conventionally in many parts of Iran, animals feeding on pastures are frequently affected with parasitic infection. Several previous investigations have been conducted in different regions of Iran, and revealed the involvement of several species of parasitic helminthes on sheep (Naem and Sargazi, 1997; Daryani et al., 2006; Moghaddar and Afrahi, 2008; Firouzivand et al., 2009; Naem and Gorgani, 2011). However, there is no published data on parasitic helminth infection in sheep in Hamedan province. The main goal of this study was to investigate the fauna and frequency of parasitic

helminth infections in native sheep in Hamedan, western Iran.

MATERIALS AND METHODS

Study area: Hamedan province (west part of Iran, 34.77°N and 48.58°E) is considered as one of major centers of sheep breeding in Iran. The *Mehraban* is a native sheep breed in this area. Mean annual rainfall and temperature in this area is 317.7 mm and 11.3°C, respectively.

Sample collection and examination: In a cross-sectional study, from April 2010 to March 2011, a number of 100-native sheep were sampled from abbatoir of Hamedan. Age groups (<2, 2-3 and >3-year old) and gender of animals were recorded during sampling. The anatomic boundaries among gastro-intestinal compartments were ligated and transported to laboratory. The samples were opened longitudinally and observed macroscopically. For *Gongylonema* spp. isolation, esophagus was placed on a glass plate, fixed in a flattened position, then put in pepsin-acid solution and incubated at 37°C for 24 h (Sissay et al., 2006). Nematodes were removed and fixed in AFA (Alcohol, Formaldehyde, Acetic acid, Distilled water and Glycerine) solution, as reported by Sissay et al. (2006). The nematodes were cleared in lactophenol (Odoi and Musisi, 2007). Cestodes and trematodes were collected from liver and small intestine, washed with physiological saline and stained with carmine acid (Naem and Gorgani, 2011). All the worms were identified using diagnostic keys (Soulsby, 1986).

Statistical analysis: Statistical analyses were performed by using the software package SPSS version 16.0 for Windows. The differences among age groups, seasons and genders were evaluated by Chi-square and Fisher's exact tests. A *p*-value of less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Overall infection rate was found as 69% (95% CI: ±9). No helminth infection was found in esophagus and rumens. *Parabronema skerjabini* (22%) and *Ostertagia circumcincta* (1%) were the maximum and minimum cases of nematode infection, respectively. The most prevalent trematode and cestode were *Fasciola hepatica* (13%) and *Monezia expansa* (13%), respectively. The highest infection rate was reported in summer (84%) (**Table 1, 2**). The association between infections and seasons were not statistically significant ($p>0.05$), except in spring and winter ($\chi^2=4.367$, $p=0.037$).

In previous studies, there was different prevalence rate of parasitic helminth infection in Iran (6.8-82%) and other countries (2.3-86%) (Wajdi and Nassir, 1983; Daryani et al., 2006; Firouzivand et al., 2009; Rasouli et al., 2010). A variety of factors such as animals' age, gender, breeding status, grazing habits, level of education and economic capacity of farmers, standard of management and anthelminthic used were identified as the major causes of variation of results (Nematollahi and Moghaddam, 2009; Bersissa et al., 2011).

In the present survey, the highest and lowest prevalent parasites were *P. skerjabini* (22%) and *O. circumcincta* (1%), respectively. On the other hand, the highest and lowest range of infection were related to *Dicrocoelium dendriticum* (n=131) and *Avitellina centripunctata* (n=1), respectively. Among different organs, abomasum revealed the most infection rate (**Table 2**).

In our study, the infection rate of *P. skerjabini* was 22%; unlike to other researchers (zero to 3.7%) (Meshgi et al., 2006; Bahadory et al., 2007; Bana and Sultana, 2009; Chalechale and Karimi, 2010; Sultan et al., 2010; Naem and Gorgani, 2011; Lone et al., 2012). In this study, *Haemonchus contortus* infection was determined as 3%. This result is similar to the study in Pakistan and lower than other regions (Bahadori et al., 2007; Bana and Sultana, 2009; Sultan et al., 2010; Naem and Gorgani, 2011; Lone et al., 2012). *H. contortus* is the most important nematode of abomasum, causing severe anemia in sheep (Soulsby, 1986; Zajac, 2006).

Trichuris ovis (13%) was mostly prevalent in large intestine; similar to some studies in Iran and other countries (Meshgi et al., 2006; Chalechale and Karimi, 2010; Rasouli et al., 2010; Radfar et al., 2011; Tavassoli et al., 2011; Lone et al., 2012). The life cycle of *T. ovis* is direct and may be pathogenic in severe cases of contamination (Rasouli et al., 2010).

In the ruminants, pulmonary worms are the most prevalent cause of Bronchopneumonia (Soulsby, 1986; Nematollahi and Moghaddam, 2009). In our study, only *Dictyocaulus fillaria* (9%) was observed in respiratory system. Some studies showed that prevalence of *D. fillaria* was higher than other lung worms; due to direct life cycle·s (Bahadori et al., 2007; Nematollahi and Moghaddam, 2009; Bersissa et al., 2011; Hashemi et al., 2011). In the study conducted by Nematollahi and Moghaddam (2009) in Tabriz (Northwest of Iran), *D. fillaria* (34%), *Protostrongylus rufescens* (11%) and *Cystocaulus ocreatus* (32%) were isolated. The difference in optimal conditions for life of

Table 1: The infection rate of animals in different age groups, gender and seasons.

Season	Number of sample (positive%)				
	Gender		Age groups (year)		
	Male	Female	<2	2-3	>3
Spring	16(56.2)	9(44.4)	4(75)	9(33.3)	12(58.3)
Summer	12(83.3)	13(84.4)	6(66.7)	13(100)	6(66.7)
Autumn	14(57.1)	11(63.7)	3(0)	10(70)	12(66.7)
Winter	12(91.7)	13(69.2)	4(25)	8(75)	13(100)
Total	54(70.4)	46(67.4)	17(47)	40(72.5)	43(74.4)

intermediate hosts were the most variation result in regions. The infection rate of lung worms in autumn and winter were higher than other seasons (Soulsby, 1986; Nematollahi and Moghaddam, 2009; Hashemi et al., 2011); this was in agreement to our findings.

Liver flukes are common parasites of ruminants in most countries of Middle East, such as Iran (Talari et al., 2011). In our study, *F. hepatica* infection rate (13%) was similar to the studies conducted in northern Iran and Iarq (Wajdi and Nassir, 1983; Talari et al., 2011). Also, infection rate of *D. dendriticum* (8%) was higher than other regions (Daryani et al., 2006; Murat et al., 2009; Sultan et al., 2010; Radfar et al., 2011).

In the most of investigations, infection rate of *F. hepatica* was higher than *D. dendriticum*. It might be due to resistance of anthelminthic agent by *D. dendriticum*; also, the life cycle of *D. dendriticum* is complex than *F. hepatica* (Talari et al., 2011; Lone et al., 2012). *F. hepatica* infection rate in summer and winter were higher than other seasons; because the frequency of intermediate hosts (*Lymnaeidae*) was very high in spring and autumn. Infection rate of liver trematodes in traditional breeding animals was higher than commercial methods (Daryani et al., 2006). Study on geographic distribution, fauna and frequency rate of snails is necessary for control of liver flukes in animals and man.

In our study, we could not find paramphistomes infection, similar to other studies; this may be attributed to the excessive usage of fasciolicidal drugs by farmers (Murat et al., 2009). *Monezia expansa* (13%) was the most dominant cestodes in animals; this agreed with the reports of other researchers (Saleh and Rahman, 2008; Sultan et al., 2010; Bersissa et al., 2011; Naem and Gorgani, 2011). Shazly et al. (2004) reported the first zoonotic *M. expansa* in a 15-year old male in Egypt. The boy acquired the zoonotic monieziasis by accidental ingestion of an infective oribatid mite while eating his food on the ground in the farm guarding the sheep.

Hydatiosis in animals and man is an important disease in Iran and neighboring countries (Bahadori et al., 2007; Chalechale and Karimi, 2010; Talari et al., 2011). In our study, Hydatid cyst infection rate of liver (4%) was higher than lungs (3%), similar to the study conducted by Murat et al. (2009) in Turkey. The sheep had an important role in the life cycle of parasite, and public health (Soulsby, 1986). Design of eradication programs for cystic echinococcosis and control programs for stray dogs is highly recommended.

In this study, the infection rate between male (70.4%) and female (67.4%) animals was not statistically significant (Table 1; $\chi 2$=0.107, *df*=1, *p*=0.748), similar to other investigations of Bana and Sultana (2009) and Murat et al. (2009).

Regarding to age groups, infection rate was reported as 47% in <2-yr, 72.5% in 2-3-yr, and 74.4% in >3-yr old ($\chi 2$=0.044, *df*=2, *p*=0.978) (**Table 1**). According to results of Lone et al. (2012) in Keshmir, the most infected age group was ≤1-yr (*p*=0.002). In the study of Murat et al. (2009) conducted in Turkey, age group of 1-5-yr was highly prevalent (*p*<0.05). The low level of parasitism in adult animals might be due to the immunity of hosts (Naem and Gorgani, 2011). Previous infection and age of hosts provide effective protection against reinfection (Soulsby, 1986).

The most rate of seasonal infection was observed in summer (84%) followed winter (80%), autumn (60%) and spring (52%). *P. skerjabini*, *M. expansa*, *F. hepatica* and *D. dendriticum* were extracted in each season. The association between infections and seasons were not statistically significant (*p*>0.05), except in spring and winter (*p*=0.037) (**Table 1, 2**). In a study conducted by Radfar et al. (2011), prevalence of infection during autumn and winter were significantly higher than summer (*p*<0.05). In the study of Bana and Sultana (2009), the incidence was highest in rainy season and lowest in winter, and moderate infection was reported during spring and summer seasons (*p*<0.05). Also, in

Table 2: The fauna and frequency of parasitic helminth infection rate of animals (NP=number of positive, P=positive, Min= minimum range of infection, Max= maximum range of infection).

Location	Species NP(P%)	Seasons				Total NP(Min-Max)
		Spring	Summer	Autumn	Winter	
Abomasum	*T. axei*	0(0)	1(4)	0(0)	1(4)	2(1-2)
	O. circumcincta	1(4)	0(0)	0(0)	0(0)	1(3)
	O. occidentalis	1(4)	3(12)	0(0)	0(0)	4(6-11)
	H. contortus	1(4)	2(8)	0(0)	0(0)	3(2-7)
	P. skerjabini	3(12)	8(32)	6(24)	5(20)	22(2-47)
Small intestine	*T. capricola*	2(8)	3(12)	2(8)	0(0)	7(3-28)
	N. helvitianus	2(8)	4(16)	0(0)	0(0)	6(2-5)
	N. abnormalis	1(4)	3(12)	0(0)	2(8)	6(5-14)
	H. giardi	1(4)	2(8)	0(0)	3(12)	6(1-2)
	A. centripunctata	0(0)	2(8)	0(0)	0(0)	2(1)
	M. expansa	4(16)	4(16)	3(12)	2(8)	13(1-4)
	M. benedeni	2(8)	0(0)	1(4)	1(4)	4(1-3)
Large intestine	*O. venolosum*	2(8)	3(12)	0(0)	0(0)	5(3-11)
	C. ovina	0(0)	1(4)	0(0)	2(8)	3(2-7)
	S. ovis	6(24)	0(0)	0(0)	2(8)	8(1-25)
	T. ovis	0(0)	2(8)	4(16)	7(28)	13(3-27)
Liver	*F. hepatica*	1(4)	6(24)	2(8)	4(16)	13(3-18)
	D. dendriticum	1(4)	3(12)	1(4)	3(12)	8(3-131)
	Hydatid cyst	0(0)	2(8)	1(4)	1(4)	4(3-8)
Lungs	*D. filaria*	2(8)	0(0)	1(4)	6(24)	9(1-22)
	Hydatid cyst	0(0)	1(4)	0(0)	2(8)	3(2-5)
Total		**13(52)**	**21(84)**	**15(60)**	**20(80)**	**69(1-131)**

some other reported helminthes infection were not statistically significant (p>0.05) except *D. dendriticum* (Daryani et al., 2006; Bersissa et al., 2011). Environmental conditions are usually favorable for development, survival and translocation of pre-parasitic stages of parasitic nematodes during the rainy season. High rainfall in spring helps in providing suitable molaring of salt present in soil, which is an important factor for ecdysis (Lone et al., 2012).

CONCLUSION

The present observation initially is of great importance to understand the epidemiology of parasitic helminthes in sheep in Hamedan province in Iran. Also, it will certainly be of potentially significant in planning pasture and grazing management and other prophylactic strategies for sheep. This study is the first report of parasitic infections in native sheep in Hamedan, western Iran.

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