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Short Communication

Helminth Parasites of Wild Boars, *Sus scrofa*, in Bushehr Province, Southwestern Iran

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Abstract

Background: Wild boars, *Sus scrofa*, of wide distribution considered as a potential source of zoonotic parasites. The current study aimed to assess the prevalence of helminth infections in wild boars in the Persian Gulf coastal area (Bushehr Province), Southwestern Iran.

Methods: Twenty-five wild boars, including 11 males and 14 females, were collected during a course of vertebrate pest control in the Bushehr Province, southwestern Iran in 2013. The specimen were immediately dissected and carefully searched for the parasites. During necropsy, each organ was examined macroscopically for presence of any helminthic agents. Tissue samples were taken from each organ. Moreover, samples were taken from the content of digestive system. Blood samples were also collected from each boar. All the samples were evaluated for helminth infections by parasitological methods.

Results: Twenty-two (88%) of the wild boars were infected with at least one helminth. Out of 25 wild boars, 1 (4%) were infected with *Cysticercus tenuicollis*, the larval stage of *Taenia hydatigena*, 13 (52%) with *Macracanthorhynchus hirudinaceus*, 17 (68%) with *Metastrongylus* spp, and 20 (80%) with *Ascarops* spp. Hydatid cyst was detected in the lung of one of the wild boars. No *Trichinella* spp. larvae were detected in any of the tissues of the animals when evaluated by artificial digestion method. In addition, no contamination with microfilaria was detected in any of animals when the blood samples were tested with Knott's method.

Conclusion: Wild boars are contaminated by some helminthes including zoonotic ones. These animals could be involved in the epidemiology of zoonotic helminth by acting as reservoir hosts. This in turn may bring potential risk for locals and residents of the Bushehr Province, Southwestern Iran.

Introduction

Wild boars, *Sus scrofa*, have wide distribution all-around the world. This species of wild boars live in condensed populations in south and southwest, north and northeast forests of Iran. Wild boar as omnivores consume everything including vegetables, mushrooms, seeds, larvae, reptiles, mammals, birds and their eggs and even carrion and corpses of animals. Hence, they are considered as vertebrate pests in agricultural fields, which can cause significant damage to plants. Moreover, they are considered as potential source of zoonotic parasites.

Wild boars could have an important role in the epidemiology of several zoonotic helminthes by acting as reservoir hosts and maintaining the helminthes in sylvatic cycles of the parasite, regardless of the domestic cycles. These animals may be a potential risk of transmission of zoonotic helminthes to the people living in rural communities, where wild boars are freely roaming around the villages. Wild boars could be infected with a variety of zoonotic helminthes and protozoan (1-4). In Iran, a few studies reported the infection of wild boars with protozoan and helminthes in different part of the country (1, 5). Eslami et al., reported sixteen species of helminthes, including ten nematodes, two trematodes, one acanthocephalan and two larval of cestodes in wild boars in north, northeast and southwest of the country (5). Solaymani-Mohammadi et al., reported seven species of helminthes in wild boars in Lorestan Province, western of Iran (6). Mowlavi et al., in Khuzestan Province documented the prevalence rate of 64% for *Macracanthorhynchus hirudinaceus* infection in wild boars in cane sugar fields (7).

The current study aimed to assess the prevalence of helminth infections in wild boars in Persian Gulf coastal area (Bushehr Province), Southwestern Iran. The study was justified by the lack of information on the prevalence of helminth infections in these animals in this area.

Materials and Methods:

Study area

The study was conducted in Bushehr Province, Southwestern Iran. Bushehr is a coastal province with nine counties, which has a long coastline onto the Persian Gulf. With a coastal weather, average annual temperature of province is about 24° C, ranges from 6 in winter up to 50° C in the summer. Highland nature in northern part of this province makes this province to be a suitable habitat for wild boars and other wild animals. International joint projects and natural attractions have changed the region to a touristic area with numerous travelers annually, which can be itself considered as a public health threat in this issue.

Sample collection

After getting approval from the Ethics Committee of Shiraz University of Medical Sciences, Shiraz, Iran, twenty-five wild boars, including 11 males and 14 females, were collected from Deylam district in Bushehr Province, in 2013. During sampling of each boar, data related to age of animals (based on tooth shape and development) and sex were recorded. Right after sample collection, blood samples were collected from each boar and blood smears were prepared for evaluation of microfilaria.

During necropsy, each organ was examined macroscopically for presence of any cyst or visible parasite (5). The thoracic and abdominal viscera were detached and placed in a separate container. The esophagus was separated from the intestinal tract, sliced longitudinally and examined for any helminth infection. The rest of intestinal tract, stomach, small intestine and large intestine were also removed and their contents were sieved through a 100 (100 springs in 1/5 CM length) sieve, while washing with tap water. Mucosa of digestive tract was carefully examined for

helminthes, which may be buried in the mucosal layer. Muscles and subcutaneous tissues were examined for helminth larva. Other organs, including spleen, liver, gall bladder, heart, kidney and urinary bladder were also examined for the presence of any cyst or helminthes (5-8).

All isolated worms were placed in appropriate fixatives (*Taenia* larvae in 96% ethanol, nematodes in 70% ethanol containing 5% glycerin and acanthocephalan in AFL; Alcohol-Formalin-Acetic acid) after relaxation in warm water (63° C, for about 6 h) (5). Isolated helminthes were studied after clearing with lacto-phenol or staining with alum carmine, cleared and stained by FAAL solution (formaldehyde, pure ethyl alcohol, azocarmine, lactophenol) or polyvinyl alcohol (PVA).

Digestion method was used for detection of *Trichinella* larvae in the muscles. Moreover, pathological sections was prepared from the tongue and diaphragm muscle and stained with Hematoxylin eosin (HE). EDTA-contained blood samples were evaluated by Knott's technique for detection of microfilaria.

Results

The overall rate of helminthic infection in the wild boars was 22 (88%). Out of 25 wild boars, 1 (4%) were infected with *Cysticercus tenuicollis*, the larval stage of *Taenia hydatigena*, 13 (52%) with *M. hirudinaceus*, 17 (68%) with *Metastrongylus* spp, and 20 (80%) with *Ascarops* spp. Fig. 1 and 2 show the features of *Metastrongylus* and *Ascarops* adult worms isolated from the wild boars.

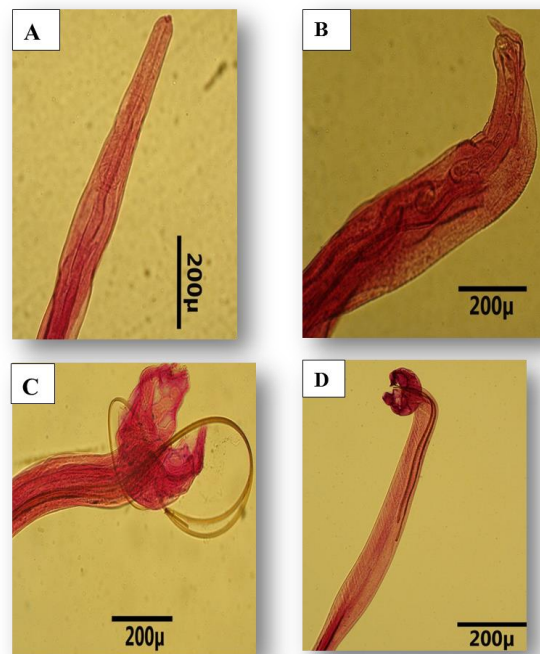


Fig. 1: Features of *Metastrongylus* isolated from the wild boars in southwestern Iran. A: Posterior end of female's worm; B: Anterior part of the worm; C: Posterior part of male's worm showing copulatory bursa; D: posterior part of male's worm showing the equal size spicules

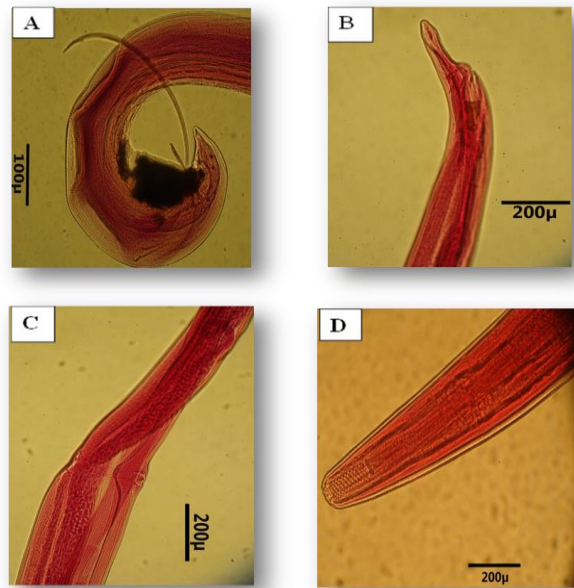


Fig. 2: Features of *Ascarops* spp. isolated from the wild boars in southwestern Iran. A: Posterior end of male's worm showing unequal spicules; B: Posterior part of female's worm; C: Middle part of the body of female's worm, showing vulva; D: Anterior part of the worm

The most contaminated tissues of the wild boars were lung with 17 (68%) infection. *Ascarops* spp. was seen in stomach (52%), esophagus (20%) and large intestine (8%) of the animals. No significant correlation was found between sex and helminth infection of the animals. Evaluation of the prevalence of worm infection in different age groups revealed that *Metastrongylus* spp. and *Ascarops* spp. are more common in adult than juvenile wild boars. However, differences of helminth infection between the different age group was not statistically significant ($P>0.05$).

Twenty-two (88%) of the wild boars were infected with at least one helminth. Mixed infections with *Ascarops* and *Metastrongylus* was

seen in 14 (56%) of the animals. In one case (4%) multiple infections with *Ascarops*, *Metastrongylus* and *Cysticercus tenuicollis* was observed. The lung of one of the wild boar was seen infected by hydatid cyst, initially characterized at the molecular level and reported earlier (9). No trematodes were detected in any of the studied boars. Moreover, no *Trichinella* spp. larvae were detected in any of the tissues of the animals, when evaluated by artificial digestion method. In addition, no contamination with microfilaria was detected in any of animals when the blood samples were tested with Knott's method. Table 1 listed the data related to the prevalence of worm infections in studied animals.

Table 1: Prevalence of helminth infections in wild boars in southwest of Iran, based on sex and age

Helminth infection	Sex		Age status	
	Female n (Prevalence %)	Male n (Prevalence %)	Juvenile n (Prevalence %)	Adult n (Prevalence %)
<i>Metastrongylus</i> spp.	1 (7.1)	1 (9.1)	1 (6.25)	1 (11.1)
<i>Ascarops</i> spp.	4 (28.6)	1 (9.1)	3 (18.75)	1 (11.1)
<i>Macracanthorhynchus hirudinaceus</i>	7 (50)	6 (54.5)	8 (50)	5 (55.5)
No infection	0	3 (27.3)	3 (18.75)	0
Total	14	11	16	9

Discussion

Wild boars *Sus scrofa* have widespread distribution in all over the continents and live in dense population in different parts of Iran. These animals are considered as potential reservoirs of few zoonotic diseases. The current study aimed to evaluate the helminthic infection of wild boars in Bushehr Province. Two nematodes, *Metastrongylus* spp and *Ascarops* spp were the most prevalent helminth infections of wild boars in this study. With stomach as the most infected organ, *Ascarops* spp was seen in other two parts of intestinal tract, intestine and esophagus. This indicates that *Ascarops* migrates through different parts of the gastrointestinal system. Other studies including in Iran, Japan, Turkey, and Spain reported this helminth merely in the stomach (3-5, 10). These are somewhat contrary to our findings.

A study on wild boars from a commercial breeding facility in southern Brazil documented the infection of these animals with *Ascaris suum*, *Trichostrongylus colubriformis*, *Oesophagostomum dentatum* and *Trichuris suis* (11). The prevalence infection of *Metastrongylus* spp in wild boars was high (68%) in our study. Perhaps that is expected since wild boars eat various species of inchworm, cockroaches, dung and beetles and these creatures act as intermediate host for this helminth. Infections with other nematodes were not seen in wild boars in this study. Diverse diet habits of *S. scrofa* in various seasons in the year may be accounted in this issue. Therefore, sampling of animals in all of four seasons may increase the chance of detecting other nematodes in these animals. One of the important helminthic infections in swine, reservoir hosts, is *Trichinella*. Study of Kia et al., detected *Trichinella* spp in muscle tissue of a boar in Gilan Province (12). In Turkey, all of analyzed muscle samples with artificial digestion test and trichinostomy were negative for *Trichinella* larvae (4). In a previous study of helminthic infections of wild boars in

western Iran, no case of *Trichinella* infection was detected in any of the animals (6).

Meanwhile, infection of wild boars with *T. hydatigena* larvae was detected in the current study. The real importance of *T. hydatigena* larvae is economic damages due to larvae in young ruminants; especially sheep. This is a common helminth in dogs and cats in Iran (13, 14). Study of Imampour et al., in stray dogs in the northeast of Iran revealed *T. hydatigena* infection in 43 % of cases (11). Another study in the same region reported a prevalence of 1.92% for *T. hydatigena* in stray cats (10). In our study, no trematoda infection was detected in any of the studied boars. Infection with *Dicrocoelium dendriticum* has been previously reported in a hunted wild boar from Talesh in North of Iran (15).

Conclusion

Taken together, findings of this study revealed that wild boars in Bushehr Province are contaminated with many zoonotic helminthes, which may bring potential risk for locals and residents of the area. Health authorities ought to consider the role of these animals in the epidemiology of zoonotic helminthes is Bushehr Province and in other geographical areas with similar environmental condition.

Acknowledgements

The authors declare that there is no conflict of interests.

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