Original Article

Endoparasites of Wild Rodents in Southeastern Iran

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Abstract

Background: This study was aimed to collect wild rodents for endoparasites determination in some parts of Sistan and Baluchistan Province, southeastern Iran nearby Pakistan and Afghanistan countries.
Methods: A total of 100 wild rodents were captured alive with cage traps. Various samples were collected from blood and feces, also impression smear prepared from different organs. The samples were prepared by formalin-ether or stained with Giemsa, after that were examined under microscope.
Results: All the caught rodents (47 *Tatera indica*, 44 *Meriones hurriana*, 5 *Gerbilus nanus* and 4 *Meriones libycus*) were studied for endoparasites emphasizing to their zoonotic aspects. Endoparasites including Spirurida, *Hymenolepis diminuta*, *Hymenolepis nana feraterna*, *Trichuris trichiura*, *Skerjabino taenia*, *Trichostrongylus* spp, *Entamoeba muris*, *Chilomastix mesnili* and *Leishmania* spp were parasitologically identified.
Conclusion: Among 9 genera or species of the identified parasites at least 5 of them have zoonotic and public health importance.

Keywords: Wild rodent, Endoparasite, Iran

Introduction

Many infectious diseases classified as zoonotic infections can be caused by parasitic, viral and bacterial agents transmitted to human by different types of animals such as rodents (Etemad 1978, Weiss et al. 2008). Ectoparasites such as fleas, lice and ticks can also transmit some infectious agents from rodents to human (Daniels and Hutchings 2001). Meerburg et al. (2009) showed a large spectrum of rodent borne pathogens. Helminth parasites are a large group of metazoan organisms that infect vast numbers of human and livestock (Anthony 2007). Similarly, some protozoan zoonoses such as *Toxoplasma* and *Leishmania* can also affect human and become malignant for those who are positive HIV (Alvar et al. 2008, Naqi et al. 2010).

Metazoan and protozoan zoonoses are responsible for a large number of morbidity and mortality of human around the world (Chai et al. 2005) and induce significant public health and socioeconomic problems.

This study was conducted to collect some informative data about the rodents and relevant parasites in some parts of Sistan and Baluchistan Province in Iran with emphasis on finding worms and protozoan parasites which have medical importance to human.

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Materials and Methods

Study areas

The study was performed at the Iranshahr and Nikshahr districts in Sistan and Baluchistan Province, southeastern Iran (Fig. 1). The weather in the districts is hot and dry in summer with usual maximum temperature of 45 ºC but temperate and low humid in winter with usual minimum temperature of 15 ºC. Six sites in each district nearby the inhabitant locations along the rodent's routes were randomly selected for trapping.

Rodent collection

A total of 100 rodents were captured alive with cage traps. The traps were collected and transfered to Iranshahr Health Research Station. Tail punctured and thin blood smears were made from all of the rodents and then the animals were anesthetized under chloroform inhalation for careful dissection and preparing impression smears of spleen, liver and lungs. One smear also was made from any papilla on the surface of ears. The smears were stained with Giemsa stain diluted in natural distilled water up to 3% for 30 min. Spots that prepared from dissected brains were also stained as the same method and precisely observed by light microscope with magnification of 1000.

Some amounts of the gastrointestinal tract content were collected for gastrointestinal parasites examination. Ether-chloroform method was applied to identify parasites. Both protozoan and helminthes parasites isolated as well as the rodents were distinguished by skilled persons using a number of valid references (Khalil and Jones 1994, David et al. 2004, Jones et al. 2004, Rodney et al. 2008).

Results

Four species of rodents including *Tatera indica* (47%), *Meriones hurrianae* (44%), *Gerbilus nanus* (5%) and *M. libycus* (4%) were identified. Classification of the animals was performed according to family (*Cricetidae*), subfamily (Gerbillinae), genus (*Tatera*, *Meriones*, *Gerbilus*) and species. The maximum and minimum quantities belong to *T. indica* 47(47%) and *M. libycus* 4(4%) respectively (Table 1).

The microscopic examination of gastrointestinal tract contents revealed the presence of *Spirurida* spp. and *Trichostrongylus* eggs in seven and two *T. indica* respectively. The rest helminthes isolated including *Hymenolepis diminuta, H. nana feraterna, Trichuris trichiura, Skerjabino taenia* and *Rictularia* were found in adult stages. Moreover protozoan parasites, *Entamoeba muris* and *Chilomastix mesnili* were isolated from the feces. In one case of liver tissue *Leishmania* spp., was identified (Table 2).

Table 1. Distribution of wild rodents caught from Iranshahr and Nikshahr districts in southeastern Iran

Genus/species	Iranshahr	Nikshahr	Total N(%)
Tatera indica	38	9	47 (47)
Meriones hurrianae	0	44	44 (44)
Gerbilus nanus	5	0	5 (5)
Meriones libycus	4	0	4 (4)
Total	47	53	100 (100)

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Table 2. Frequency of protozoan and helminthes parasites identify captured in 100 wild Nikshahr and Iranshahr districts

Rodents	Parasites		Wild Rodents		Total N (%)
	Meriones libycus	*Meriones hurrianae*	*Tatera indica*	*Gerbilus nanus*	
Hymenolepis diminuta	0	0	11	0	11 (23.4)
Hymenolepis nana feraterna	0	0	8	0	8 (17.0)
***Spirurida* spp.**	0	0	7	0	7 (14.9)
Trichuris trichiura	0	0	6	0	6 (12.7)
***Skerjabino taenia* spp.**	0	0	4	0	4 (8.5)
Trichostrongylus	0	0	2	0	2 (4.2)
***Rictularia* spp.**	0	0	1	0	1 (2.1)
Entamoeba muris	0	2 (%4.2)	2	0	4 (8.5)
Chilomastix mesnili	0	3 (%6.3)	0	0	3 (6.3)
***Leishmania* spp.**	0	0	1	0	1 (2.1)
Total	0	5 (%10.6)	42	0	47 (10)

Fig. 1. Sistan and Baluchistan Province located at southeastern Iran

★ : location of the study areas in the province

Discussion

This study was conducted to consider the endoparasites of wild rodents in some parts of southeastern Iran where located nearby western borderline of Pakistan and Afghanistan countries.

Control of zoonotic parasites depends on reliable knowledge of their life-cycles, reservoirs, distribution and transmission patterns in each zoogeographical situation. Many rodents particularly commensal species enable to take place in transmission cycle of parasitic infections as an important reservoir (Ghadirian and Arfaa 1972, Sadighian et al. 1973, Mohebali et al. 1998, 2004, Kia et al. 2001, Mowlavi et al. 2004). Reports released by some authors about rodent borne parasitic infections from some parts of Iran made more obvious the role of rodents as reservoir of many protozoan and helminth parasites (Edrissian et al. 1975, 1976, Yaghoobi-Ershadi 1996, Mohebali 1997, Javadian et al. 1998, Sadjjadi and Massoud 1999 Kia et al. 2001, 2010).

During this study four species of rodents, *M. libycus*, *M. hurrianae*, *T. indica* and *G. nanus* were identified that the most prevalent species was *T. indica* with 47% (n= 47). In a zoonotic helminth study conducted in Khuzestan, a Province in southwestern Iran, *T. indica* was found as the most dominant species (Sadjjadi and Massoud 1999). While in another study performed by Kia et al. (2001) *Rattus norvegicus* was the most prevalent rodent in Ahvaz, centre of Khuzestan Province. In the present study the samples were collected from rural areas so our results are comparable with those studies that em-

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phasis gerbils are dominant species in the rural areas, while in the urban areas rattus can be usually found more than gerbils. In Kamranrashani et al. study in Maraveh Tappeh, Golestan Province located in north-east of Iran a heavy burden of infectivity with helminth parasites (81.8%) was found in *R. opimus* (Kamranrashani et al. 2012).

In our study *M. hurrianae* (n= 44, 44%), *G. nanus* (n= 5, 5%) and *M. libycus* (n= 4, 4%) stayed at the second to fourth ranks respectively after *T. indica*. *Tatera indica* bore the maximum parasitic infectivity and none of the parasites was isolated from *M. libycus* and *G. nanus* (Table 2). In a previous study performed in the leishmaniasis endemic areas of Iran *T. indica* was accounted the main *Leishmania major* reservoir in Mehran district of Iran where located nearby eastern borderline of Iraq (Mohebali et al. 2004). Some promastigotes of *Leishmania* spp. were isolated from *Phlebotomous papatasi* and *Ph. salehi* sand flies those were collected from *T. indica* and *M. Hurriana*e burrows in Chabahar district located at the south of Iranshahr district (Kasiri and Javadian 2000). In our study *Leishmania* spp. was isolated from *T. indica* which is consistent their results.

In addition, examination of gastrointestinal content of this rodent showed infection with *Entamoeba muris*. Although *E. muris* is assumed to be a common protozoan parasite of the most rodents, results of this study recorded the parasite only for *T. indica* and *M. hurrianae* with equal burden of infection. *Chilomastix mesnili* as the third protozoan parasitic infection in this study was found among three *M. hurrianae.* Although *C. mesnili* has been isolated from a few infected individuals, it is a common parasite among rodents and usually none pathogen for human. A scientific report indicated that 0.6% of adolescent girls from two boarding schools, in southern Benin were carrier of *C. mesnili* at the time of study (Alaofe et al. 2008). All the identified helminth parasites were isolated only from *T. indica* in this study. These results pointed to the more activity and prevalence of *T. indica* and also capability of the rodent for assuming a wide variety of parasitic infections in comparison with the other captured rodents in the studied areas.

Among the parasites isolated from rodents in this study, *Hymenolepis diminuta,* the rat tapeworm, was the most prevalent helminth species. In Kia et al. study (2010) *H. diminuta* was the most common parasite that could be found in different species of rodents. Some helminthes such as *Trichuris trichiura*, *H. feraterna*, *Skerjabino taenia*, *Trichostrongylus* spp., *Spirurida* and *Rictularia* spp. are infective to human and deleterious for public health (Keney et al. 1975, Mowlavi et al. 2006, 2008, Ok 2009). Infectivity of *H. diminuta* for human had been distinguished from long time ago in Iran (Ghadirian and Arfaa 1972). Among eight *T. indica* that were infected with order of *Spirurida* one of them was identified as adult *Rictularia* spp. infection but the others remained at the level of order because the infectivities were distinguished only with presence of the eggs. Some studies performed in Khuzestan Province indicated presence of *Rictularia* spp. and *Gongylonema* spp. that were isolated from a number of wild rodents and carnivores (Farahnak1998, Sadjjadi and Massoud 1999, Kia et al. 2001). *Spirurida* includes a great number of genera and species which all have invertebrate intermediate hosts. Both *Rictularia* and *Gongylonema* have been isolated from human (Urch et al. 2005, Keney et al. 1975).

To our knowledge among nine genera or species of the identified parasites at least five of them have zoonotic and public health importance.

Conclusion

Harboring a wide variety of zoonotic parasites by *T. indica* particularly when the ro-

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dent lives nearby the native population residences represents a potential risk to the health of the population. Although the infection of *M. hurrianae* was not comparable with *T. indica*, nevertheless the rodent can be accounted at the second potential risk to the health of human at the studied areas.

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