Prevalence of gastrointestinal helminth infections in rodents of Tarai region of Uttarakhand

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Abstract The present work was aimed to investigate helminth biodiversity among rodents in order to evaluate the threat for helminth transmission to humans since they act as a potential source of parasitic zoonoses. In this study, faeces of 43 black rats (*Rattus rattus*) and 35 house mice (*Mus musculus*) were collected from various habitats viz. domestic places and agricultural fields of different parts of tarai region of Uttarakhand. These faecal samples were examined for the presence of parasitic eggs, adult and segments of the worms. The study revealed that the rodents were infected with 5 genera of helminth parasites, i.e. *Hymenolepis nana*, *Hymenolepis diminuta*, *Syphacia muris*, *Capillaria hepatica*, *Trichuris muris* and other strongyle eggs (2 species of cestodes and 4 species of nematodes). Adult *Syphacia muris* and segments of *Hymenolepis nana* were also recovered from faecal droppings. Of the 43 samples of black rat, all (100 %) and of the 35 samples of mice 9 (25.71 %) were found positive for one or more than one species of parasitic infections. Greater infection of *H. diminuta* 19 (44.18 %) followed by

H. nana 17 (39.53 %) was seen in rat whereas mice were mostly infected with *H. nana*. The diversity and prevalence of various parasites reported here within domestic habitats may suggest that these can pose a high risk of helminth transmission to human population and are thus of considerable public health importance.

Keywords Rodents · Parasitic zoonoses · Gastrointestinal helminths

Introduction

Rodents act as a vital component in various ecosystems either acting as a prey to its predator or as a carrier and reservoir of the diseases (Okoye and Obiezue 2008). It is well recognized that they harbor a number of ecto and endo parasites thus posing threats to health of human beings who live in close proximity to rodent populations (Zain et al. 2012). Ectoparasites such as lice, ticks and mites can transmit a number of pathogens to man and animals (Soliman et al. 2001). The parasitic eggs are passed out in rodent droppings on agricultural fields, stored grains and in various edible commodities in houses and thus responsible for spread of the disease (Khatoon et al. 2004). Their ability to act as a vector is greatly enhanced due to their physiological similarities which they share with humans (Kataranovski et al. 2010). Hence increased rodent population in an area could be directly related to increased zoonotic diseases in human population (Stojcevic et al. 2004). Such importance of rodents had also attracted the attention of WHO experts (WHO 2007). Keeping this importance in view, the present work was therefore undertaken to know the prevalent species of helminth parasites in rodents in and around Pantnagar and thereby assess their public health risks.

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Table 1 Overall percent prevalence of helminth infections in rats and mice

Sl. No.	Parasites	Rats (n = 43)		Mice (n = 35)	
		Positive	%	Positive	%
1	<i>Trichuris muris</i>	1	2.32	–	–
2	<i>Hymenolepis diminuta</i>	19	44.18	2	5.71
3	<i>Hymenolepis nana</i>	17	39.53	4	11.42
4	<i>Syphacia muris</i>	3	6.97	3	8.57
5	<i>Strongyles</i>	2	4.65	–	–
6	<i>Capillaria hepatica</i>	1	2.32	–	–
	Total	43	100	9	25.71

Materials and method

Faeces of 43 black rats (*Rattus rattus*) and 35 house mice (*Mus musculus*) were collected from domestic places and agricultural fields of different parts of tarai region of Uttarakhand. Wire mesh traps were used to catch hold the rodents by the method of Asgari et al. (2007). The traps were set in the dark in the evenings and when rodents got in traps were collected next morning. A thick bundle of papers was kept below each trap and was left for few hours at room temperature so as to collect faecal droppings. Since the amount of faecal dropping collected was scanty, it was processed and was examined by direct smear method for the detection of helminth's eggs (Battersby et al. 2002). Parasitic eggs were identified up to generic level using the

key of Soulsby (1982), adult and segments passed were identified up to species level using standard keys.

Results and discussion

The study revealed that the rodents were infected with two species of cestodes and four species of nematodes (Table 1, Plate 1). Similar findings have been reported by Rafique et al. (2009) and Kittipong et al. (2010) in rodents. Faecal examination revealed the presence of eggs of *Hymenolepis nana*, *Hymenolepis diminuta*, *Syphacia muris*, *Capillaria hepatica*, *Trichuris muris* and other strongyle eggs along with adult *Syphacia muris* and segments of *Hymenolepis nana* (Plate 1). The characteristic features of parasite's eggs and segments were shown in Table 2. The overall prevalence of helminth infections of the rat was 100 % which is greater than that of mice (25.71 %). Milazzo et al. (2010) similarly reported higher prevalence rate (92.68 %) in rats than that of mice (61.64 %). This may be due to living and feeding habits of rats i.e. lives in sewages and omnivorous in nature. Of the 43 samples of black rats, all (100 %) and of 35 samples of mice, 9 (25.71 %) were found positive for one or more parasitic infections. Higher prevalence (44.18 %) of *H. diminuta* in rats followed by *H. nana* (39.53 %) recorded in the present study had also been noticed in rats by Gudissa et al. (2011) while in mice *H. nana* was the most common cestode as also reported by Rafique et al. (2009). However in rats, *T. muris* and *Capillaria* spp. were least commonly observed as reported

Table 2 Characteristic features of different parasitic eggs and adult worms recovered from rats and mice

Sl. No.	Name of parasites recovered	Key Identifying features
Eggs		
1	<i>Trichuris muris</i>	Barrel shaped egg with bipolar plug at both ends
2	<i>Hymenolepis diminuta</i>	Round or slightly oval egg with striated outer and thin inner membrane. Space between membranes may appear smooth or faintly granular; Lacks polar filaments; Embryonated 6-hooked oncosphere inside shell
3	<i>Hymenolepis nana</i>	Oval egg with spherical shell consists of 2 distinct membranes; on inner membrane are two small “knobs” or poles from which 4 to 8 polar filaments arise and spread out between the two membranes, Embryonated 6-hooked oncosphere inside shell
4	<i>Syphacia muris</i>	Egg is slightly asymmetrical, flatter on one side than the other, thin shelled and transparent
5	<i>Strongyles</i>	Thin shelled oval egg with segmented embryo
Adult worms		
1	<i>Syphacia muris</i>	Vulva is located in anterior one-fourth of the body (in female). Anterior mamelon is close to middle of the body (in male)
2	<i>Hymenolepis nana</i>	Smallest cestode, Scolex is small globular (rounded) cup-like situated at the anterior end having four suckers and retractile rostellum with a single row of 20–30 hooks (hooks are absent in <i>H. diminuta</i>)

Plate 1 Different species of parasitic eggs and segments recovered from rodent's faeces

by Singla et al. (2008). The results suggested that the range of various parasites recovered from the faecal droppings of rodents collected from domestic habitats can make human population more vulnerable to parasitic zoonoses and may thus be of significant public health importance.

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