

POPULATION DYNAMICS OF GASTROINTESTINAL HELMINTHS OF DOMESTIC RATS TRAPPED FROM RESIDENTIAL AREAS OF PIPAR CITY TEHSIL, JODHPUR, RAJASTHAN

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Abstract: A helminthological survey of 139 domestic rats was conducted to investigate the population dynamics of gastrointestinal (GI) helminth infections in Pipar City Tehsil between March 2015 to February 2016. Rats were randomly collected from different residential sites within Pipar City Tehsil. Trapped rats were humanly sacrificed and examined for recovery of helminths using standard methods. Identification of helminths was based on key morphological characteristics. In the total of 139 rats sampled in the study, 96 were positive for helminth infection. The helminth species identified were having two cestodes (*V. fraterna*, *H. diminuta*) and three nematodes (*A. pakistanika*, *R. ratti* and *S. muris*). It was concluded from this study is that domestic rats harbor five species of helminth parasites. Incidence, density, index of infection and dominance are obtained highest of *V. fraterna* and followed by *A. pakistanika*, *H. diminuta*, *R. ratti* and *S. muris*. While highest intensity obtained of *A. pakistanika* and followed by *V. fraterna*, *H. diminuta*, *S. muris*, *R. ratti*.

Keywords: Population Dynamics, Gastrointestinal, Helminth, Domestic rats.

Introduction

The helminthological work in India usually related to systematics and taxonomy, including the histochemical and morphological studies. Despite, the recent studies include the statically surveys and ecological studies of rats. The helminth fauna of rats includes variety of species such as cestodes, nematodes and trematodes. The studies on helminthic infections in rats have been carried out inside and outside India. Roman (1951) & Bernard (1963) described the percentage infection of *Aspicularis tetraptera* in *Mus musculus*. Tenora (1967), Tenora *et al.* (1973) & Tenora and Zejda (1974) carried ecological studies on helminths infecting small rodents. Behnke (1975) described infection of *A. tetraptera* in *M. musculus* according to the sex of host. Nama & Parihar (1976) carried out the quantitative & qualitative study of helminth infections in *R. rattus rufencens*. Parihar and Nama (1977) shows parasitic burden of desert micromammals of Rajasthan. Malsawmtluangi & Tandon (2009) describes helminth parasite spectrum in rodent hosts from Mizoram. Shashi *et al.* (2013) studied zoonotic cestodes of three commensal rats in Dehradun. Most of all researchers studied helminth fauna of rats and shows diversity, quantitative and qualitative analysis of helminths but the present work deals with to investigate the population dynamics of gastrointestinal helminths with parameters of incidence, intensity, density, index of infection and dominance in domestic rats of Pipar City Tehsil.

Material and Methods

Study area: Pipar City is a city and a municipality in Jodhpur district (Rajasthan) and 65 km away from Jodhpur. Its geographical coordinates are 26° 23' 8" North and 73° 32' 16" East. This survey was carried out in some rural and urban areas of Pipar City Tehsil. It has an area of 108666 hectares (1086.66 Sq. Km.) and a total population of 193035 according to census 2011. (36,810 in Pipar City urban area + 1,56,225 in rural areas).

Study Design

For this study live rats were caught by using wired cages which were placed at night with baits eg. Bread, biscuits and chapatti (roti) with the pickle. Then hosts were transported to the Parasitology laboratory, Department of Zoology for parasitological examinations. To collect the GI tract for helminth recovery, trapped rats were euthanized according to standard procedure (Leary *et al.*, 2013) and subjected to standard postmortem examination. (Fiette & Slaoui, 2011). The helminths recovered from GI tract were kept in normal saline (0.9 percent NaCl) and then preserved in 70 percent alcohol containing 5 percent glycerin. For identification, helminths were cleared in lactophenol and stained with aceto alum carmine. Then mounted on glass slide and identified using key morphological characters described by Okorafor *et al.*, 2012. Though the protocols of experimental animals were permitted by Institutional Animal Ethical Committee (Reg. No. 1646/GO/Ere/S/CPCSEA)

Statistical Analysis

To do statistical analysis, all helminths were counted and obtained data were subjected to following formulae used by Rajendra *et al.*, 2009.

Incidence- The frequency of infection of the host by the parasite expressed in terms of percentage.

$$\text{Incidence} = \frac{\text{infected host}}{\text{total host examined}} \times 100$$

Intensity- The quotient forms the no. of parasites divided by no. of the infected host.

$$\text{Intensity} = \frac{\text{no. of parasites obtained}}{\text{no. of infected hosts}}$$

Density- The concentration of the parasite in term of the parasite (single host) per unit space.

$$\text{Density} = \frac{\text{no. of parasites collected}}{\text{no. of hosts examined}}$$

Index of infection- It is expressed by the formula of Tenoza & Zejda (1974)

$$Z = \frac{A \times B}{C^2}$$

Where Z= index of infection, A= no. of parasites collected, B= no. of hosts infected, C= no. of host examined.

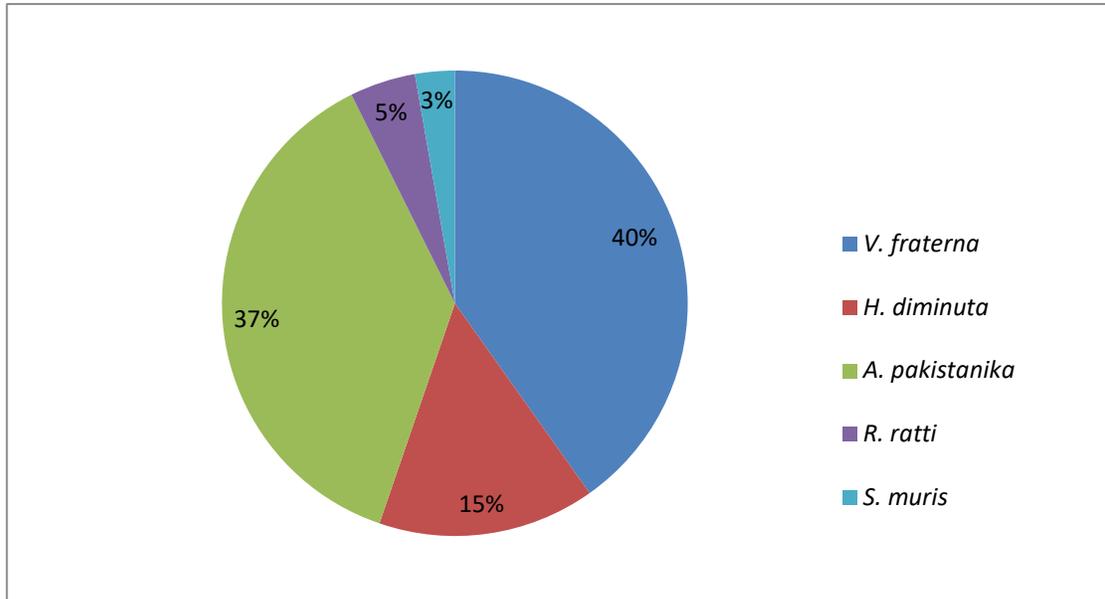
Dominance percentage- The monthly burden of a particular species to its annual burden

$$\text{Dominance percent} = \frac{\text{particular helminth burden}}{\text{total helminth burden}} \times 100$$

Result

Out of 139 rats examined in the study, 96 were positive for helminth infections. Helminth species were two cestodes and three nematodes. No trematodes were found during the study period. The two tapeworms belonged to family Hymenolepididae (*H. diminuta*, *V. fraterna*). In findings, *V. fraterna* was the most commonest cestode and *H. diminuta* was least frequent. The three species of nematodes were from two families Oxyuridae (*A. pakistanika* & *S. muris*) and Rictulariidae (*R. rattii*). For statistical analysis the no. of host examined, no. of host infected and the no. of helminth species found, form the basic data for calculation and results are expressed as incidence, intensity, density, index of infection and dominance percentage as shown in Table 1. The total no. of domestic rats examined (139), 96 were infected with the total of 943 helminths (Table 1). The statistical data analysis showed that domestic rats have a total of 69.06 percent incidence in total examined hosts. The incidence of *V. fraterna* infection was high during the study period and *S. muris* was least incident. Total helminth intensity was 40.75. The intensity of *A. pakistanika* was highest (13.57) and *R. rattii* have least intensity (2.88). The study revealed the total helminth density was 6.78. *V. fraterna* has the highest density (2.72) and *S. muris* had lowest (0.18) in the study period. The total index of infection of helminths was 1.20. *V. fraterna* has the highest index of infection (0.54) and *S. muris* has least (0.01). In total helminth infection *V. fraterna* was most dominant helminth whereas *S. muris* was least dominant during the study period. (Figure 1)

Figure 1: Dominance Percentage of Helminths in Domestic Rats



The overall incidence, intensity, density, index of infection and dominance of helminths is presented in Table 1. Out of 139 rats examined in the study, 96 were positive for helminths with an infection rate of 69.06 percent. Five helminths species were recovered, 2 cestode and 3 nematodes, no trematode were found. Two cestodes belonged to one family hymenolepidiae (*H. diminuta*, *V. fraterna*). The most and least common cestode was *V. fraterna* and *H. diminuta* respectively shown in Table 1. The three species of nematodes were belonged to two families. Oxyuridae (*A. pakistanika* and *S. muris*) and Rictulariidae (*R. rattii*). *A. pakistanika* recorded as commonest and most numerous nematode. *S. muris* was least numerous nematode. All helminth species were located in the intestine and caecum of their hosts.

Figure 2: Comparison of Total Host Examined and Total Helminths Recovered

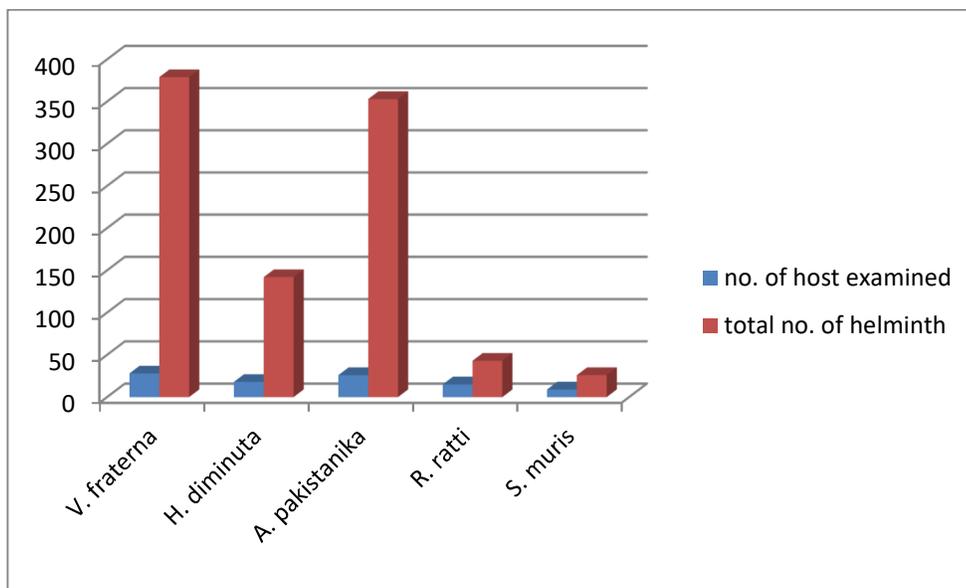


Table 01: Population Dynamics of Helminths in Domestic Rats

Helminth species	No. of host examined	No. of host infected	Total no. of helminth	Incidence	Intensity	Density	Index of infection	Dominance
Cestodes								
<i>V. fraterna</i>	139	28	379	20.143885	13.53571	2.726619	0.549246933	40.1908802
<i>H. diminuta</i>	139	18	142	12.94964	7.888889	1.021583	0.132291289	15.0583245
Nematodes								
<i>A. pakistanika</i>	139	26	353	18.705036	13.57692	2.539568	0.475027173	37.4337222
<i>R. ratti</i>	139	15	43	10.791367	2.866667	0.309353	0.033383365	4.55991516
<i>S. muris</i>	139	9	26	6.4748201	2.888889	0.18705	0.012111174	2.75715801
	Total	96	943	69.064748	40.75708	6.784173	1.202059935	100

Discussion

The results obtained from this study represent an overall infection of 69.06 percent for gastrointestinal helminth recovered from domestic rats in Pipar City Tehsil. The rodents generally have a high infection of gastrointestinal parasites due to their euryphagic food habitats (Okorafor *et al.* 2012). So, the recovery of various helminths from domestic rats is not an unusual finding. Akhtar (1955) reported that the overall helminth infection in *Rattus rufescens* in Pakistan was 64 percent, the highest incidence of infection being by *Aspiculuris* (60 percent) and lowest by *Syphacia* (2 percent) and *Rictularia* had 6 percent incidence. Parihar and Nama (1977) recorded 63.2 overall infection percentage and the percentage of incidence of *A. pakistanika* was 20.4. *R. ratti* was 12.0 percent and *S. muris* was 5.6 percent. Parihar & Nama (1980) recorded overall helminth infection as 63.5 percent in Jodhpur city. Singla *et al.* (2008) reported the highest prevalence of helminthic infection in *R. rattus* (40.05 percent) from Punjab, India. In present findings overall infection percentage is 69.06 and the incidence percentage of *A. pakistanika* is 18.70, *R. ratti* is 10.79 and *S. muris* is 6.47. Presently, no *T. taeniformis* or *Acanthocephala* had been recovered from domestic rats, this study result is not in agreement with Nama and Parihar (1976), had reported these helminths in *R. rattus*. The present finding does not consent the results of Malasawmtlungi and Tondon (2009), had reported *M. musculus* free from cestode. The present results had slightly higher overall incidence percentage than the results of Parihar and Nama (1977), whom work was carried out in Jodhpur city. The authors think that high infection of rats may be due to poor hygiene, habitat of rats and effortless availability of intermediate host for infecting domestic rats in rural areas of Pipar City Tehsil. One of the recovered helminth *H. diminuta* in this study was of zoonotic importance. *H. diminuta* has already been reported in humans in Iran by Chadirian and Arfaa (1972) and also been reported in children by Mowalvi *et al.* (2008). Domestic rats can spread zoonotic helminth's egg through faeces in food stuffs. So, the rural public health importance is to be investigated and should aware about these contagious helminths. Present results show the infection of helminths in domestic rats is comparatively higher in rural areas than urban areas. This study will be useful to identify the helminth infections of domestic rats in rural areas of Pipar City Tehsil and to know diseases caused by zoonotic helminths which are transmitted by domestic rats.

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