The Journal of Animal & Plant Sciences, 24(2): 2014, Page: 392-396
ISSN: 1018-7081

OCCURANCE OF *HYMENOLEPIS DIMINUTA* IN RATS AND MICE CAPTURED FROM URBAN LOCALITIES OF LAHORE, PAKISTAN

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ABSTRACT

Prevalence of *Hymenolepis diminuta*, a zoonotic parasite was determined in rodents captured from three urban localities of Lahore, city. Rats and mice (n=3600) were trapped for one year on monthly basis from residential areas of human beings and identified as *Rattus rattus* (n=3190) and *Mus musculus* (n=410) on the basis of morphological characters. Overall prevalence of *H. diminuta* determined by coprological technique in rodents was 35.4 percent and non-significant difference was observed in relation to different localities. The highest (48.0%) month-wise prevalence of *H. diminuta* was found during August whereas the lowest (28.0%) during January. The highest (45.4%) season-wise prevalence was noted during summer followed by spring (35.1%) while the lowest (29.3%) during winter. Infection was higher in males (43.8%) than females (29.3%). Adult rats and mice were more commonly affected than younger ones. Infection was higher in rats (37.3%) than mice (20.2%). Rodents were captured from human populated areas and presence of zoonotic parasite may be a threat of infection to human beings.

Key words: Occurance, *Hymenolepis diminuta*, Rat, Mice and Urban localities

INTRODUCTION

Rats and mice, belonging to the Order Rodentia, have remained an important figure in the human lore and culture since centuries. A large and growing proportion of the urban population is living in the slum and squared areas (Katchi abadi) of Pakistan and suffer from excessive exposure to rodents which breed prolifically and are highly adaptable to a range of environments (Parshad, 1999). These furtive synanthrops have also played havoc with human society by transmitting diseases (Otto and Burns, 1983; Hobson and Collier, 1984) as they harbour a number of *ecto*- and *endo* parasites of great zoonotic importance (El-Safi and Peters, 1991; Velez *et al*., 1995; Webster and Macdonald, 1995; Yaghoobi and Javadian, 1996; Yasuraoka *et al*., 1996).

Hymenolepis diminuta has a worldwide distribution whose definitive hosts are rodents. Infection of human is rare and occurs by accidental ingestion of infected arthropods (intermediate host) harboring cysticercoids, infective larvae of the parasite (King, 1995; Schantz, 1996). Transmission to human beings is rare however it may be a serious threat to those living in close association with rodents. Although *H. diminuta* infection is often asymptomatic (Acha and Szyfres, 1984; Baily, 1996) yet abdominal pain (Edelman *et al*. 1965; Acha and Szyfres, 1984 and Baily, 1996), irritability (Vasallo and Gonzalez1, 1979; Velasco *et al.* 1980 and Acha and Szyfres, 1984), pruritis (Acha and Szyfres, 1984) and eosinophilia (Baily, 1996) have been associated with this condition.

The occurrence of the *H. diminuta* in rodents has been studied extensively elsewhere throughout the world but little attention has been paid towards this zoonotic parasite in Pakistan. There have been no extensive studies of these murid synanthropic pests in Pakistan since its independence except for a few sporadic ones such as those conducted by Hayat and Akhtar (1999), Khatoon *et al.* (2004), Yaqoob *et al.* (2007) and Mushtaq-ul-Hassan *et al*. (2008). In view of zoonotic importance, present study was conducted to determine overall prevalence of the *H. diminuta* in rats and mice captured from three selected localities of Lahore city.

MATERIALS AND METHODS

Live rodents were caught (n=3600) from three areas of Lahore city having human population of different socio-economic status. Rats and mice were trapped on monthly basis from selected localities (1200 each) following protocol described by Asgari *et al*. (2007). The captured specimens were restrained (Jann *et al.*, 2003) and identified on the basis of anatomical features as described by Roberts, (1997). Droppings were collected from each trapped rodent by keeping in separate cage. Droppings and intestinal contents were examined by coprological techniques for identification of eggs and proglotids of *H. diminuta* (Hayat and Akhtar, 1999; William, 2001; Battersby *et al.*, 2002).

In wet mount method, small quantity of each sample was placed on a glass slide, mixed with normal saline and cover slip was placed on it. Wet mounts were examined under bright field binocular compound microscope at 40X.

Three (03) grams of each sample were mixed thoroughly with 15 ml Zinc Sulphate (1.18 specific gravity) for flotation technique and one drop of supernatant was placed on a glass slide. Slides were observed under microscope and results were recorded.

For sedimentation technique mixture of each sample in normal saline was sieved, 15ml was vigorously mixed with 3ml ethyl acetate and centrifuged at 1500-2000 rpm for 5 minutes. Direct smear was made on the slide using sediment. Eggs of Cestodes were identified on the basis of morphological features (Soulsby, 1982).

Statistical Analysis: The data thus collected were analyzed statistically by Chi square test using SPSS version 10 software.

RESULTS AND DISCUSSION

In present research plan overall prevalence of the *H. diminuta* in rats and mice captured from three selected localities of Lahore city was 35.4%. Minor differences were observed within localities infection rate of parasite in rats and mice trapped from Allama Iqbal town (32.7%), Walled City (39.0%) and Railway Station adjacent areas (34.6%). Within structures higher prevalence of *H. diminuta* was recorded in rats and mice trapped from Floor Mills (40.3%) than Fruit/Vegetable shops (35.4%), Grocery shops/ Departmental stores (33.1%) and residential areas (32.9%).

Table 1: Season-, sex-, age- and species-wise percent infection of *H. diminuta* in rodents trapped from three localities of Lahore, Pakistan

Parameters		Localities									Overall %age
		Allama Iqbal Town			Walled City			Railway Station/Adjacent areas			
		No. examined	No. positive	%age	No. examined	No. positive	%age	No. examined	No. positive	%age	
Season	**Winter**	300	75	25.0	300	101	33.7	300	88	29.3	**29.3**
	Spring	300	95	31.7	300	117	39.0	300	104	34.7	**35.1**
	Summer	300	134	44.7	300	144	48.0	300	131	43.7	**45.4**
	Autumn	300	88	29.3	300	107	35.7	300	92	30.7	**31.88**
Sex	**Male**	509	193	37.9	524	284	54.2	503	195	38.8	**43.8**
	Female	691	199	28.8	676	185	27.4	697	220	31.6	**29.3**
Age	**Young**	135	12	8.4	151	19	12.6	128	15	11.7	**11.1**
	Adult	1065	380	35.7	1049	450	42.9	1072	400	37.3	**38.6**
Species	**Rat**	1069	364	34.0	1023	434	42.4	1098	391	35.6	**37.3**
	Mouse	131	24	21.4	177	35	19.8	102	24	23.5	**20.2**

The results of the study are corroborated with previous reports in literature by scientists working in different geographical regions. Infection rates 38, 36.9, 35.8, 33.33 and 30.7% reported by Kumarasinghe *et al.* (2006) in Sri

Stojcevic *et al*. (2004) at Croatia, Abu-Madi *et al.* (2005) at Doha Qatar, Paramasvaran *et al.* (2009) at Kuala Lumpur and Kassan and Assefa (2000) from Addis Ababa (Ethiopia), respectively with *H. diminuta* in different species of rodents were in accordance to those found in the present study. Variations exist in the peak infection level by *H. diminuta* like 44.1% and 28% as observed by Nickel and Buchwald (1979) in German and Gomez *et al*. (2008) at Argentina. In a parallel study conducted at Faisalabad, Pakistan the prevalence of *H. diminuta* observed by Rafique *et al.* (2009) ranged between 20-60% and is comparable with our findings. In contrast much lower infection rates with *H. diminuta* (11.1 and 3.8%) were reported by Kia *et al.* (2001) and Waugh *et al*. (2006), respectively. It is suggested that prevalence and pattern of parasitism is not same at different localities in rodents but vary a lot depending upon the hygiene, educational status, type of environment and geographical area.

The highest (48.0%) month-wise prevalence peak was during August and lowest (28.0%) in January. The highest seasonal prevalence peak (45.4%) was during summer followed by spring (35.1%), autumn (31.9%) and the lowest (29.3%) in rats/mice captured during winter. In summer different food stuffs are stored, rodents wander at multiple places in search of nutrition and chances of infection by parasites are comparatively higher as compared with winter. Gomes *et al.* (2008) observed high infection intensity in males than females and is comparable with our findings. In contrast, Abu Madi *et al.* (2001) recorded 17.6% prevalence of *H. diminuta* in brown rats at Qatar and seasonal relation was nil. High *H. diminuta* prevalence in summer is due to the fact that rat-beetle (intermediate host) contact intensity is higher than in other seasons. However, the load of infection in

rats/mice is not dependent on the seasonal variations rather on the presence and contact of intermediate host with definitive host. The reason of high rate in rats/mice captured from Flour Mills again seems to be the same, number of intermediate host and contacts between definitive and intermediate hosts.

Prevalence of *H. diminuta* was significantly high in male rats/mice (43.8%) than females (29.3%) trapped from three selected localities of study area. Males travel from one population to the other getting more chance to contact infection from infected intermediate hosts. Higher prevalence was reported in male rats (76.6%) than in females (54.5%) however, the difference in mean intensity was nil. Similarly, higher prevalence was recorded by Goswami *et al.* (2009) in male rats in India as compared with the females. A number of reports of higher infection rate of male than female rodents are in support of our findings as of Nama and Parihar (1976), Maki and Yanagisawa (1987), Yen *et al.* (1996) and Waugh *et al.,* (2006). In contrast high prevalence was observed in females (62.4%) than males (37.7%) by Stojcevic *et al.* (2004) at Croatia. Variable findings are in literature indicating that the load and maintenance of *H. diminuta* infection is not dependent on sex of rodents but on presence and chances of contact with infected intermediate host.

The peak of infection was significantly higher in adults (38.60%) than younger (11.1%) rats/mice captured from selected localities of the study area in accord with Abu- Madi *et al.* (2005). The worm burdens of *H. diminuta* were almost two times in adults than juveniles of both sexes of rats. Similarly, higher intensities with *H. diminuta* infection of black rats had been reported by Mafiana *et al.* (2001) at Nigeria. Increase in the intensity of infection with age was observed by Gomez *et al.* (2008) in Argentine brown rats comparable with the results of Stojcevic *et al.* (2004), higher prevalence in adults (45.5%) than in juveniles (13.7%) and ours as well. Maintenance of higher infection in adult than young rats is due to reason of more feed intake and wandering behavior of rodents.

Among two rodent species included in the work plan the prevalence of *H. diminuta* was much higher in rats (37.3%) than mice (20.2%). There were significant differences in infection peaks between both the species in accordance with Glazebrook *et al.* (1978), Yen *et al.* (1996) and Singla *et al.* (2008). Variations in the prevalence of *H. diminuta* in different regions and species of the rodents are evident in the literature. In present study much higher infection rate was recorded in rats than in mice which may be due to wandering behavior of rats in polluted environments than house mice. From the observations of the present work plan it can be concluded that rodents act as strong source/reservoir of *H. diminuta* and there is a serious threat for the spread of infection to human beings living in close association with them in a polluted, un-hygienic environment.

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