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HYMENOLEPIASIS IN RATS (*Rattus norvegicus*) WITH ITS ZONOTIC POTENTIAL IN MYMENSINGH DISTRICT OF BANGLADESH

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Hymenolepis nana and *Hymenolepis diminuta* are globally widespread zoonotic cestodes and rats act as main reservoir host of these cestodes. Wild brown rats (*Rattus norvegicus*) are the most common rats usually live in human's dwellings, especially in areas of low socioeconomic status and low levels of hygiene practices. Since there is scarcity of information of the hymenolepiasis in rats in Bangladesh, therefore the aim of this study was to determine the incidence of *H. nana* and *H. diminuta* in wild and laboratory rats. A total of 60 rats were collected from the residential areas of rural villages of Mymensingh sadar and the Bangladesh Agricultural University campus and 10 were from the laboratory of the Department of Parasitology, BAU, Mymensingh. The rats were killed by cardiac puncture and tapeworms were collected and subsequently were subjected for morphological study under the stereomicroscope. Two species of cestodes, namely *H. nana* and *H. diminuta* were detected showing the overall prevalence of 23.3 % and 35 % respectively. The high prevalence of *H. nana* (30%) was determined in rats captured from the rural village areas whereas *H. diminuta* was found more prevalent (60%) in the laboratory rats. The result of the current study suggests that *H. nana* infection in rural village areas may act as a risk factor for the zoonotic transmission of hymenolepiasis to human in Bangladesh.

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INTRODUCTION

Hymenolepiasis, is a potentially zoonotic a disease caused by the cestode *Hymenolepis nana* (dwarf tapeworm) and *H. diminuta* (Sreedevi et al., 2015). These two cestodes (*H. nana* and *H. diminuta*) are widely distributed throughout the world and endemic to Asia, Southern and Eastern Europe, Central and South America and Africa (Thompson, 2015). Epidemiological data showed that around 175 million human cases of hymenolepiasis have been reported in different part of the world. Infections with adult hymenolepids occur in humans, particularly in children living in areas of low socioeconomic condition and with poor hygiene and sanitary practices that cause pediatric diarrhoea in urban slum dwellings (Mirdha and Samantray, 2002). Human hymenolepiasis is often asymptomatic, but can cause chronic diarrhoea, abdominal pain, irritability and itching (Martínez-Barbabosa et al., 2012). Most seriously, infection of *H. nana* and *H. diminuta* ultimately can cause severe diseases, even life threatening conditions in immunosuppressed individuals with HIV (Olson et al., 2003). Both cestodes can be differentiated by the morphology of their scolices. Scolex of *H. nana* consists of four suckers and a retractable rostellum armed with hooks, whereas the scolex of *H. diminuta* has four suckers similar to that of *H. nana* and is unarmed. *H. nana* and *H. diminuta* are two commonly occurring cestodes causing hymenolepiasis in rodents and humans especially young children (Sood et al., 2018). Synanthropic rodents (*Rattus norvegicus*, Berkenhout, 1769) are known reservoirs for these cestodes, as well as many others organisms like bacteria, viruses which have zoonotic importance (Simões et al., 2016). These rodents are capable in adapting to a variety of environments which makes them extremely abundant. They are closely associated with human settlements and areas disturbed by human activities (Simões et al., 2016). At present, the processes of urbanization and the unplanned growth of cities provide an excellent habitat for rats. Currently they have attracted much attention for research because of their role as a reservoir of human and livestock diseases, particularly zoonotic pathogens (Ito and Itagaki, 2003; Paramasvaran et al., 2009). Although several studies have been carried out to identify and determine risk factors of gastrointestinal helminthes parasite of laboratory animals especially the rats and wild brown rodents in different parts of the world (Goswami et al., 2011; Gudissa et al., 2011; Malsawmtluangi and Tandon, 2009; Paramasvaran et al., 2009) but there is a scarcity of information regarding the prevalence of hymenlepiosis in rats of Mymensingh district. Moreover, rats are commonly used for experimental studies and their endoparasites frequently causing zoonotic problem, therefore, the present study was aimed to determine the incidence of hymenolepiosis in naturally infected adult wild and laboratory rats in Mymensingh district of Bangladesh.

MATERIALS AND METHODS

A total of 60 rats were dissected to find out the cestodes that they harbored during the period of of study. Among them, 50 were wild brown rats (*Rattus norvegicus*) and 10 were laboratory rats which reared in the Laboratory of the Department of Parasitology, Bangladesh Agricultural University, Mymensingh. The wild brown rats were captured by using wire mesh traps from the residential areas of rural villages (n=30) and the Bangladesh Agricultural University campus (n=20) according to the previously described protocol (Asgari et al., 2007). The traps were fitted up in the evenings in the darken place and rodents were trapped and collected in the next morning. The captured rats were transported to the laboratory in the Department of Parasitology, BAU, Mymensingh and euthanized by cardiac puncture and dissected following standard procedures. The viscera were separated and dissected under a binocular microscope to identify and count the helminth parasites. Cestodes were collected directly from the intestine and kept in separate plastic containers irrespective of the areas of collection. The permanent slides were prepared and stained with semichon acetocarmine, dehydrated in different grades of alcohols, cleared in xylene and mounted in Canada balsam. After that cestodes were morphologically identified under stereomicroscope using the taxonomic keys described previously (Palmer et al., 2011). The scolex of *H. nana* is small globular (rounded) cup-like structure situated at the anterior end of the body and consists of four suckers and the retractile rostellum is armed with a single row of hooks. In contrast, the scolex of *H. diminuta* has four suckers similar to that of *H. nana* but the restellum is unarmed (absence of hooks) (Sood et al., 2018).

RESULTS AND DISCUSSION

The present study revealed that the rodents were infected with two species of cestodes, namely *H. nana* (Figure 1) and *H. diminuta* (Figure 2) showing overall prevalence of 23.3 % and 35 % respectively (Table 1). The findings of the present study was in line with the previously reported results in Pakistan and Thailand where the authors also found two cestodes (*H. nana* and *H. diminuta*) infection in rodents (A. Rafique, S. A. Rana, 2009; Chaisiri et al., 2010). The present study showed relatively higher prevalence of *H. diminuta* (35%) followed by *H. nana* (23.3%) which was in according with Guddissa et al. (2011) where the author reported the high prevalence of *H. diminuta* (26.79 %) followed by *H. nana* (7.1 %) in rats at Ethiopian Health and Nutrition Research Institute (EHNRI), Addis Ababa. High prevalence of *H. nana* was found in rats trapped from the rural village areas (30%) followed by lower prevalence (15%) in the Bangladesh Agricultural University residential areas. The plausible cause may be due to the poorly developed hygiene and sanitary condition in rural villages compared to that of the BAU residential areas. However, it has been reported that *H. nana* infects humans. Humans get infection with *H. nana* accidentally by ingestion of contaminated food containing the parasite eggs or by ingesting the intermediate host such as arthropods infected by cysticercoids (Mason and Patterson, 1994). Moreover, *H. nana* is also considered as common cause of pediatric diarrhea in urban slum dwellings and infant mortality, particularly in rural areas who live in conditions of inadequate hygiene and poorly developed sanitary facilities (Martínez-Barbabosa et al., 2012; Mirdha and Samantray, 2002). On the other hand, the high prevalence (60%) of *H. diminuta* was found in laboratory rats followed by low prevalence (25%) in rats caught from the Bangladesh Agricultural University residential areas (Table 1) which is in accordance with Goswami et al. (2011) where it has been reported the high prevalence of *H. diminuta* infection (24 %) in albino laboratory wistar rats. The reason for high prevalence of *H. diminuta* in experimental albino rats could be due to the housing conditions of rats in cages leading to increased oro-faecal transmission or contamination of foods with infested beetles (Palmer, S.R, Soulsby, L, Torgerson, P, 2011) which in turn readily facilitate them the transmission to human and other susceptible animals when there is a close contact (Fan, 2005). The current study also suggests that care should be taken while handling the laboratory rats in addition to the maintenance of the hygienic conditions of animal house as they act as natural reservoir of zoonotic parasites of public health importance.

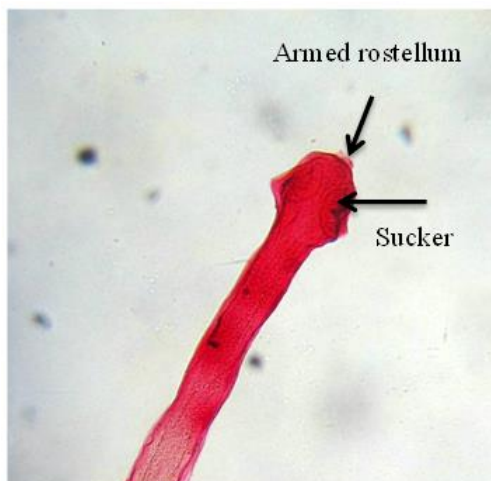


Figure 1. Scolex of *H. nana* (40X)

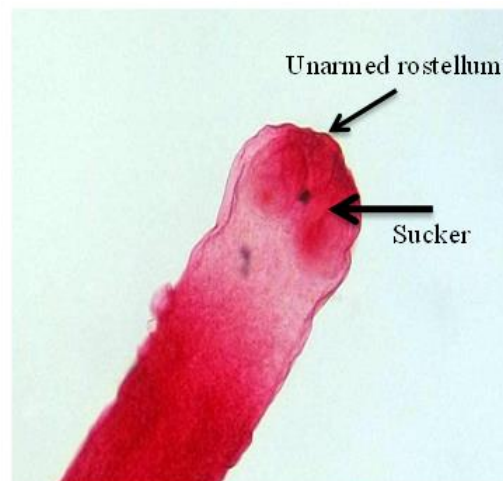


Figure 2. Scolex of *H. diminuta* (40X)

Table1. Prevalence of *H. nana* and *H. diminuta* in wild and laboratory rats based on the microscopic examination

Collection site	No. of samples examined	No. of positive case of <i>H. nana</i> (%)	No. of positive case of <i>H. diminuta</i> (%)
Rural village area	30	9 (30)	10 (33.3)
BAU campus residential area	20	3 (15)	5 (25)
Laboratory rats	10	2 (20)	6 (60)
Total	60	14 (23.3)	21 (35)

CONCLUSIONS

The present study demonstrated the occurrence of *Hymenolepis nana* and *Hymenolepis diminuta* in the synanthropic (wild and laboratory) rats in Mymensingh district. High prevalence of *H. diminuta* (60%) was found in the laboratory rats whereas *H. nana* was more prevalent (30%) in the rats captured from the rural village areas. Lower prevalent for both cestodes were found in the BAU campus residential area. The results of the present study give the basic understanding of these cestodes (*H. nana* and *H. diminuta*) in rats which provide the information of zoonotic significance since rats contaminating the environment, food and water sources with their parasites poses a public health threat. Further investigation is needed to determine the risk factors associated with the zoonotic transmission among the human population.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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