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Short communication

PREVALENCE OF INTESTINAL HELMINTHIC INFECTIONS AMONG HOUSEHOLD RATS IN ADDIS ABABA

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ABSTRACT: This paper reports the prevalence of intestinal helminthic infections among 101 *Rattus rattus* collected in Addis Ababa, from November, 1996 to December, 1997. Examination of faecal samples from each rat by the formol-ether concentration technique revealed that 44/101 (43.6%) of the rats were positive for a single intestinal parasite: 31/101 (30.7%) for *Hymenolepis diminuta*, and 13/101 (12.9%) for *Hymenolepis nana*. Double infection was recorded in 7/101 (7%). Among the double infection, 3% were infected with *H. diminuta* and *H. nana*, and 4% with *H. diminuta* and *Syphacia obveleta*. *H. diminuta* was the most frequent followed by *H. nana*. *S. obveleta* was found only in association with *H. diminuta*. The infection rates for cestodes in the present study were compared with the rates reported for cities in other countries. These findings suggest that household rats could be potential sources of human infections in the areas studied.

Key words/phrases: *Hymenolepis diminuta*, *H. nana*, *Syphacia obveleta*, household rats, Addis Ababa

INTRODUCTION

Hymenolepis diminuta and *H. nana* are the two species of cestodes in the genus *Hymenolepis* that infect man and rodents. Both species are cosmopolitan in their distribution. However, *H. diminuta* is a very common parasite of rats, mice and wild rodents. Man is infected by ingestion of the intermediate hosts such as grain insects infected from rat droppings (Chandler and Read, 1961; Faust and Russel, 1964). Human infection with *H. diminuta* have been reported from 10

Latin American countries, Italy, Belgium, Australia and some African countries, most cases being reported from children (Acha and Szyfres, 1987). There is a limited information available on the prevalence of *H. diminuta* in Ethiopia. Its existence in Ethiopia was revealed only in 1968 by Aklilu Lemma *et al.* (1968), where two human cases were reported in Addis Ababa. The infection rate was 1–2% in Tensae Birhan (Tesfamichael Tesfayohannes, 1984) and in Jiren school children (Girma Haile *et al.*, 1994). Rate of infection of more than 2% was found in Bebeka Coffee Plantation (Amha Kebede and Seyoum Taticheff, 1992). Infection rates seem to be under reported possibly due to mis-diagnosis as *H. nana* as is observed in some reports (Tesfamichael Tesfayohannes, 1983a; 1983b; Terefe Wondimagegnehu *et al.*, 1992).

H. nana, on the other hand, is one of the most frequent human parasites. Human infection results from ingesting eggs in food or water or through contaminated hands. Internal auto-infection also occurs. Infection is more common in children than in adults, particularly children from institutions in tropical countries such as orphanages, day care centres and schools (Chandler and Read, 1961; Muller, 1975). High prevalence rates are found among children in Europe, Africa, several countries in the Middle East, India and Latin America (Acha and Szyfres, 1987). The infection rate is 94% in 5–9 year old children in area of Punjab, India (Muller, 1975). In Chile, 49% of 2,426 intestinal cestodiasis confirmed between 1961–1971 were due to *H. nana* (Acha and Szyfres, 1987). The highest recorded prevalence in Ethiopia was 61% in school children in Kemise, Wello (McConnell and Armstrong, 1976). The infection rate among school children has also been reported as being 37% in Debre Birhan, 34% in Mekele, and 9% in Addis Ababa (Aklilu Lemma *et al.*, 1968).

The level of parasitism of rats by these cestodes can be very high in some cities. In Chunchon, Korea, 33% (14/43) of the rats tested were infected with *H. diminuta* (Seong *et al.*, 1995). Infection rates for *H. nana* were 14% in Santiago, Chile, and 7.8% in Bombay, India (Acha and Szyfres, 1987). In Tokushima Perfecture, Japan, out of 114 rats examined, about 25% were positive for *H. diminuta* and 2.6% for *H. nana* (Takagi *et al.*, 1962).

Although rats are known to be reservoirs of these cestodes, so far there is no information concerning the occurrence of *Hymenolepis* infection in household rats in Ethiopia. This paper, thus presents the first report on the prevalence of intestinal helminthic infections among household rats captured in Addis Ababa.

MATERIALS AND METHODS

Household rats were captured from different houses inhabited by people working for Ethiopian Health and Nutrition Research Institute (EHNRI) in Addis Ababa between November, 1996 and December, 1997. Rats were trapped alive with 12 x 45 cm wire cage traps baited with *injera* and bread. Traps were placed inside houses during evening hours. Trapped rats were taken to our laboratory where they were weighed, identified and examined. All the rats collected were identified to be *Rattus rattus* by their pointed nose and by their tails which are longer than their head and body combined. Identification of species was verified by Dr Mekonnen Fekadu (DVM, PhD, Centre for Disease Control, Atlanta Georgia, USA). Faecal samples from each rat were examined for intestinal parasites by formol-ether faecal concentration technique (Ritchie, 1948). Egg of *H. nana* is colourless, oval, measuring 30–45 μm and at each end of the eggs thread-like structures called polar filaments are usually visible. Compared with *H. nana* the egg of *H. diminuta* is yellow brown, larger, measuring 60–80 μm, usually spherical and without polar filaments. When faecal samples were positive for *Syphacia obveleta*, the intestine of the rat was removed and examined for adult worms. *S. obveleta* was confirmed by the form of its cervical alae which have rounded posterior margin.

RESULTS

A total of 101 household rats, weighing from 105–219 grams and all belonging to *R. rattus*, were examined for intestinal parasites. Table 1 shows the prevalence of intestinal helminths among the household rats. Of the total rats examined, 43.6% had single intestinal helminthic parasite: 30.7% *H. diminuta* and 12.9% *H. nana*. Seven per cent had double infection. Among the double infections, 3% were carrying *H. diminuta* and *H. nana*, and 4% *H. diminuta*

and S. obveleta. The most frequent parasite was *H. diminuta* (38/101) followed by *H. nana* (16/101). *S. obveleta* (4%) was found only in association with *H. diminuta*.

Table 1. Prevalence of intestinal helminths in 101 household rats captured in Addis Ababa from November 1996 to December 1997.

Parasite	No. infected	% infected
Single infection		
Hymenolepis diminuta	31	30.7
Hymenolepis nana	13	12.9
Syphacia obveleta	nil	nil
Double infection		
H. diminuta and *H. nana*	3	3.0
H. diminuta and *S. obveleta*	4	4.0
Total	51	50.6

DISCUSSION

The data presented in this paper are part of the work on rats which were collected to obtain mature proglottides of *H. nana* which was used to infect and maintain the parasite in laboratory mice. The cestodes, *H. diminuta* and *H. nana* both infect man and rodents, the latter acting as reservoirs. In the present study, of the 3 species of intestinal helminths found in *R. rattus* in Addis Ababa, *H. diminuta* (37.6%) was the most frequent parasite (Table 1). It is interesting to note that the infection rate for *H. diminuta* in this study was greater than the rates reported from Japan (25%) (Takagi *et al.*, 1962) and in the same order with the rate from Korea (33%) (Seong *et al.*, 1995). The fact that inter-human transmission of the parasite does not occur (Acha and Szyfres, 1987) suggests that those rats are the main source of human infection.

H. nana infection rate in rats in this study was 15.9% when single and double infection cases are combined (Table 1). This was comparable to what was reported from Bombay (14.5%), but was higher than the rate from Santiago (7.8%) (Acha and Szyfres, 1987) and Japan (2.6%) (Takagi *et al.*, 1962).

Divergent opinions exist among parasitologists with respect to the position of *H. nana*, which infects man as well as rats, mice and other rodents. Some

consider that there are two sub-species of *H. nana: H. nana fraternal* in rodents and *H. nana nana* in humans (Shorb, 1933). Others maintain that the parasites are strains of a single species, physiologically adapted to particular host but capable of causing cross infection (Acha and Szyfres, 1987). In support of the latter (the single species theory), Read (Chandler and Read, 1961) infected himself from mice source while Woodland (Faust and Russel, 1964) infected mice with eggs from human source. Abebe Endale from the School of Pharmacy, Addis Ababa University (personal communication) infected laboratory mice with eggs from human source also indicating the possible transmission of *H. nana* from man to animals and vice versa.

S. obveleta was found only in association with *H. diminuta* (4%). It is a parasite of rats and mice, and seldom found in man.

Direct correlation between incidence of hymenolopiasis and prevalence of household rodents combined with conditions favouring their access to food was reported in India (Chandler and Read, 1961). Although no attempt was made to study the prevalence of *Hymenolepis species* among human population in the surveyed area, the results of the present study suggest that those household rats could be potential source of human infections. Moreover, the population in the studied area, especially children could be exposed to high risk of *Hymenolepis* infections. Thus control of rats and adequate protection of food against contamination by rats and insects seem to reduce source of human infection by these cestodes.

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