

**ENDEMICITY OF INTESTINAL PARASITES WITH SPECIAL
REFERENCE TO NEMATODES IN INDIVIDUALS RELATED TO
EDUCATION (STUDENTS, STAFF AND WORKERS) IN SWAT,
KP, PAKISTAN**

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Abstract

This study was aimed to assess the impact of education on the prevalence of nematode intestinal parasites among individuals relevant to education under and above 15 years age in Swat, Pakistan. Stool samples were randomly collected during January 2006 to December 2008 and examined from a total of 420 individuals including 238 and 182 under and above 15 years age, respectively from Urban and Rural area of Swat, Pakistan. The techniques used were wet mount (WMT), sedimentation and centrifugation. A number of 171 individuals were found infected with any single species of parasite, 81 cases were found infected with double species of parasites, 21 individuals were having triple and 4 individuals were found to be infected with four species of parasites. Nematodes were the most prevalent intestinal parasites than cestodes and protozoans. The prevalence rate was: *Ascaris lumbricoides* 39.8, *Trichuris trichura* 19.1, *Enterobius vermicularis* 8.25, *Ancylostoma duodenale* infection 3.64, *Taenia saginata* 12.8, *Hymenolepis nana* 10.1, *Entamoeba histolytica* 4.36 and *Giardia* species 1.69 %. The children were found more infected than adults but adults were found infected with multiple infection. Present study leads to understand that sanitary measures should be effectively adopted and health education should be given as a compulsory subject.

Intestinal parasites are still major health problem in tropical and sub tropical areas among people with low socio-economic status and poor hygiene, which favours indirect fecal oral transmission (Ravdin, 1995). Intestinal parasites are widely prevalent causing considerable medical and public health problems in the developing countries, especially in tropical region (WHO, 1981).

In most of the rural areas of Swat, Pakistan no attention has been paid on education, health and social welfare etc. Literature indicates that no research work on human intestinal parasitic infections was conducted in Swat therefore

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present study was conducted to fill in the gap. Less work has been done in the province Khyber Pukhtunkhwa (KP) as well as in Pakistan (Farooqi, 1964; Haleem *et al.*, 1965; Ansari & Naru, 1968; Siddidi & Bano, 1979; Bilqees *et al.*, 1982; Pal & Rana, 1983 a, b; Nawaz & Nawaz, 1983; Baqai *et al.*, 1985; Shah *et al.*, 1986; Pal & Subhani, 1989; Khan *et al.*, 1993; Ali, 1993; Akhtar *et al.*, 1993; Qureshi, 1995; Jamil, 1999; Stoddart, 1999; Shaikh *et al.*, 2000; Chaudhry *et al.*, 2004; Kamran *et al.*, 2005).

Materials and Methods

The study was carried out in 420 individuals including 238 < 15 years and 182 > 15 years of age. These individuals belonged to the education department of staff, students and workers in Swat, KP, Pakistan. The stool samples were collected randomly by visiting different sites and locations of the district including schools and hospitals and through general body services. The participants were convinced by the impact of parasites on human especially children health. The participants were provided with a clean, dry screw capped, wide-mouth plastic bottle containing 10 % M.I.F (Merthiolate, Iodine, Formaldehyde) preservatives and with a wooden spatula. At the time of collection, a questionnaire of basic parameters (name, age, sex, date of collection, locality and intestinal complaints) was filled for each individual. The participants were instructed to collect about 10 grams of specimens. All specimens were brought to the Medical Zoology Laboratory, Vertebrate Pest Control Institute (VPCI), Southern Zone Agricultural Research Centre (SARC), Pakistan Agricultural Research Council (PARC), Karachi, for laboratory investigation. The laboratory investigation was carried out through wet mount techniques, including fresh normal saline solution and Lugol, iodine solution. Sedimentation, floatation and centrifugation procedures and techniques were also used. The data was analyzed statistically using standard deviation and mean.

Results

In the present study prevalence of intestinal parasites in children was 63.4% and 69.2% in adults. Six helminth and two protozoan parasites were collected. Among helminth parasites, 4 species of nematodes (*A. lumbricoides*, *T. trichura*, *E. vermicularis* and *A. duodenale*) and two species of cestodes (*T. saginata* and *H. nana*) were collected. Only two species of protozoan (*E. histolytica* and *Giardia* spp.) were collected. Mixed infection was observed only in 106 infected individuals including 81(51, 30), 21 (12, 9), 4(3, 1) as having two, three and four species of parasites in both < and > 15 years of age, respectively. Total collected stool samples were four hundred and twenty including two hundred and thirty eight from less than 15 years and one hundred eighty two from more than 15 years age, respectively. The mean age of < 15 is 9.53 and >15 is 32.8 years were reported, respectively (Table 1).

Table 1. Relation of age with intestinal parasites in the studied samples of education (students, staff and workers) in Swat, KP, Pakistan.

Parameters	< 15 years	> 15 years	Total	%
Total samples collected	238	182	420	
Total positive samples	151(63.4)	126 (69.2)	277	65.9
Total negative samples	87(36.5)	56 (3.7)	143	34.0
Mean age (Years)	9.53	32.8	19.6	

The prevalence of total number of intestinal parasites (Nematodes, Cestodes and Protozoans) were four hundred and twelve including 235 intestinal parasites in under 15 years and 177 in above 15 years were reported amongst two hundred and seventy seven individuals infected. All the recovered parasites were found in a variable distribution (Table 2).

Table 2. Prevalence of intestinal parasites (nematodes, other helminths and protozoans) in education (students, staff and workers) of Swat, KP, Pakistan.

Helminth / protozoan parasites	<15 years	>15 years	Total	%	
Nematodes	<i>A. lumbricoides</i>	85	79	164	39.8
	<i>T. trichura</i>	51	28	79	19.1
	<i>E. vermicularis</i>	18	16	34	8.25
	<i>A. duodenale</i>	10	5	15	3.64
Cestodes	<i>T. saginata</i>	29	24	53	12.8
	<i>H. nana</i>	32	10	42	10.1
Protozoans	<i>E. histolytica</i>	7	11	18	4.36
	<i>Giardia</i> spp.	3	4	7	1.69
Total no. of intestinal parasites	235	177	412		
Mean \pm SD	29.6 \pm 29.6	23.4 \pm 21.8	52.7 \pm 51.5		

The total number of infected cases in pattern of infections were 85, 86, in under and above 15 years age, respectively. More than half of the individual were having single infections, whereas above 15 years individuals were found to be more infected than below 15 years in age. *A. lumbricoides* was found more prevalent than other species of parasites in single infection (Table 3).

Table 3. Prevalence and pattern of single infected cases in < and > 15 years age in individuals related to education (students, staff and workers) in Swat, KP, Pakistan.

Parasites	< 15 years	>15 years	Total	%
<i>A. lumbricoides</i>	40	48	88	31.7
<i>T. trichura</i>	15	8	23	8.30
<i>E. vermicularis</i>	8	6	14	5.05
<i>A. duodenale</i>	1	2	3	1.08
<i>T. saginata</i>	10	12	22	7.94
<i>H. nana</i>	7	2	9	3.24
<i>E. histolytica</i>	4	4	8	2.88
<i>Giardia</i> spp.	0	4	4	1.44
Total no. of single infected cases	85	86	171	61.7
Mean \pm SD	10.6 \pm 12.82784	10.7 \pm 15.4	21.3 \pm 27.948	

The total number of infected cases in pattern of infections were 51, 30, 12, 9 and 3, 1 double, triple and quadruple infections in under and above 15 years age, respectively. Below 15 years individuals were found more infected than above 15 years age. *A. lumbricoides* was found more prevalent than other species of parasites in single as well as in the association of other species of parasites. The association of *A. lumbricoides* with *T. trichura* was frequently found in double cases while *A. lumbricoides*, *T. trichura* and *H. nana* in triple patteredn and *A. lumbricoides*, *T. saginata*, *A. duodenale* and *H. nana* as quadruple in association (Table 4).

The percentage of infection of helminths as well as protozoan parasites was calculated from the total number of parasitic infections (Table 2) while percentage of the number of infected individuals was calculated from the total number of collected samples (Table 3).

Table 4. Prevalence and pattern of mixed intestinal parasitic infections in under and above 15 years age in individuals related to education (students, staff and workers) in Swat, KP, Pakistan.

Parasites	< 15 years	>15 years	Total	%
Double infected cases				
<i>A. lumbricoides, T. trichura</i>	14	13	27	9.74
<i>A. lumbricoides, E. vermicularis</i>	8	4	12	4.33
<i>T. saginata, H. nana</i>	12	3	15	5.41
<i>A. lumbricoides, A. duodenale</i>	2	0	2	0.72
<i>A. lumbricoides, T. saginata</i>	6	4	10	3.61
<i>A. lumbricoides, Giardia spp.</i>	1	0	1	0.36
<i>E. vermicularis, T. saginata</i>	0	1	1	0.36
<i>T. trichura, T. saginata</i>	2	0	2	0.72
<i>A. lumbricoides, H. nana</i>	0	1	1	0.36
<i>T. saginata, H. nana</i>	1	1	2	0.72
<i>T. trichura, Giardia spp.</i>	1	0	1	0.36
<i>A. lumbricoides, E. histolytica</i>	2	1	3	1.08
<i>E. vermicularis, H. nana</i>	0	1	1	0.36
<i>T. trichura, E. histolytica</i>	1	0	1	0.36
<i>A. duodenale, H. nana</i>	1	0	1	0.36
<i>T. trichura, E. vermicularis</i>	0	1	1	0.36
Total no. of triple infected cases	51	30	81	29.2
Mean \pm SD	3.18 \pm 4.43	1.87 \pm 3.26	5.06 \pm 7.379	
Triple infected cases				
<i>T. trichura, A. duodenale, H. nana</i>	1	0	1	0.36
<i>A. lumbricoides, T. trichura, H. nana</i>	4	1	5	1.80
<i>A. lumbricoides, T. trichura, T. saginata</i>	1	0	1	0.36
<i>A. lumbricoides, T. saginata, H. nana</i>	3	0	3	1.08
<i>A. lumbricoides, H. nana, E. histolytica</i>	0	1	1	0.36
<i>A. lumbricoides, T. saginata, E. histolytica</i>	0	1	1	0.36
<i>T. saginata, H. nana, E. histolytica</i>	0	1	1	0.36
<i>A. lumbricoides, E. vermicularis, E. histolytica</i>	0	1	1	0.36
<i>E. vermicularis, T. saginata, Giardia spp.</i>	1	0	1	0.36
<i>A. duodenale, T. saginata,</i>	0	1	1	0.36

<i>H. nana</i>				
<i>T. trichura</i> , <i>A. duodenale</i> , <i>T. saginata</i>	0	1	1	0.36
<i>E. vermicularis</i> , <i>A. duodenale</i> , <i>T. saginata</i>	1	0	1	0.36
<i>A. lumbricoides</i> , <i>A. duodenale</i> , <i>T. saginata</i>	1	0	1	0.36
<i>A. lumbricoides</i> , <i>T. trichura</i> , <i>A. duodenale</i>	0	1	1	0.36
<i>A. lumbricoides</i> , <i>T. saginata</i> , <i>E. histolytica</i>	0	1	1	0.36
Total no. of triple infected cases	12	9	21	7.58
Mean \pm SD	0.8 \pm 1.20	0.6 \pm 0.50	1.4 \pm 1.121	
Quadruple infected cases				
<i>A. lumbricoides</i> , <i>T. saginata</i> , <i>A. duodenale</i> , <i>H. nana</i>	3	0	3	1.08
<i>A. lumbricoides</i> , <i>E. vermicularis</i> , <i>T. saginata</i> , <i>E. histolytica</i>	0	1	1	0.36
Total no. of quadruple infected cases	3	1	4	1.44
Mean \pm SD	1.5 \pm nil	0.5 \pm nil	2 \pm nil	

Discussion

In this study two thirds of the individuals were found infected with one or more than one species of parasite. This was close to the study conducted by Stoddart, 1999 (unpublished). The males were found more infected than females. Majority of the participants in the study were males as compared to females.

It was found that 65.9 % of the total studied samples from the individuals were infected with single or multiple species of parasites, while in Thailand up to 68 % of the total population harboured parasites. This number is two times higher than the national average (35 %) according to the national epidemiological survey conducted during 1996 (Jongsuksantigul, 1997). Upatham (1982, 1984) calculated high infection rate in age groups between 41-60 years in Thailand. Half of the infected individuals were found with one species of parasite while the other half were found with multiply infection. This finding suggests investigating the different intestinal parasitic infections in individuals belonging to education departments including both males and females. *A. lumbricoides*, *T. trichura* and *T. saginata* parasites were found more prevalent than *E. vermicularis*, *H. nana*, *E. histolytica*, *Giardia* spp., and *A. duodenale* parasites.

People in rural areas of Swat have difficulty to have good health care and basic health education; therefore diseases such as parasitic infections are still

prevalent in urban areas. Our findings as compared to other studies conducted in different parts of the country show that intestinal parasitic infections remain highly endemic and appear due to faecal contamination of drinking water, unhygienic living conditions, poor sanitary, lack of health care and health education. These findings strongly indicate a need for a comprehensive program to combat intestinal parasites, a risk factor for the humans of that area. In favour of the present study it is suggested that campaign of physicians, educationists and mass media should be launched as to create awareness among the people about parasitic disease transfer, hygiene and illiteracy. It is therefore requested that the Ministry of public health should arrange a number of programs for awareness, education and control.

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References

- Akhtar, T., Tehsin, N. & Usman, S. (1993). Intestinal parasitic burden in two local hospitals of Lahore. *Biologica*, 38: 41-48.
- Ali, N. (1993). *A survey of intestinal helminthes of man in Kurram agency*. M. Phil. Thesis, Department of Biological Sciences, Quaid-i-Azam University, Islamabad, Pakistan.
- Ansari, M.A.R. & Naru, N.A. (1968). Some incoming parasites of Lahore. *Pak. J. Med. Res.*, 7: 138-139.
- Baqai, R., Zuberi, S.J. & Khan, M.A. (1985). Pathogens in faecal samples from apparently healthy children. *J. Pak. Med. Assoc.*, 35: 307-308.
- Bilqees, F.M., Khan, A. & Ahmad, A. (1982). A survey of intestinal protozoan and helminthes parasites in Karachi. *Pak. J. Med. Res.*, 21: 54-57.

- Chaudhry, Z.H., Afzal, M. & Malik, M.A. (2004). Epidemiological factors affecting prevalence of intestinal parasites in children of Muzaffarabad district. *Pak. J. Zool.*, 36: 267-271.
- Farooqi, M.A. (1964). An investigation of human intestinal parasitism in some areas of Pakistan. *Pak. J. Med. Res.*, 3: 113-115.
- Haleem, M.A., Akram, M. & Akram, S. (1965). Intestinal parasitic infection in Karachi. *Pak. J. Med. Assoc.*, 15: 499-501.
- Jamil, F. (1999). *An analysis for the prevalence of human intestinal helminth parasites in urban and suburban communities of Islamabad*. M. Phil. Thesis, Department of Biological Sciences, Quaid-i-Azam University Islamabad, Pakistan.
- Jongsuksantigul, P. (1997). *Control of helminth infections of Thailand. Tropical Infectious disease: Now and Then, 1997*. The Medical Congress in Commemoration of the 50th Anniversary of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand, June 3-6.
- Kamran, S.A., Bilqees, F.M. & Salim, A. (2005). Protozoan intestinal infections fifteen months observation on in-patients and out-patients of Fatima hospital, Baqai Medical University, Karachi, Pakistan. *Proc. Parasitol.*, 40: 59-87.
- Khan, S.A., Shaikh, A.A. & Khan, R.M. (1993). Incidence of intestinal parasites in residents of Hyderabad and Latifabad. *Proc. Parasitol.*, 15&16: 1-4.
- Nawaz, M. & Nawaz, Y. (1983). Observations on incidence of intestinal parasitic infection in the food handlers of hostels of Peshawar University, NWFP. *Bull. Zool.*, 1: 63-70.
- Shah, S.H., Khaliq, M.A. & Subhani, F. (1986). Helminth infestation in Hazara division. *J. Pak. Med. Assoc.*, 36: 11-13.
- Pal, R.A. & Rana, S.I. (1983 a). Incidence of intestinal helminth parasites of man in the twin cities of Rawalpindi-Islamabad. *J. Pak. Med. Assoc.*, 33: 33-38.
- Pal, R.A. & Rana, S.I. (1983 b). Incidence of intestinal protozoan parasites of man in the twin cities of Rawalpindi-Islamabad. *J. Pak. Med. Assoc.*, 33: 156-161.
- Pal, R.A. & Subhani, F. (1989). Prevalence of intestinal helminth parasites in primary school children of Dir District (NWFP). *Pak. J. Sci. Tech.*, 13: 99-102.
- Qureshi, R.Q. (1995). *Intestinal helminth parasites with emphasis on hookworms of man in and around Islamabad*. M. Phil. Thesis, Department of Biological Sciences, Quaid-i-Azam University, Islamabad.
- Ravdin, J.I. (1995). Amebiasis. *Clin. Infect. Dis.*, 20: 1453-66.

- Shaik, G.S., Harani, M.S., Rathi, S.L., Khatri, P.R. & Harani, P.K. (2000). Pattern of intestinal parasitic infestation in Larkana, *Proc. Parasitol.*, 29: 61-66.
- Siddiqi, M.N. & Bano, I. (1979). Observations on parasitic infections in school children of Peshawar. *Pak. J. Zool.*, 11: 109-113.
- Stoddart, R.C. (1999). Parasitic Diversity: Intestinal helminth infections in primary school children from the Chitral and Kalash regions of the North West Frontier Province, Pakistan, Division of Environmental and Evolutionary Biology, Institute of Biomedical and Life Sciences, University of Glasgow, Glasgow, G12 8QQ Scotland, U.K. (unpublished paper).
- Upatham, E.S., Viyanant, V. & Kusathong, S. (1982). Morbidity in relation to intensity of infection in *Opisthorchiasis viverrini*: study of a community Kon Kaen, Thailand. *Am. J. Trop. Med. Hyg.*, 31: 1156-1163.
- Upatham, E.S., Viyanant, V. & Kusathong, S. (1984). Relationship between prevalence and intensity of *Opisthorchis viverrini* infection and clinical symptom and sign in a rural community in Northeast Thailand. *Bull. WHO.*, 62: 451-461.
- WHO (1981). Intestinal protozoan and helminthic infection. *Switzerland: Tech. Rep. Ser.*, 666: 18-28.

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