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Prevalence of intestinal parasites among school children in District Upper Dir, Khyber Pakhtunkhwa Pakistan

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Abstract

This study was undertaken to assess the prevalence of intestinal parasitic infection among school going children across District Upper Dir, Khyber Pakhtunkhwa Pakistan. A total of 222 stool specimens (156 from boys and 66 from girls) were taken from participants of age 4-15 years. Among 222 inhabitants 81 were included from urban and 141 from rural areas. Overall prevalence of parasitic infection was found to be (73.87%). A total of 10 different species (7 helminthes and 3 protozoans) were detected. The parasites encountered were *Ascaris lumbricoides* (54.50%), *Taenia saginata* (16.22%), *Hymenolepis nana* (10.81%) and *Taxocara* species (10.36%), *Trichuris trichiura* (6.76%), *Entamoeba coli* (5.41%), *Giardia lamblia* (2.25%), *Entamoeba histolytica* (1.3%), *Enterobius vermicularis* (1.3%) and hookworms (0.45%). *Ascaris* was more frequent (75.18%) in rural community, while *Taenia saginata* (35.80%), *Hymenolepis nana* (25.93%) and *Taxocara* species (28.40%) were more prevalent among urban population.

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Introduction

Parasites are organisms that depend upon other organisms for food and abode. Approximately most of the humans carry several different kinds of parasites. Parasites in often cases are restricted to digestive tract especially intestine. Intestinal parasites include both helminthes such as tape worm and flukes worms as well as protozoa like *Giardia*, *Cryptosporidium* and *Entameoba* sp. Intestinal infections are among the most common infections worldwide and so as in Pakistan. It is estimated that presently, due to parasitic infection, approximately 3.5 billion people are affected while 450 million are ill, majority of them being children (Jombo *et al*., 2010).

Intestinal parasites are responsible for causing some of the major diseases throughout the world such as amoebiasis, giardiasis, ascariasis, hookworm infection and trichuriasis. These diseases are closely related to the low socioeconomic status, poor sanitation, inadequate medical care and absence of safe drinking water supplies (Abu-Madi *et al*., 2008). Some of these diseases are often resulting in mortality, specifically in under develop or less develop countries of tropic and sub-tropic.

In Pakistan parasitic infection is one of the main causes of diarrhea. It affects about 170 to 400 million middle aged children annually. The immediate effects of helminthiasis include anemia and impaired cognition (NHSR Pakistan, 1998). The most common intestinal parasites in Pakistan are helminthes like *Ascaris lumbricoides*, *Hymenolepis nana, Trichuris trichiura* and *Entrobius vermicularis* and common protozoans including *Entamoeba* species and *Giardia lamblia* (Fung and Cairncross, 2009).

Owing to the severity of the issue research have been conducted on intestinal parasites in different parts of the world. Tasawar *et al*. (2010), Ensink *et al*. (2005), Qureshi *et al*. (1999) and Pal & Subhani (1989) carried out studies on intestinal parasites in different areas of the Pakistan. Sharif *et al*., (2010), Jombo *et al*. (2010), Siwila *et al*. (2010), Pourrut *et al*. (2010), Steinmann *et al*. (2010), Abdelmoneim *et al*. (2010), Hsieh *et al*. (2010), Eligial *et al*. (2010), Gamboa *et al*. (2011), Fung and Cairncross (2009), Abu-Madi *et al*. (2008), Kinfu and Erko (2008), and Mascie-Taylor *et al*. (2003) carried out research on intestinal parasites in different parts of the world.

Data regarding intestinal parasites for different areas of the Pakistan is available but no data appears in literature for the area under study. Therefore the present preliminary study was conducted to evaluate prevalence of intestinal parasites, during October and November, 2010, in school going children at District Upper Dir Khyber Pakhtunkhwa Pakistan.

Materials and methods

Study Area

District Upper Dir is situated with Latitudes and Longitudes of 35° 12′ 15″ N and 71° 52′ 20″ E respectively. District Upper Dir is having an area of 3,699 square Kilometers and lying along the border of Afghanistan between District Chitral, Bajaur Agency, District Lower Dir and District Kohistan. According to 1998 census report the population was 575,858 and population density was 194 / km² (502.5 / sq mile) (USAID, 2005).

Sampling and Data Analysis

Stool samples were collected from different schools within the study area. Collection was made from both boys and girls of different age groups. The methods of Sharif *et al*., (2010) were followed for collecting samples. A printed questionnaire was also filled from each selected student regarding age, name, sex, address, class, clinical history, socio-culture aspects and health related behavioral characteristics. The samples were analyzed in Parasitology laboratory, Department of Zoology, University of Peshawar through direct smear method and iodine staining method.

Results

A total of 237 stool samples were collected among which 15 samples were rejected on account of contamination with soil particles and urine. The rest 222 samples were examined under microscope for the

presence of intestinal parasitic infection in children of different ages ranged from 4 to 15 years. Out of total 222 respondents, 66 were girls and 156 were male. These were divided into four groups as shown in Table 1.

Table 1. Distribution of subjects by age.

S. No	Age groups	Male	Female	Total	Percentage
I	4-6	21	12	33	14.86%
II	7-9	49	30	79	35.59%
III	10-12	70	22	92	41.44%
IV	13-15	16	2	18	8.11%
Total		156	66	222	100.00%

Out of total 222 individuals 164 were found infected with an overall prevalence of intestinal parasites (73.87%). The highest infection, 88.89% (n=18), was observed in children with the age of 13-15 years while lowest parasitic infection (68.84%) with the age group of 10-12 years. Rate of intestinal parasitism and age distribution pattern among children (n=222) [(n %)] is shown in Table 2.

Table 2. Rate of intestinal parasitism and age distribution pattern among children.

Age interval	Infected		Uninfected	
Years	Number	%	Number	%
4-6 (n=33)	24	72.73%	9	27.27%
7-9 (n=79)	61	77.22%	18	22.78%
10-12 (n=92)	63	68.48%	29	31.52%
13-15 (n=18)	16	88.89%	2	11.11%
1-15 (n=222)	164	73.87%	58	26.13%

Total number of males and females children examined was 156 and 66 respectively. Distribution of parasites was higher among girls (80.3%) as compare to boys (71.5%). Of the total male and female students 111 and 53 were infected respectively. The highest prevalence (93.75%) was recorded in age group 13-15 in male children followed by age group 4-6 years (83.33%), age group 10-12 (81.82%) and age group 7-9 (80%) in female children. Female showed slightly higher prevalence of intestinal parasites as compare to male. Table 3 shows distribution of parasitic infection according to percentage, age and sex.

Table 3. Prevalence of parasitic infection according to age and sex.

Age	Male			Female		
	Examined	Positive	Percentage	Examined	Positive	Percentage
4-6	21	14	66.66	12	10	83.33
7-9	49	37	75.51	30	24	80.00
10-12	70	45	64.28	22	18	81.82
13-15	16	15	93.75	2	1	50.00
Total	156	111	71.15	66	53	80.30

of 7 different intestinal helminthes and 3 protozoan species were diagnosed. The most prevalent parasites were *Ascaris lumbricoides* (54.5%), followed by *Taenia saginata* (16.22%), *Hymenolepis nana* (10.81%), and *Taxocara* species (10.36%). Low prevalence was reported for *Trichuris trichiura*

(6.76%), *Enterobius vermicularis* (1.35%) and hookworm (0.45%). Among protozoan *Entamoeba coli* was the most prevalent (5.41%), followed by *Giardia lamblia* (2.25%) and *Entamoeba histolytica/dispar* (1.35%). Table 4 depicts distribution of intestinal parasites diagnosed. Figure 1 to 9 is showing the recorded parasites.

Table 4. Distribution of helminthes and protozoa among subjects investigated.

Parasite identified	Positive cases	Prevalence
A. lumbricoides	121/222	54.50%
T. saginata	36/222	16.22%
H. nana	24/222	10.81%
T. species	23/222	10.36%
T. trichiura	15/222	6.76%
E. coli	12/222	5.41%
G. lamblia	5/222	2.25%
E. histolytica/dispar	3/222	1.35%
E. vermicularis	3/222	1.35%
Hookworm	1/222	0.45%

Table 5. Observed Monoparasitism and polyparasitism cases.

Mode of infection	Positive cases	Percentage
Monoparasitism	102/222	45.95%
Double parasitism	47/222	21.17%
Polyparasitism	15/222	6.76%

Out of 164 (73.87%) positive cases, 102 (45.95%) were monoparasitised where as the rest 62 (27.92%) were polyparasitised with various combination of helminthes and protozoa. Mostly double combination was found between *Ascaris lumbricoides-Trichuris trichiura, Ascaris lumbricoides-Entamoeba coli, Ascaris lumbriciodes-Taenia saginata, Hymenolepis nana-Taenia saginata* and *Taenia saganita-Taxocara* spp. While polyparasitism was observed among *Ascaris lumbricoides-Trichuris trichiura-Hymenolepis nana, Ascaris lumbricoides-Taenia saginata-Taxocara* spp and *Ascaris lumbricoides-Hymenolepis nana-Taxocara* spp. Table 5 shows monoparastised and polyparasitised observed cases.

Table 6. Distribution of intestinal parasites among children in urban and rural areas.

Parasites	Rural		Urban		Total	
	Infected	Prevalence%	Infected	Prevalence%	Infected	Prevalence%
A. lumbricoides	106/141	75.18%	15/81	18.52%	121/222	54.50%
T. saginata	7/141	4.96%	29/81	35.80%	36/222	16.22%
H. nana	3/141	2.13%	21/81	25.93%	24/222	10.81%
Taxocara sp.	0/141	0.00%	23/81	28.40%	23/222	10.36%
T. trichiura	13/141	9.22%	2/81	2.47%	15/222	6.76%
E. coli	11/141	7.80%	1/81	1.23%	12/222	5.41%
G. lamblia	5/141	3.55%	0/81	0.00%	5/222	2.25%
E. histolytica	3/141	2.13%	0/81	0.00%	3/222	1.35%
E. vermicularis	1/141	0.71%	2/81	2.47%	3/222	1.35%
Hookworm	1/141	0.71%	0/81	0.00%	1/222	0.45%

Of the total respondents, 81 were from urban areas where as 141 were from rural areas. The highest prevalence in urban areas was observed for *Taenia saginata* (35.80%) followed by *Taxocara* species (28.4%), *Hymenolepis nana* (25.93%) and *Ascaris lumbricoides* (18.52%) while lowest prevalence was observed for *Entamoeba coli* (1.23%) and *Enterobius vermicularis* (2.47%). Among rural children highest prevalence was observed for *Ascaris lumbricoides* (75.18%), followed by *Trichuris trichiura* (9.22%), *Entamoeba coli* (7.80%), *Taenia saginata* (4.96%) and *Giardia lamblia* (3.55%) while lowest prevalence was observed for *Enterobius vermicularis* and hookworm (0.71%), *Hymenolepis nana* (2.13%) and *Entamoeba histolytica* (2.13%). Table 6 illustrates the distribution of subjects according to area of their residence.

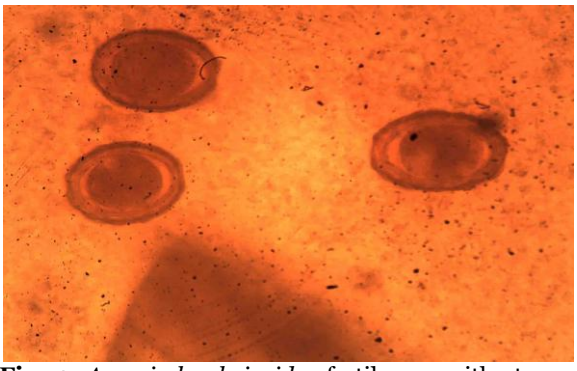

Fig. 1. *Ascaris lumbricoides* fertile ova with strong coarse mamilation (Magnification x400).

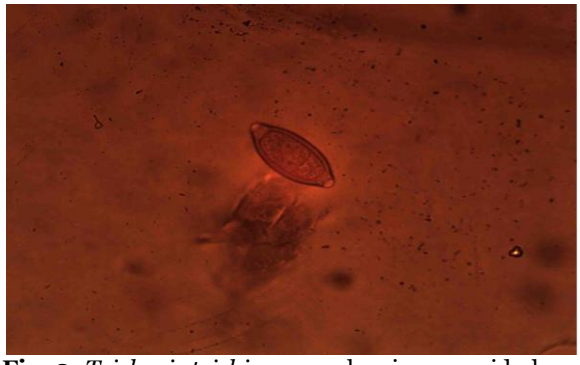

Fig. 2. *Trichuris trichiura* egg showing mucoid plugs at both ends (Magnification x400).

Discussion

Intestinal parasitic infection is one of the major health problems. It is closely related to poverty, type of living conditions, insufficient health care, personal and environmental hygiene, overcrowding, inadequate sanitation and availability of clean water supply (Crompton and Savioli, 1993; Chaudhry *et al.,* 2004). Different factors like sociogeographic and socioeconomic affect the public health. Based on the results obtained during the current study, prevalence of parasitic infections were more prominent in the areas where the basic amenities of life especially those concerned with human health are inadequate. People of those areas are less educated. There is no proper sanitation system and people use to rely on streams and lakes' water for drinking purposes.

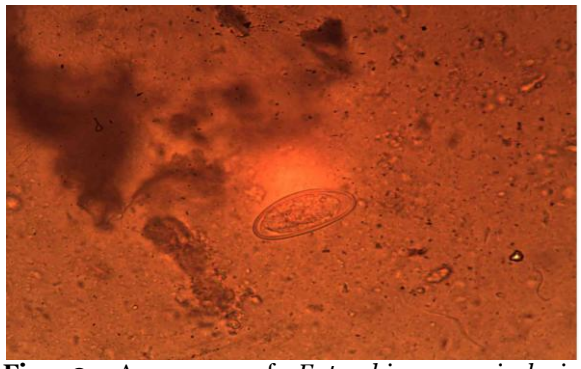

Fig. 3. An ovum of *Enterobius vermicularis* containing larva (Magnification x400).

Fig. 4. An ovum of *Necator americanus* (Magnification x400).

Association of parasitic infection with different factors like rural vs urban, and sex and age of the children were also studied. Locality wise results revealed that *T. saginita, H. nana, Toxocara sp. And E. vermicularis* were higher in urban areas' students while *A. lumbricoides, T. trichiura, G. lambelia, E. coli* and Hookworms were more prevalent in rural areas. Parasites were more prevalent in female students as compared to male students. Age group 13-15 years was the most affected group, followed by age

group 7-9 years while 10-12 years was the least affected group.

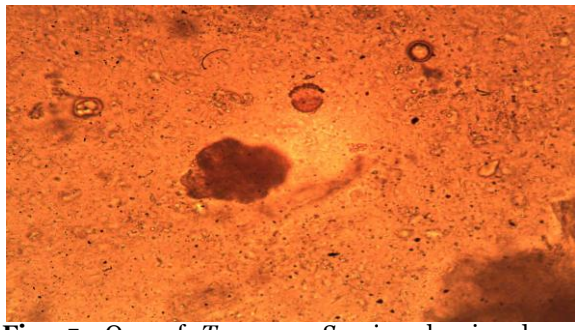

Fig. 5. Ova of *Taxocara Species* showing larva (Magnification x400).

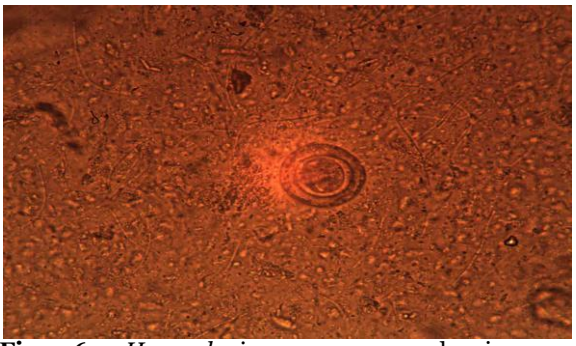

Fig. 6. *Hymnolepis nana* egg showing an onchosphere (Magnification x400).

The hygienic conditions in Pakistan are appealing and no importance is given to the disposal of animals and human excreta. As a result, there is a cumulative increase in the sources of parasitic infections. The villagers are usually poor and lack sense of sanitation and hygiene. Majority of Pakistani juvenile of age groups 5-9 years suffer from intestinal ailments such as diarrhea, abdominal pain and dysentery, because most of the children wander barefooted in fields and flood water areas. The same problems were observed during the study period for the students of the study area during school timings.

The percentage of parasitic infection (73.87%) is quite high in the district Upper Dir. The pattern revealed that a high percentage of primary school children from district Upper Dir have these parasites in the following order: *Ascaris lumbricoides*> *Taenia saginata*> *Hymenolepis nana*> *Taxocara species*> *Trichuris trichiura*> *Entamoeba coli*> *Giardia lamblia*> *Entamoeba histolytica/dispar*> *Enterobius vermicularis*> Hookworm.

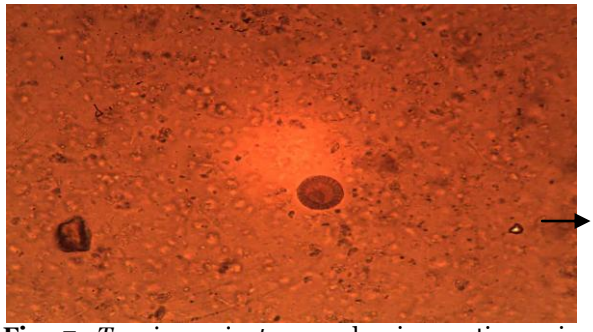

Fig. 7. *Taenia saginata* egg showing cysticercosis (Magnification x400).

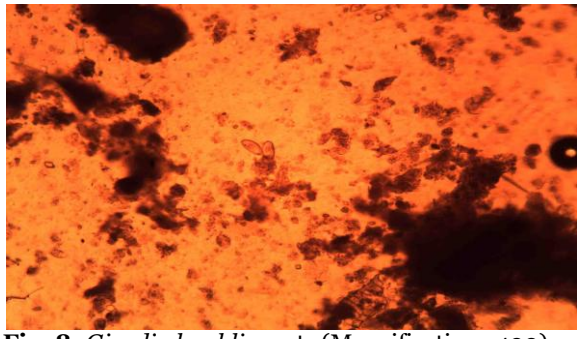

Fig. 8. *Giardia lamblia* cysts (Magnification x400).

It is concluded that intestinal parasitic infection is common among school going children of the study area. In order to avert the harmful effects and complications of this ignored problem, prompt preventive measures should be taken for eradication of high infestation rate. Some remedial actions such as public health promotion, mass awareness, clean water supply, sanitation facilities, promoting personal hygiene and periodic deworming of the children should be taken. Owing to WHO recommendation, high priority should be given to the deworming program for the study area in order to mitigate the current scenario, as the intestinal parasites prevalence rate is quite high for the study area.

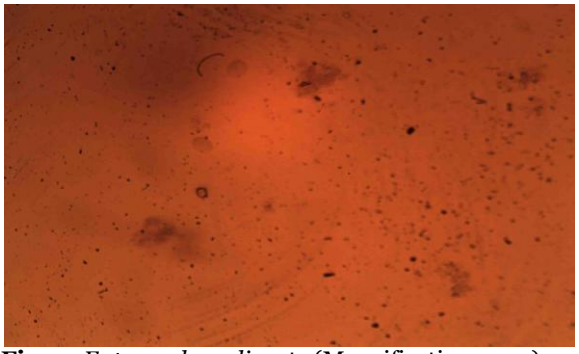

Fig. 9. *Entamoeba coli* cysts (Magnification x400).

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