



Pattern Of Intestinal Parasitic Infection In School Children Of District Malakand, Pakistan

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Abstract

Intestinal parasites either helminths or protozoans are a common health problem particularly in remote areas. This research was aimed to explore the prevalence of intestinal parasitic infection in school children of district Malakand, Pakistan. A total of 315 fecal specimens were examined by using direct smear methods and concentration techniques. Two hundred and fifty six (81.2%) children were found infected with one or more than one intestinal parasites. One hundred and sixty seven (53.2%) of the children were infected with single parasite and one hundred and four (32%) with multiple infections. *Ascaris lumbricoides* 26.0% (n=82/315), hookworm 13.9% (n=44/315), *Trichuris trichura* 4.75% (n=15/315), *Hymenolepis nana* 3.81% (n=12/315), *Taenia saginata* 2.51% (n=8/315) and *Enterobius vermicularis* 1.91% (n=6/315) were detected as single infection in order of their prevalence, multiple infections have also been observed. The male students were found more infected as compared to females ($P<0.05$). No significant association was recorded among the ages and parasitic infection ($P<0.05$). However, higher age groups were found more infected as compared to lower ones. Due to the fact that school children is coming in the group at higher risk for intestinal parasitic

CC License CC-BY-NC-SA 4.0	infection is especially important for investigation. Such studies should continue time to time to report the prevalence and impact of IPIs in the far flung areas of the country. Keywords; Poverty related infection, Neglected tropical diseases, Soil transmitted helminths, School children, Public health problems
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INTRODUCTION

The infection of intestinal parasite, out of 300 million, people are infected and in the most targeted is 50% school children's (Adil *et al.*, 2003) causes a few important diseases worldwide, such as *giardiasis*, *amoebiasis*, hookworm contamination, *ascariasis*, *enterobiasis*, and *trichuriasis*, as well as contributing operators for long-lasting disease such as frailty, damaged child improvement, intellectual and bodily well-being difficulties, diarrheal infections, spewing, ailing health, protein exhaustion, vitamin lacks and indeed causes intestinal issues (Quihui *et al.*, 2006).

Intestinal parasite interruption can be a around the world thriving issue and as a burden of brutal uneasiness interior the occupants of third world nations of the world as well as in Pakistan. Contemptible trade of fecal surface, overpopulation, dangerous drinking water, no toilet framework, not genuine blue cleanliness, the mindlessness of individuals, no unprecedented sterile concern and advancement of publics, close contact with wild creatures, and for the foremost portion accessories with soil due do muddled houses, gravely made qualification in the transmission of intestinal parasites debasement and spreading in tall rate. Since the beginning of the century, educational success has been adversely linked to hookworm infections (Waite *et al.*, 1919).

A few workers have published their research on IPIs in different areas of Malakand region such as (Rahman *et al.*, 2021, Ulhaq *et al.*, 2021, Khan *et al.*, 2021, Khan *et al.*, 2020, Khan *et al.* 2019, Khan *et al.*, 2019, Arshad *et al.*, 2019, Khan *et al.*, 2018, Khan *et al.*, 2017, Khan *et al.*, 2016, Khan *et al.* 2015, Ullah *et al.*, 2014, Khan *et al.*, 2012, Khan *et al.*, 2011) but no study and literature available for the current study area. This study was aimed to investigate prevalence and associated risks of intestinal parasitic infection in school age children of district Malakand, Pakistan.

METHODOLOGY

Study area

A survey was carried out during 2020 in Malakand district, KP. the Malakand district is surrounded by district Lower Dir in the North, Swat district in the East, Bajaur and Mohmand agencies in the west, Charsada in the South West and Mardan district in South East. The total area of district Malakand is 952 km². The longitude for Malakand, Pakistan is: 71.9045649 and the latitude is 34.5030413. It is characterized by hot summer and cold winter. The lowest temperature is approximately 19.9 °C and the maximum temperature is 30 °C. June is warmest month of the year and the coldest month of the year is January. The annual rain fall 743 mm. Snowfall does not usually occur on the top of several mountains, which once melts quickly. The general climate is extreme. The current study was conducted in school children of district Malakand (Figure 1).

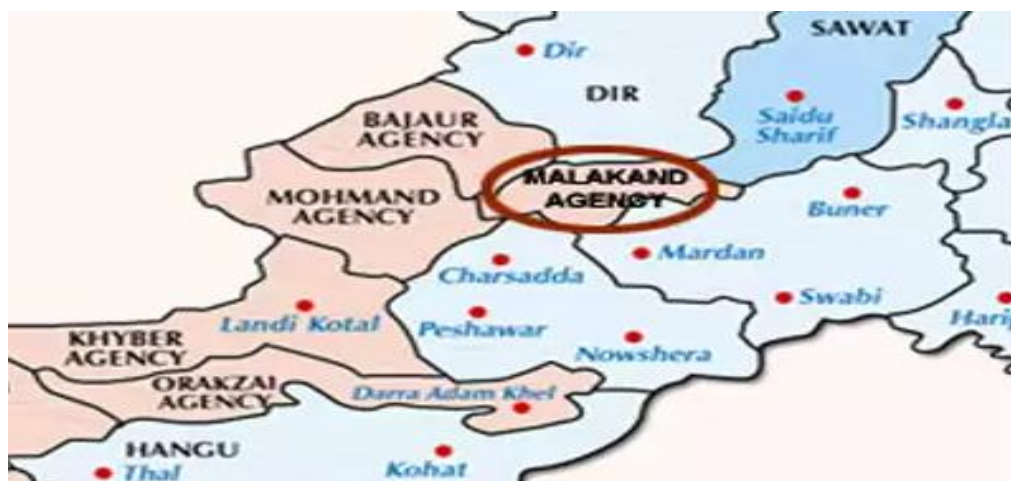


Figure 1. Map of the study area (District Malakand), KP, Pakistan

Materials used in the study

The material which I have used during laboratory work are bottles which used for fecal collection, formalin are used to keep the fecal material fresh and escape bad odor. A Microscope which is used to examining the stool samples, Slides which used to study the samples under the microscope, Tissue papers used for cleaning of slides and microscopic lenses, for the collection of fecal material from the bottle is used is Dropper, filtering out process used Beaker, to avoid to direct contact with fecal materials used Gloves, conical flask is used for filtration, and Stirrer are used for to mix fecal materials with formalin and other solution.

Sample collection and processing

All conceivable germ-free procedure was followed for quality control protection, expendable gloves were worn and face was covered with a mask. For an assortment of faces tests, every single student was given an expendable plastic bottle and spoon and they were educated on how to gather the example. Fecal examples were gathered from each student on 1st day, these stool specimens were secure in 10% formalin, and were conveyed to the Laboratory of Parasitology, Department of the Zoology University of Malakand, KP, Pakistan, where they were inspected though the light magnifying instrument by utilizing of floating technique, Direct smear strategy in Lugol's answer and normal salt solution. By these 2 methods, the collected samples from each and every student were examined for the identification of intestinal parasite (Yu *et al.*, 2018).

Examination of Faecal Samples

Direct Smear Methods

One of the drops of 10% formalin with one gram of fecal materials was combined through wooden applicator and studied under microscope for parasite identification (Truscott *et al.*, 2017)

Floating Method

Stool materials of a 1gram were applied to NaCl 4 percent scheme and were completely combined. This suspension was discharged into a cylinder, and an additional coasting arrangement was used for full cylinder filling. The cylinder will remain standing for 15 to 20 minutes, just as the spread slip. At that point, the spread slip under magnifying lens was evacuated and inspected (Kumar *et al.*, 2014)

Processes

The early phase of the current exploration appointments to different schools. The head educators of the visited schools were wished to provide their approval. The poll was set up to evoked data on the segment information (age and sexual orientation) just as a financial profile of the occupants (source of water and source of food creatures at home, source of latrine, nail status, weight, size ,area, and clinical manifestations (irritation, Pain in abdomin and stomach), ecological sanitation and day to day environment characteristics (season, contact with local creatures and soil) which was utilized to quantify the torpid hazard factors for IPIs. On the first day of enlistment, every current study was furnished with an empty fecal jug having an understanding structure; both marked with unmistakable ID numbers. Every one of the compartments and assent structure was named with name, class evaluation, and age. Fecal examples were gathered starting at everything about on the second day, these fecal jugs were protected in 10% formalin, and will be moved to, Parasitology Laboratory, University of Malakand, where the samples were inspected with the assistance of a light microscope by utilizing direct smear methods including Lugol's Iodine and common salt.

RESULTS

The total collected stool samples 315 from both boys and girls. Out of the total collected samples was 315, from boys 190 samples and from girls 125 samples were collected. The current study prevalence IPIs infection report shows that in boys was 60.3% (n=190) and girls 39.6% (n=125) were reported. This study shows that the male students were more infested as compared to female students of Malakand District. From both boys and girls, *A.lumbricoides* was the most common prevalent. The Age group of 10-12 years was found extremely infested 93.7% (n=60) with IPIs which is shadowed by 13-15 year-age which was 89.2% (n=25) than the age-group of 7 to nine years 79.1% (n=72) the low infection rate were 75% (n=99) from the 4-6 age group.

Demographic characteristic of the study population

For the parasitic examination for the presence of IPIs in the schools-going children from both male 60.3% (n=190) and female 39.6% (n=125) total of 315 fecal samples were collected. The total rate of prevalence was reported in the current study is 81.7%. The Mean & SD of the demographic characteristic are 157 ± 45.9 (Table I).

Representative	Total	%
Male	190	60.3
Female	125	39.6
Total	315	100

Table I. Demographic characteristics of the studied population

Sex wise frequency of school children

In the current study the total collected samples, 315 the frequency of parasitic infection was 81.2% including both Male 84.2% (n=160) and female student was 76.8% (n=96). While in the present was collected negative for male 15.7% (n=30) and a female student was 23.2% (n=29). P Value >0.005) (Table II).

Table II. Sex wise frequency of school children both male and female of the study area

Gender	Number examined	Number positive	Number negative	P Value
Male	190	160 (84.2)	30 (15.7)	0.0991
Female	125	96 (76.8)	29 (23.2)	
Total	315	256 (81.2)	59 (18.7)	

Sex and age wise relationship of students take part in the study

In the present study of District Malakand for the prevalence IPIs in school-going to children's age is a solid and approved sign of this Infection. During the collection of stool samples, maximum number of the students were contributed in the age of 4-6 years followed by 7-9, 10-12 year, and 13-15 years of age student individually in together males and females P Value >0.005) (Table III)

Table III. Sex and age wise relationship of students take part in the study

Age group	Male	Female	Total	P Value
4-6	86	46	133(41.9)	0.5256
7-9	52	39	91(28.7)	
10-12	36	28	64(20.3)	
13-15	16	12	28(8.88)	

Age wise relationship of IPIs among school children of the study area

In current study children of age 10-12 years were found highly infection rate 93.7% (n=60) with parasitic infection followed by 13-15 year of age which was infected 89.2% (n=25), age group of 7-9 years 79.1% (n=72), while the age of 4-6 years has the lowest rate of infection 75% (n=99). The student which highly uninfected 78.5% (n=22) which followed by 10-12 age group 25% (n=16) then 8.79% 7-9 (n=8) age group of was observed. Whereas the lowest rate of uninfected (n=13) which show is 9.84% and reported in the current study. P Value <0.005) (Table IV).

Table IV. The intestinal parasite distribution of and age among school children of the study area

Age (Years)	Infected	Uninfected	Total	P Value
4-6	99 (75)	13(9.84)	112(41.9)	< 0.0001
7-9	72(79.1)	8(8.79)	80(28.8)	
10-12	60(93.7)	16(25)	76(20.3)	
13-15	25(89.2)	22(78.5)	47(8.88)	
1-15	256(81.2)	59(18.7)	315(100)	

Pattern of mono parasitism in school children of the Study area

A total of 315 infested students 53.02% (n=167) with a single parasitic species infection founded. The mono parasitic species was reported as *Ascaris lumbricoides* 26.02% (n=82), *Trichuris trichura* 4.75% (n=15), *Enterobius vermicularis* 1.91% (n=6), hookworm 13.97% (n=44), *Taenia saginata* 2.51%(n=08), and *Hymenolepis nana* 3.81% (n=12) correspondingly. *Ascarislumbricoides*26.02% (n=82) was, in the present study the most occurring IPIs is *Ascaris lumbricoides* followed by hookworm 13.96% (n=44) and *Enterobius vermicularis*1.90% (n=6) was the least common single parasitic infection (**Table V**).

Table V. Intestinal parasitic infection with Mono parasitism in school children of the Study area

Pattern of infection	Species No.	Parasites spp	Prevalence (%)
Mono-parasitism	One species (n=167)	<i>Ascaris lumbricoides</i>	82 (26.02)
		Hookworm	44(13.97)
		<i>Trichuris trichura</i>	15(4.75)
		<i>Enterobius vermicularis</i>	06 (1.91)
		<i>Taenia saginata</i>	08 (2.51)
		<i>Hymenolepis nana</i>	12 (3.81)
Total Mono-parasitism			167 (53.02)
Total infected student			256 (81.26)

Pattern of poly-parasitism in school children

The school children 32.2% (n=104) were found infected with more than one parasite species (**Table VI**).

Table VI. Intestinal parasitic infection with poly-parasitism in school children

Poly-parasitism	2 Species(n=72)	Parasites	Prevalence
		<i>A-lumbricoides</i> + Hookworms	20 (6.17)
		<i>H-nana</i> + <i>A-lumbricoides</i>	12 (3.70)
		<i>A-lumbricoides</i> + <i>T- trichura</i>	10 (3.08)
		Hookworms + <i>H- nana</i>	08 (2.46)
		<i>T-trichiura</i> + <i>E-vermicularis</i>	15 (4.62)
		Hookworms + <i>E-vermicularis</i>	07 (2.16)
Sub total			72 (22.2)
	3 species n=24	Hookworms + <i>A- lumbricoides</i> + <i>H- nana</i>	11 (3.39)
		<i>A- lumbricoides</i> + <i>H -nana</i> + H- worm	05 (1.54)
		<i>H- nana</i> + <i>T- trichura</i> + <i>A- lumbricoides</i>	02 (0.61)
		<i>E-vermicularis</i> + Hookworm + <i>H –nana</i>	04 (1.23)
		<i>T- saginata</i> + <i>E-vermicularis</i> + Hookworm	01 (0.30)
		<i>T- saginata</i> + <i>E- vermicularis</i> + <i>T-saginata</i>	01 (0.30)
Sub total			24 (7.40)
	4 species n=08		
		Hookworm + <i>T- saginata</i> + <i>A-lumbricoides</i> + <i>H-nana</i>	04 (1.23)
		Hookworm+ <i>E-vermicularis</i> + <i>A-lumbricoides</i> + <i>H-nana</i>	03 (0.92)
		<i>A-lumbricoides</i> + <i>H-nana</i> + <i>T-trichura</i> + <i>T-sagina</i>	01 (0.30)
Sub total			08(2.46)
Total parasitism			104 (32.0)
Total infected student			256 (81.2)
Total sample examined			315

School-wise distribution of parasitic infection amongst school children of the study area

For the current study total of 315 samples were collected to find out the intestinal parasite infection at district Malakand. Seven different schools were selected for the collection of stool specimens. Over all 80.9% of the school children were found infected with intestinal parasites (Table VII).

Table VII. School-wise distribution of parasitic infection amongst school children of the study area.

Government primary school Name	Number of Samples examined	Number of samples Infected	%
Akbar Abad (34.6072° N, 71.9597° E)	50	42	13.3
Batkheela Upper(34.62°N 71.97°E)	45	32	10.1
Hatim Banda(34 15' 40"N, 71 59' 01"E)	50	39	12.3
Barawal (35.1320° N, 71.6911° E)	40	35	11.1
Chakdara (34.6666° N, 72.0290° E)	45	38	12.0
Batkheela lower (34.62°N 71.97°E)	50	40	12.6
Amandara (34.6202° N, 71.9928° E)	35	30	9.5
Total	315	256	81.26

DISCUSSION

The present research was carried out on primary schools children in Malakand Pakistan. Prevalence of IPIs in present study was showing 81.2% which is similar to the studies conducted in various parts of Pakistan such as Shakoor et al., 2018; Ahmad et al., 2015; Khan et al., 2015; Anwar et al., 2018; Khushdil et al., 2016; Khan et al., 2019; Khan et al., 2022; Rahman et al., 2021. Some lower rate of over all prevalence was reported by Arshad et al., 2019; Kosar et al., 2017; Ghani et al., 2016 in different parts of Pakistan. Several studies conducted and reported a variable rate of prevalence of intestinal parasitic infection in different parts of other countries of the world as Shakya et al., 2019; Bonisov et al., 2019; Sitotaw et al., 2020.

The most common intestinal parasite in present study was *A. lumbricoides* 53.7%. Results can be compared with other studies conducted by Abdullah et al., 2019; Yousaf et al., 2020; Vasailar et al., 2019; Robert et al., 2018; Endalamaw, 2020; Borisov et al., 2019; Atuhaire et al., 2021; Girma et al., 2019.

Hook worms was reported as 13.97% in present study which is almost match able with the studies conducted by Chaudhry et al., 2004; Khan et al., 2018; Shakoor et al., 2018; Nisa et al., 2011; Khan et al., 2019; Khan et al., 2017; Khan et al., 2017; Shaikh et al., 2003; Shaiket et al., 2000. The infection rate is lower in other surveys such as Ali et al., 2016; Khan et al., 2012; Khan et al., 2015; Khan et al., 2011; Khan et al., 2018; Ahmad et al., 2015; Khan et al., 2019; Muhmood et al., 2018; Khan et al., 2012; Mehmood et al., 2009; Ilyas et al., 2018; Ullah et al., 2014; Mirza et al., 2012; Arshad et al., 2019). The higher infection rate was reported such as Dar et al., 2013). Lack of education, improper sanitation and drinking water facility play the major role in causing infection.

Enterobius vermicularis is commonly known as thread worm or seat worm is an intestinal round worms parasites and commonly called as pinworm. The overall prevalence was 1.91 % (n=06) which is comparable with the studies of Shaiket et al., 2000; Sajad et al., 2009; Shah And Akhtar., 2014; Shah and Akbar, 2014; Ullah et al., 2014; Sheikh et al., 2003. The higher prevalence of this pin worm was evidenced by the findings of Shakoor et al., 2018; Ahmad et al., 2015; Khan et al., 2017; Khan et al., 2018; Khan et al., 2012; Khan et al., 2015; Khan et al., 2019; Khan et al., 2017. The incidence rate of *E. vermicularis* in current study negligible and recommended to pick up the poor living condition, health education, sanitization, and contaminated water supply to reduce intestinal parasitic infection among children.

Trichuris trichiura is a nematode and has the broadest geographic range of distribution. some high rate of prevalence *Tricuris trichura* in present study was 4.75%. This is comparable with the research findings of Ahmad et al., 2012; Shaikh et al., 2000; Shikh et al., 2003; Kosar et al., 2017; Ali et al., 2016; Arshad et al., 2019; Chudary et al., 2004; Shah and Akber., 2014; Anwar et al., 2018). Some high rate of prevalence was reported as Khan et al., 2019; Khan et al., 2017; Khan et al., 2015; Khan et al., 2012; Khan et al., 2011; Nisa et al., 2011; Khan et al., 2014; Khan et al., 2018; Khan et al., 2018; Khan et al., 2019; Khan et al., 2019; Ullah et al., 2014; Maqbool et al., 2007.

Taenia saginata is also known as beef tapeworm. The prevalence rate was 2.51% in present study. This study is comparable with Dar .,2013; Nisa *et al.*,2011; Shaiket *et al.*.,2000; Khan *et al.*.,2017; Sheikh *et al.*.,2003; Khan *et al.*,2018; Ali *et al* 2018; Khan *et al.*, 2015.

Hymenolepis nana was noted with 3.81 % prevalence in this study which is comparable with Haider *et al.* .,2018; Ilyas *et al.* ., 2018; Muhammad *et al.* .,2018; Mehmood *et al.* .,2009; Shakoor *et al.* .,2018; Ahmad *et al.* .,2012; Maqbool *et al.* .,2007; Khan *et al.*., 2019 Khan *et al.* .,2018; Kosar *et al.* .,2017; Chaudhry *et al.* .,2004; Mirza *et al.*,2012. Some higher rate of prevalence was reported by Shaiket *et al.*,2000; Shaikh *et al.* .,2003; Khan *et al.* .,2000; Ahmad *et al.*,2015; Khan *et al.* .,2018; Ullah *et al.* .,2014; Khan *et al.* .,2012; Khan *et al.* .,2015; Khan *et al.*,2017; Arshad *et al.* .,2019; Anwar *et al.* .,2018; Shah and Akbar.,2014; Sajjid *et al.* .,2009; Nisa *et al.* .,2001; Ansari *et al.* ., 2018; Khan *et al.* .,2011; Khan *et al.*,2019. Intestinal parasitic infections are directly associated with the low socioeconomic status. Furthermore, peoples of rural areas are more facing poor cleanliness system which has a key role in the high occurrence of these infections.

CONCLUSIONS

Based on our findings it may be concluded that intestinal parasites act as a common health problem amongst school-going children. Male students were more infected as compared to females. *A.lumbricoides* was the most common intestinal parasite, followed by hookworm, *T. trichura*, *H. nana*, *E. vermicularis*, *T. saginata*, and *E. histolytica*. The most affected group was the age group of 10-12 years, followed by the age group of 13-15 years, as compared to 4-6 years age.

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