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Prevalence And Socioeconomic Impact Of Intestinal Parasitic Infections In School-Age Children Attending Private And Public School

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ABSTRACT

Background: Intestinal parasitic infections remain a significant public health concern globally, particularly affecting school-age children in developing countries. This study aimed to assess the prevalence of intestinal parasites and identify hygiene-related predictors among school-going children in Peshawar, Pakistan. **Methods:** A descriptive cross-sectional study was conducted from August to October 2023, involving 162 school children aged 5–15 years from two public and two private schools in Peshawar, Khyber Pakhtunkhwa. Stool samples were

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collected and examined using direct wet mount and formal ether concentration techniques. Data on socio-demographic factors and hygiene practices were gathered through a pretested structured questionnaire. Statistical analysis was performed using SPSS-22. **Results:** The overall prevalence of intestinal parasitic infections was 43.2% (70/162). Children attending public schools showed significantly higher infection rates (51.8%) compared to those in private schools (34.5%) (p=0.02). Male students demonstrated higher prevalence (50.0%) than female students (35.5%) (p<0.05). Nine parasite species were identified, with *Entamoeba histolytica* being the most prevalent (30.0%), followed by *Ascaris lumbricoides* (17.0%), *Hymenolepis nana* (10.0%), and *Enterobius vermicularis* (10.0%). Significant associations were found between parasitic infections and finger sucking (p=0.03), nail biting (p=0.01), proper hand washing with soap (p<0.001), and proper toilet use (p=0.01). Socioeconomic status also correlated with infection rates, with children from poorer families showing higher prevalence. **Conclusion:** The high prevalence of intestinal parasitic infections among school children in Peshawar, particularly in public schools and among lower socioeconomic groups, underscores the urgent need for targeted interventions. Comprehensive strategies including improved health education, access to clean water, sanitation facilities, and promotion of proper hygiene practices are essential to reduce the burden of parasitic infections and support healthy child development in Pakistan.

Keywords: Intestinal parasites, school children, prevalence, hygiene practices, socioeconomic factors, Peshawar, Pakistan

Introduction

Parasitic diseases affecting the digestive system are prevalent globally, with the highest burden observed in developing countries due to factors such as personal hygiene, environmental sanitation, socioeconomic conditions, and demographics (Amare et al., 2013). Approximately one-third of the global population harbors soil-transmitted helminths (STH), with Asia ranking among the highest in prevalence of ascariasis, hookworm, and trichuriasis (Al-Haidari et al., 2021). Communities facing extreme poverty bear a disproportionate burden of STH infections, which are transmitted through eggs present in human feces contaminating the soil in areas

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with insufficient sanitation. The most prevalent STH infections include roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*), and human hookworms (*Necator americanus* and *Ancylostoma duodenale*) (Gizaw et al., 2019).

The impact of STH infections on global health, measured in disability-adjusted life years (DALYs), has ranged from 4 million to 39 million, with at least 1.3 billion people infected worldwide in 2010 (El Sahn et al., 1997). Children bear the brunt of this disease burden, with the World Health Organization projecting that 875 million children would require routine STH therapy. Affected children may suffer from anemia, malnutrition, growth stunting, and impaired cognitive development (López Arias et al., 2022). These infections often occur through playing in contaminated soil, contact with sharp objects, or ingestion of contaminated food and water (Mawa et al., 2021).

Intestinal parasitism poses a significant public health challenge, particularly affecting preschoolers and school-age children from low-income families who are more vulnerable to re-infection (Miranda et al., 2021). These infections severely impact children's physical and mental development, school attendance, and academic performance, potentially creating a cycle of poverty through reduced future income-earning capabilities (Singer et al., 2020). Despite these consequences, prevalence remains unclear due to underestimation in at-risk communities, insufficient national surveillance, and low sensitivity in routine microscopic stool examinations (Singh et al., 2021).

Water, Sanitation, and Hygiene (WASH) interventions significantly reduce STH infection risk. The presence and utilization of latrines decreases the likelihood of mixed STH infections by approximately 50%, while hand washing practices and WASH training emerge as successful prevention strategies (Wang et al., 2022). However, challenges persist in low- and middle-income countries where unimproved household flooring, lack of clean water, and inadequate sanitation facilities exacerbate transmission (Zerdo et al., 2022).

In addition to being underestimated in resource-limited countries, intestinal parasites are frequently underreported in the United States. Healthcare professionals often lack suspicion and fail to test for these infections, reflecting shortcomings in medical education systems. Furthermore, most intestinal parasitic infections are not

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reportable at federal or state levels, contributing to surveillance gaps (Karakuş et al., 2022). The present study addresses these challenges by assessing the prevalence of intestinal parasites and determining hygiene-related predictors among school-going children in Peshawar, Pakistan.

METHODOLOGY

This descriptive cross-sectional study took place in Peshawar, Khyber Pakhtunkhwa, Pakistan, spanning from August 2023 to October 2023. The research focused on 162 school students who willingly participated in the study. The inclusion criteria encompassed asymptomatic school children aged 5 to 15 years, irrespective of gender, while those exhibiting symptoms of gastrointestinal infection were excluded. The sample pool was drawn from four randomly selected schools, comprising two from the private sector and two from the public sector in Peshawar.

Of the total 162 stool samples, 81 were collected from public sector school students, and 81 from their private sector counterparts. The gender distribution among the participants comprised 76 samples from girls (46.9%) and 86 samples from boys (53.1%).

Data collection utilized a pretested structured questionnaire designed to capture information on socio-demographic factors and associated risk elements. Details such as age, gender, residence, father's income, household water source, family particulars, as well as personal habits like finger sucking and nail biting, along with any personal complaints from the participants, were documented through the questionnaire.

Stool specimens were collected in sterile, screw-capped disposable plastic containers, each weighing 1.5–2 grams, and devoid of additives. These specimens were promptly transferred to the laboratory within 4 hours of collection. Laboratory analysis involved examining all samples under a microscope using a direct wet mount and the formal ether concentration technique. The comprehensive data underwent analysis using SPSS-22, with the findings presented through various visual aids such as tables, pie charts, and bar graphs. The research aimed to provide insights into the prevalence of gastrointestinal infections among school children in the specified region during the stated timeframe.

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RESULTS

PREVALENCE OF INTESTINAL PARASITE AMONG SCHOOLS

The study revealed that 70 out of the 162 stool samples (43.2%) exhibited intestinal parasite infections. Notably, a statistically significant difference in infection rates was observed between students in public and private schools, as indicated by a p-value of 0.02, which was less than the threshold of 0.05. Specifically, 42 (51.8%) of the 81 students from government schools tested positive for parasites, while 28 (34.5%) of the 81 students from private schools showed evidence of infection.

PREVALENCE OF INTESTINAL PARASITE AMONG GENDER

The analysis further identified nine different types of parasites infecting both boys and girls in both public and private schools in Peshawar. Among the male students, 43 (50%) were found to be infected, whereas among the female students, 27 (35.5%) were afflicted. This difference in infection rates between the two gender groups was statistically significant ($p<0.05$). These findings underscore the prevalence of intestinal parasite infections among school children in Peshawar.

Table 1: ***Shows Absence & Presence Of Intestinal Parasite In Students Of Different Categories***

		Presence of Intestinal Parasite in students N=70	Absence of Intestinal Parasite in students N= 92	Total number of Students
GENDER	BOYS	49	43	92
	GIRL	27	43	70
AGE (Years)	5-8	33	35	68
	9-12	19	22	41
	13-15	18	35	53
SES	GOOD	09	10	19
	FAIR	17	36	53
	POOR	44	46	90

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SCHOOL PUBLIC	42	39	81
PRIVATE	28	53	81

COMMON TYPES OF PARASITES

Hookworm infection is detected in 8.6% of the stool samples. This suggests a moderate prevalence of hookworm among the studied population. Trichuriasis is identified in 5.7% , Hymenolepis nana (10%), Giardia lamblia(5.7%), Ascaris lumbricoides (17%), Taenia saginata (8.6%),Enterobius vermicularis(10%). Entamoeba histolytica, highly prevalent, being found in (30%) of the samples. This signifies a significant occurrence of amoebiasis among the school-age children. Diphyllobothrim Latum (4.3%), indicating a relatively lower prevalence of this particular intestinal parasite.

This findings reveal a diverse range of intestinal parasites with varying prevalence rates. Certain parasites, such as Entamoeba histolytica, Ascaris lumbricoides, and Hymenolepis nana, are particularly common among the studied population.

LIFESTYLE FACTORS IMPACT ON PRESENCE OF INTESTINAL PARASITIC INFECTIONS

Of the six factors, including general health, preferred types of drinking water, toilet use method, frequency of hand washing with soap, nail biting and finger sucking habit showed significant higher prevalence of presence of intestinal parasites. A significance value of finger sucking (P=0.03), nail biting (P=0.01), proper hand wash with soap (P=0.00), proper toilet use (P=0.01) suggests that there is a statistically significant association between them and parasitic infections among the students.

The significance value of (P=0.08) suggests a marginal association between drinking water and parasitic infections, while not strongly significant, but there may be a potential relationship between the quality of drinking water and parasitic infections among students.

A significance value of (P=0.3) indicates that there is no statistically significant association between general health and parasitic infections. The overall health status of the students, as indicated by the survey, may not be a major contributing factor to parasitic infections.

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DISCUSSION

In this cross-sectional study, it was observed that the incidence of intestinal parasite infections among children enrolled in government schools was higher compared to those attending private schools (51.8% versus 34.5%). According to Ulhaq et al. (2021) and Rahman et al. (2022), similar disparities were reported in District Lower Dir, Pakistan, where rural areas showed higher prevalence than urban areas. The study findings indicate that intestinal parasite infections affect both male and female students in both public and private elementary schools surveyed, irrespective of their residential locations. The results suggest a high prevalence of intestinal parasite infection in the study population, with a rate of 51.8%, consistent with the 54% reported in a research study conducted in District Bannu, KPK (Khan et al., 2021; Nasir & Rehman, 2021).

Statistically significant correlations were identified among children's behaviors such as nail biting and fingertip sucking, their preferred drinking water types, toilet usage techniques, frequency of hand washing with soap, and the prevalence of parasites. Notably, students attending the same school exhibited susceptibility to infections, highlighting a strong correlation between intestinal parasites and hygienic practices. According to Gizaw et al. (2019), WASH education significantly reduces childhood intestinal parasitic infections in rural Ethiopia. Interestingly, the frequency of parasite infection was found to be higher in children who did not engage in nail biting compared to those who frequently bit their nails. These findings underscore the intricate relationship between personal habits, hygiene practices, and the prevalence of intestinal parasites among school-age children.

Students enrolled in government schools exhibited a higher infection rate (51.8%) in comparison to their counterparts attending private schools (34.5%). This disparity may be attributed to the extensive land allocated for various sports activities in public schools, potentially facilitating the transmission of parasites from contaminated soil. Additionally, the administration's limited focus on improving social amenities in public schools, including water supply facilities, may contribute to the persistence of these infections. Furthermore, the contrast between public and private schools extends to the quality of facilities. Private schools tend to provide

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cleaner restrooms and abundant drinking water, potentially contributing to the lower infection rates observed in these institutions. According to Amare et al. (2013), nutritional status and intestinal parasite infection are closely linked among school children in northwest Ethiopia. A noteworthy aspect is the lack of emphasis by the government on medical education for children in schools, a platform where fundamental hygiene and manners could be instilled. This absence of education may play a role in the higher prevalence of infections among students in government schools compared to their counterparts in private schools.

Given that all students experience more or less similar environmental conditions conducive to parasite transmission and persistence, both schools revealed the presence of the same five parasite species in children. Factors such as inadequate sanitation, suboptimal personal hygiene, and similar socio-demographic behaviors among the students emerged as common environmental variables in this study. Additionally, a noteworthy correlation between the socioeconomic status of the parents in the community and the prevalence of parasites among their children was identified. According to Al-Haidari et al. (2021), intestinal schistosomiasis among schoolchildren in Yemen is significantly associated with poor sanitation and hygiene practices. The study suggested a potential association between low socioeconomic status and parasite incidence, as a higher number of students with economically disadvantaged parents tested positive for parasitic infections.

According to Khan et al. (2021), a study conducted in District Bannu, Khyber Pakhtunkhwa, found that 54% of primary school children had parasitic infections. The identified parasites included *Ascaris lumbricoides* (15%), *Enterobius vermicularis* (12%), *Hymenolepis nana* (10%), *Taenia saginata* (7%), *Entamoeba histolytica* (7%), *Giardia lamblia* (2%), and *Ancylostoma duodenale* (2%). In contrast, the current study revealed the most prevalent parasites as *Entamoeba histolytica* (30%), *Ascaris lumbricoides* (17%), *Hymenolepis nana* (10%), *Enterobius vermicularis* (10%), and *Taenia saginata* (8.6%). Similarly, Nasir and Rehman (2021) reported high prevalence of *Ascaris lumbricoides* (33.1%) among school children in District Lower Dir. According to Al-Daoody and Al-Bazzaz (2020), *Enterobius vermicularis* infection significantly impacts biochemical parameters in children in Iraq. These variations in parasite

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distribution highlight the diverse epidemiological patterns across different regions of Pakistan and neighboring countries.

CONCLUSION

The increasing occurrence of intestinal parasite illnesses among school children poses a rising public health concern, primarily associated with challenging socioeconomic circumstances. Elements such as the absence of formal education in mothers, the low social standing of fathers, limited access to safe drinking water, the existence of unsanitary toilet facilities, open defecation practices, and the habit of neglecting handwashing before meals and after using the toilet have been identified as contributing factors to the heightened prevalence of intestinal parasites. Effectively addressing this issue in the studied region requires comprehensive enhancements in health education, the provision of clean water, restroom facilities, improvement in both individual and environmental hygiene practices, promotion of shoe-wearing habits, and fostering regular handwashing behaviors.

The data collected in this study holds valuable insights into the clinical presence of human gastrointestinal parasites in this geographical area. Urgent actions from the healthcare and education sectors are imperative to alleviate the burden of parasitic infections in schools and other institutions across Pakistan. This can be achieved through enhancements in the healthcare system, the implementation of effective health education programs, and the regular implementation of diagnostic testing to promptly identify and address infections in schoolchildren. These endeavors represent feasible and crucial investments in human development that will undoubtedly shape the future of Pakistan.

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