

Relationship Between Intestinal Parasitic Infection and Anemia in School-Going Girls: A Cross-Sectional Study

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ABSTRACT

Objectives: The purpose of this study was to determine the prevalence of anemia and intestinal parasite infection in school-going adolescent girls.

Study design: A cross-sectional study

Place and Duration: This study was conducted at Hamdard University of Medicine and Dentistry Karachi from march 2021 to march 2022.

Methodology: There were eight schools in the research area, and three were chosen at random. Each school used universal sampling, and 250 voluntarily participating girls were included in the study. A sample of the morning's stool was taken for microscopic analysis, and hemoglobin levels were calculated. Relevant data were gathered using a structured questionnaire that had been evaluated beforehand, and SPSS version 22 was used for data analysis.

Results: The most often isolated organism is *Entamoeba histolytica*, which is followed by *Giardia intestinalis* (5.2%), hookworm (4.4%), and *Ascaris Lumbricoides* (3.2%). A total of 36% of patients had intestinal parasite infection, according to the research. Mild, moderate, and severe anemia were found to be present in them at rates of 12.8%, 46.8%, and 25.2%, respectively, with a prevalence of anemia of 84.8%. Anemia, insufficient hand washing techniques, and intestinal parasite infection were all found to be statistically significantly correlated.

Practical implication: We can minimize the likelihood of acquiring iron deficiency anaemia, which would increase the morbidity of school-going girls and increase their vulnerability to malnutrition and poor academic performance, by detecting worm infestation early on through routine screening tests.

Conclusion: According to the study, female school-going children had a significant prevalence of anemia and intestinal parasite infection. Preventive interventions, such as regular deworming and health education about eating a diet that is nutritionally balanced, taking iron supplements, and practicing good personal hygiene, are required for parents and their children in order to avoid and minimize the burden of disease.

Keywords: Anemia, Worms infestations, school-going girls, iron supplements

INTRODUCTION

A child with childhood anemia has insufficient red blood cells to adequately oxygenate the body tissues¹. Despite a modest increase in hemoglobin levels from 109 g/L in 1995 to 111 g/L in 2011, anemia still affects 273 million children under the age of five worldwide, with a prevalence that is significantly greater in Sub-Saharan African and South Asian nations². The World Health Organization (WHO) believes that anemia is prevalent in 43% of children under the age of five years, classifying it as a serious public health issue. India, one of the developing tropical nations, has prepared the way for the creation of previously unknown diseases and food-borne parasite infections due to its growing population, ongoing urbanization, ethnic food customs, and terrible socioeconomic conditions. In turn, this has caused nutritional issues, like anemia, in people afflicted, raising their morbidity. Since the longer period of time of time, humans have been plagued with parasitic illnesses. Nearly forty percent of the total burden of tropical disease is accounted for by helminthiasis and other parasitic infections. These parasites make their home in the intestinal tracts of persons who are infected and produce thousands of eggs, which are then expelled through the faces. Even in the modern day, these diseases continue to rank among the top causes of human suffering and mortality around the globe. They also represent significant roadblocks to the growth of nations that are economically less developed. When children play in those regions and do not practice sufficient personal hygiene, it may pollute the soil in those areas with poor sanitation and open-air defecation habits and spread to the children³.

Helminthiasis is the collective term for the illnesses brought on by helminthic parasites, which influence a person's nutritional status by producing intestinal bleeding, appetite loss, diarrhea, and decreased absorption of minerals. Tropical and subtropical areas with inadequate water supplies and sanitary infrastructure are

where these illnesses are most common⁴. The intestinal protozoan parasites that cause sickness are linked to diarrhea and dysentery⁵. According to estimates, almost 1.5 billion people worldwide suffer from a chronic helminth infestation brought on by contaminated soil, and this high prevalence is linked to both environmental hygiene issues and poverty. The severity of these issues is greater in developing nations. anemia is characterized as a condition in which the red blood cells' ability to carry oxygen is diminished and insufficient to meet the body's needs, which vary depending on the patient's age, sex, and stage of pregnancy. Anemia can have many different causes, but iron deficiency is by far the most frequent, followed by deficiencies in folate, vitamin B12, vitamin A, and vitamin B12. Weakness, weariness, and sleepiness are symptoms of severe anemia. Particularly at risk are children, adolescent girls, and pregnant women⁶. Adolescents make up roughly 21% of the entire population. School-going children are one of the most readily recognizable teenage target populations, and schools can be thought of as a primary source for obtaining epidemiological data regarding the regional causes of anemia and for planning the appropriate therapies. During adolescence, the body's overall iron need rises, and when combined with girls' recurrent menstrual blood loss, it causes iron deficiency anemia⁷. Some parasitic diseases, particularly those caused by helminths and protozoan parasites that are spread through the soil, are more common among school-aged children. These infections feed on the blood of the host, causing loss of iron leading to anemia. Adolescent school-going girls were chosen as study participants for these reasons because they are a vulnerable population for intestinal parasite infections and anemia. The aim of this research is to determine the prevalence of intestinal parasite infections and anemia in school-going girls

METHODOLOGY

The participants in this descriptive cross-sectional study were female students. There were eight schools in the area, and information was gathered from all of them. Three schools were randomly chosen among them, and the universal sampling method was used to gather the data. Before beginning the study, authorization from the school administration was requested after explaining the specifics and goal of the study to them. From each school, the lists of teenage girls between the ages of 8 and 12 year were gathered. Three schools had a combined enrollment of 360 pupils. Of them, 110 refused to agree to take part in the study. Consequently, 250 willing subjects in all were chosen for the study. The institutional ethical committee granted their consent. Each of the chosen individuals and their parents gave their informed consent.

A pretested structured questionnaire was used to gather information for this study about the participants' sociodemographic characteristics, dietary practices, toilet habits, hand-washing habits.

The students were provided with sterile screw-capped bottles for collecting stool samples, and both the students and their parents received instructions on how to collect a sterile stool sample in the early morning. The stool sample was brought to the lab where it was examined under a microscope for the presence of cysts, ova, and parasites using conventional methods⁸.

A portable digital hemoglobin meter was used to estimate hemoglobin levels. The finger prick method of collecting the blood sample was used in accordance with standard practices. According to the standards established by the World Health Organization (WHO), they were divided into categories of normal, mild, moderate, and severe anemia [Table 1].

Table 1:

Grading of anemia	Hb level
No anemia	>12
Mild	11-11.9
Moderate	8-10.9
Severe	<8

SPSS software version 22 was used for data analysis (SPSS Inc., Chicago, USA). Using descriptive statistics, the sociodemographic details of the study participants as well as the prevalence of intestinal parasite infection and anemia were examined. We examined for a connection between anemia and intestinal parasite infection using odds ratios, 95% confidence intervals and statistical significance

RESULTS

The sociodemographic details of the research participants are shown in Table 2. There were 11.2% to 26.8% of the study sample in each class for students in the Second through sixth grades, respectively. Most of the research participants (33.6%) and upper middle class (29.2%) members fell within BG Prasad's socioeconomic level classification of the top and middle classes, respectively. Nearly 79.6% of them were in nuclear families, according to the sort of family they were a part of. A total of 16.4% of respondents' homes contained one or more pets (dogs, cattle, cats, and birds). While 80.8% of study participants had sanitary toilets in their homes, another 19.2% made use of open fields. The majority of them—nearly 38.8%—said they would wash their hands either before eating or immediately after using the toilet. The clinical features of the study subjects are shown in Table 3. About 84.8% of the study subjects were found to be anemic. Stool samples were examined under a microscope, and it was 36% of the subjects were found to have at least one of the parasitic organisms in the intestine. Those who received diagnoses included 12.8%, 46.8%, and 25.2% of people were found to have anemia, having mild, moderate, or severe anemia according to the recommendations the WHO's suggestion [Figure 1]. Entamoeba histolytica the most prevalent intestinal parasite seen in the stool samples, Giardia

intestinalis (5.2%), and other samples (23.2%) (4.4%) hookworms [Figure 2].

The risks of developing an intestinal parasite infestation rose by 2.5 times among those who had been diagnosed with an intestinal parasitic infection (OR: 2.54, 95% CI: 1.34-4.83]. Also discovered to be statistically significant (P = 0.004) was the connection. It was observed that those who did not practice proper hand washing had statistically significant (P = 0.001) probabilities of developing intestinal parasite infection that were 2.4 times higher. [Table 5].

The risks of developing anemia increased by 2.84 times among study participants who had intestinal parasite infection. A statistically significant relationship between intestinal parasite infection and anemia was observed (P = 0.014) [Table 4].

Table 2: Socio demographic data about the research participants, along with relevant factors

Characteristic	Frequency	Percentage
8 th	49	19.6
9 th	49	19.6
10 th	57	22.8
11 th	28	11.2
12 th	67	26.7
Socioeconomic status		
Upper class	84	33.6
Upper middle	73	29.2
Middle	65	26
Lower middle	22	8.8
Lower class	6	2.4
Types of family		
Nuclear family	199	79.5
Joint family	51	20.4
Pets in homes		
Yes	41	16.4
No	209	83.6
Diet		
Vegetarian	128	51.2
Mixed	122	48.8
Types of toilet		
Open toilet	48	19.2
Sanitary latrine	202	80.8
Adequate hand washing practice		
Yes	153	61.2
No	97	38.8

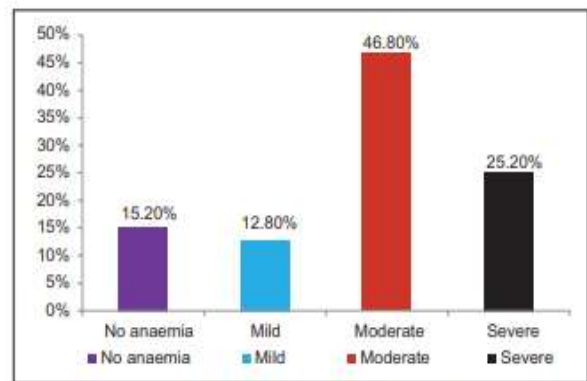


Figure 1: Grading of anemia among the study participants

Table 3: Clinical manifestations of the study participants

Anemia	Frequency	Percentage
Present	212	84.8
Absent	38	15.2
Presence of intestinal parasites in stool examination		
Yes	90	36
No	160	64

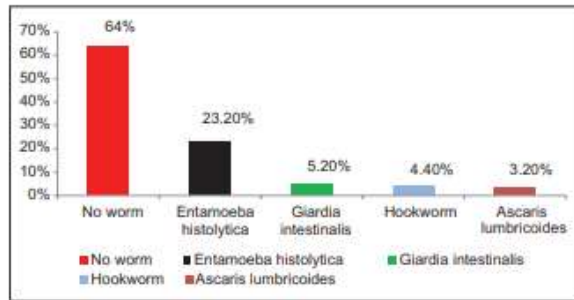


Figure 2: Type of intestinal parasite in stool examination

Table 4: association between anemia and intestinal parasites

Variable	Anemia		Odds ratio	Chi-square	p-value
	Yes	No			
Intestinal parasites in stool examination					
No	129	31	1.19-6.7	6.01	0.014
Yes	83	7	2.84		

DISCUSSION

In underdeveloped nations, intestinal parasite infection is more common, and in teenage schoolgirls, it raises the risk of iron deficiency anemia and increases morbidity, which can result in malnutrition and poor academic performance. This study, which examined the prevalence of anemia and intestinal parasite infection among teenage school-going girls, produced a range of intriguing findings. In this investigation, intestinal parasite infection was observed in 36% of the individuals. Studies by Tsuyuoka et al. in Brazil and Okyay et al. in Turkey, which revealed that the prevalence among school students was 42% and 31.8%, respectively, were almost similar to the findings of this study⁹. The frequency of intestinal parasite infection varied greatly across India. A study by Kotian et al. in Uttarakhand showed the prevalence to be 11.4%, a study by Mareeswaran et al. in Tamil Nadu found it to be 23.4%, a study by Rai et al. in Nepal found it to be 30.11%, and a study by Ashok et al. among school children in Andhra Pradesh found it to be as high as 63.9%¹⁰⁻¹². These variations could be a result of the sociodemographic variations between the study participants and study sites. Microscopic stool analysis revealed that hookworms (4.4%), Giardia intestinalis (5.2%) and Entamoeba histolytica (23.2%) were the most common parasites in the research group. Similar results were obtained by Dhanabal et al. in their study¹³. The prevalence of protozoan species indicates that food and water in the research area are heavily contaminated by Faeces. The results of the investigation revealed that 19.2% of the participants were using open fields as latrine. According to a study by Ashok et al., almost 74.5% of people use open fields as latrines¹⁶. This discrepancy may have arisen from the fact that this study involved urban school-going children as opposed to Ashok et al's study which involved rural Andhra Pradesh schools. Both of these investigations indicated an increased risk of intestinal parasite infection when people use open fields as latrines. In this study, those who did not wash their hands properly before eating and/or after using the toilet had a higher prevalence rate of intestinal parasite infection (48.5%). In a study conducted by Ashok et al., similar outcomes were attained¹⁰. To lessen the likelihood of parasite infection in school-aged children, it is essential to raise awareness of proper hand washing techniques and their significance. According to the results of this study, 84.8% of school-aged children were anemic. A developing country is considered to be of serious public health relevance if anemia prevalence is greater than 40% there¹⁴. This demonstrates that females are particularly affected by anemia, which poses a serious public health issue and necessitates the implementation of measures to enhance their general health and wellbeing.

In this study, it was observed that the incidence of anemia was fairly evenly divided between vegetarians (83.6%) and those

who followed a mixed diet (86.1%), demonstrating that diet did not significantly affect the prevalence of anemia. These results go counter to a research by Rati and Jawadagi that observed anemia to be more common in people who ate vegetarianism. Moderate anemia had a much greater frequency in this study (46.5%). These findings were consistent with those of studies by Rati and Jawadagi and Mandot et al., in which mild anemia was more prevalent than in those studies. According to this study, there is a statistically significant link between anemia, intestinal worm infection. This suggests that regular deworming, more knowledge of the benefits of iron and folic acid supplementation, and Parasite-caused blood loss contributes significantly to anaemia. Routine deworming should be part of primary healthcare, along with initiatives to reduce the community's infection reservoir by discouraging open defecation and promoting footwear and hygienic latrines. Personal and environmental hygiene education can reduce worm load and anemia. Controlling anemia through primary care is vital to socioeconomic development and general health¹⁵.

CONCLUSION

The results of this study will aid in raising family doctors' and primary healthcare workers' awareness of the importance of the high prevalence of anemia and intestinal parasite infection among teenage schoolchildren in our country. Due to its direct correlation with a high anemia prevalence rate and inadequate hygienic circumstances and practices, intestinal parasite infection is a serious public health concern.

Suggestions: Interventional measures could include teaching school-going children about the importance of personal and environmental hygiene, including how to wash their hands properly, dispose of their waste properly, and eat a nutritious diet. Parents of school-aged children should also get health education about periodic deworming and its value.

Children' knowledge, attitudes, and practice of healthy living can be improved by bringing the stakeholders together, and schools can play a significant part in this. These actions will contribute to a decrease in the incidence of intestinal parasite infection and anemia, which will benefit both the person and the community's general health and wellbeing.

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Conflict of interest: None

REFERENCES

- Kotian S, Sharma M, Juyal D, Sharma N. Intestinal parasitic infection-intensity, prevalence and associated risk factors, a study in the general population from the Uttarakhand hills. *International Journal of Medicine and public health.* 2014;4(4).
- Savioli L, Albonico M. Focus: Soil-transmitted helminthiasis. *Nature Reviews Microbiology.* 2004;2(8):618-9.
- Jourdan PM, Lamberton PH, Fenwick A, Addiss DG. Soil-transmitted helminth infections. *The Lancet.* 2018;391(10117):252-65.
- Cappello M. Global health impact of soil-transmitted nematodes. *The Pediatric infectious disease journal.* 2004;23(7):663-4.
- Davis AN, Haque R, Petri Jr WA. Update on protozoan parasites of the intestine. *Current opinion in gastroenterology.* 2002;18(1):10-4.
- Gopalakrishnan S, Eashwar VA, Muthulakshmi M, Geetha A. Intestinal parasitic infestations and anemia among urban female school children in Kancheepuram district, Tamil Nadu. *Journal of family medicine and primary care.* 2018;7(6):1395.
- Mandot S, Bamnawat S. Prevalence of anemia among rural school children of Rajasthan. *International Journal of Current Research and Review.* 2015;7(15):40.
- Control CfD, Prevention. Laboratory identification of parasitic diseases of public health concern. *CDC INF (800).* 2013:232-4636.
- Tsuyuoka R, Bailey JW, Guimarões AM, Gurgel RQ, Cueva LE. Anemia and intestinal parasitic infections in primary school students in Aracaju, Sergipe, Brazil. *Cadernos de Saúde pública.* 1999;15:413-21.
- Rai L, Saud B, Paudel G, Dhungana G. Prevalence of intestinal parasitic infection among rural area school children of Lokhim VDC, Nepal. *Journal of Microbiology & Experimentation.* 2017;4(1):102.

11. Ashok R, Suguneswari G, Satish K, Kesavaram V. Prevalence of intestinal parasitic infection in school going children in Amalapuram, Andhra Pradesh, India. *Shiraz E-Medical Journal*. 2013;14(4).
12. Mareeswaran N, Savitha A, Gopalakrishnan S. Prevalence of intestinal parasites among urban and rural population in Kancheepuram district of Tamil Nadu. *Int J Community Med Public Health*. 2018;5(6):2585-9.
13. Dhanabal J, Selvadoss PP, Muthuswamy K. Comparative study of the prevalence of intestinal parasites in low socioeconomic areas from South Chennai, India. *Journal of parasitology research*. 2014;2014.
14. De Benoist B, Cogswell M, Egli I, McLean E. Worldwide prevalence of anaemia 1993-2005; WHO global database of anaemia. 2008.
15. Rati SA, Jawadagi S. Prevalence of anemia among adolescent girls studying in selected schools. *Int J Sci Res*. 2014;3(8):1237-42.