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Prevalence of Enterobius Vermicularis (PINWORM) Among Primary School Boys in Selected Villages of Misan Governorate, Southern Iraq

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ABSTRACT

Objective: *This study aimed to determine the prevalence of Enterobius vermicularis (pinworm) infection among male primary school pupils in selected rural villages in Misan Governorate, Iraq, and to examine age-related infection patterns as well as the health and environmental factors contributing to its transmission.* ***Method:*** *A total of 384 schoolchildren aged 7–13 years were surveyed between 25 February and 30 April 2025. Stool samples were collected and examined using the wet-mount normal saline technique to detect intestinal parasites, with a specific focus on E. vermicularis.* ***Results:*** *Parasitological analysis identified 43 infections (11.2%), including 26 cases of E. vermicularis (6.77%), 8 cases of Entamoeba histolytica (2.08%), and 9 cases of Giardia lamblia (2.34%), with no mixed infections recorded. The highest prevalence of E. vermicularis occurred among 7-year-olds (42.9%), while the lowest (3%) appeared in the 11–12 age groups. Infection rates decreased progressively with age, except for a slight increase at age 13 (9%), with differences statistically significant ($P \leq 0.05$).* ***Novelty:*** *This study provides updated epidemiological evidence from understudied rural communities in Misan Governorate, emphasizing the continuing public health burden of enterobiasis and the need for targeted hygiene-focused interventions.*

INTRODUCTION

Enterobius vermicularis (Pinworms) are parasitic nematodes that infect the human gastrointestinal tract, causing a disease known as enterobiasis [1], [2]. This disease is spreading globally, affecting both developing and developed countries, and the number of cases of it is estimated at about 300 million cases around the world [3].

The life cycle of the parasite begins when eating infectious eggs [4]. These eggs hatch in the small intestine, and the larvae develop into adult worms in the colon. After mating, egg-bearing females migrate to the anal and perineal regions, where they lay approximately 8,000-11,000 eggs before dying after spawning [5]. Eggs are distinguished by their high resistance to harsh and dry environmental conditions, which allows them to survive for several weeks outside the host's body [6].

The disease is mainly transmitted by direct interpersonal contact, or indirectly through contaminated surfaces such as clothing, bedding and toys [4], [6]. The infection is usually transmitted through the fecal-oral route, when the eggs are transmitted through contaminated hands or food [7]. Eggs accumulate around the anal area, causing the most prominent symptom of the disease, namely anal itching, which intensifies at night [8].

Clinical symptoms usually appear a few days after infection, and may include severe anal itching, irritation, inflammation around the anus, due to the viscous

substance secreted by females during egg laying, intestinal disorders such as abdominal pain and cramps, psychological or behavioral problems caused by sleep deprivation, including stress and anxiety [9], [10].

Infection rates vary widely between countries and communities. Reported prevalence rates have reached 50% in Thailand, 34% in Pakistan, and about 30% in Denmark, reflecting the global distribution of this parasitic infection [11]. Age is a major factor affecting infection rates, with school-age children being the most affected group, unlike many other intestinal parasitic infections that affect multiple age groups [12].

This study aims to assess the epidemiological situation of intestinal roundworm infection among school-age children in villages located near rivers in Misan governorate, southern Iraq.

RESEARCH METHOD

This study was applied to 384 male children aged 7-13 years in five schools in five different areas in Misan governorate in southern Iraq. These samples were collected and examined from 25-2-2025 to 30-4-2025.

Specimen collection and processing :

The samples were collected in the middle of the morning or mid-afternoon, depending on the nature of school hours, and placed in containers with a wide, sterile, clean nozzle, free of any sterilizers or contaminants, making sure that feces do not mix with water, urine or any other contaminants, taking care to write down all the important information for this study to investigate pinworms

Direct Microscopic Examination of Stool :

All stool samples collected from the pupils were examined using the wet saline preparation method to detect intestinal parasites in general, and the pinworm (Enterobius vermicularis) in particular. Approximately 1–2 g of feces was placed on a glass slide using a disposable wooden stick, and two drops of 0.9% normal saline solution were added. A cover slip was then placed over the sample, which was examined under a microscope at magnifications of 10X and 40X, and, when necessary, at 100X using oil immersion [13], [14].

Statistical analysis :

All data were presented and analyzed by the statistical package of Social Sciences 26 (SPSS Statistics V26) using the chi-square test, P value was ≤ 0.05 considered statistically significant.

RESULT AND DISCUSSION

Results

The ages of the examined male pupils ranged from 7 to 13 years of age out of 384 stool samples collected, 43 samples (11.20%) were positive for parasitic infection and 341 samples (88.80%) were negative and there were significant relative differences between

positive and negative cases, with P values below the threshold of ≤ 0.05 as shown in Table 1.

Table 1. Positive and Negative cases

Intestinal parasites	Positive No.	Positive percentage%	Negative No.	Negative percentage%
E. histolytica	8	2.08%	376	97.92%
G. lamblia	9	2.34%	375	97.66%
Enterobius vermicularis	26	6.77%	358	93.23%
Total	43	11.20%	341	88.80%

$X^2 = 20.79$; df = 6; Sig. = 0.002; P ≤ 0.05

The study, which included 384 students, revealed a clear discrepancy and difference in the rates of infection with intestinal parasites in general and the parasite *Enterobius vermicularis* (pinworm) in particular, where the total parasite infection reached 11.20%.

The highest infections were recorded in the 7-year-old group (42.9%), while the 12-year-old group was the lowest in terms of infections (4.6%).

Enterobius vermicularis (Pinworm) showed a pronounced infection rate of 6.8%, much ahead of the giardia parasite (2.3%) and Amoeba (2.1%) as in Table 2.

Table 2. Age distribution of intestinal parasitic infection prevalence among male primary school children (n = 384).

Age Group	N (%)	*Enterobius vermicularis* n (%)	*E. histolytica* n (%)	*G. lamblia* n (%)	Any Infection n (%)
7 years	7 (1.8)	3 (42.9)	0 (0.0)	0 (0.0)	3 (42.9)
8 years	50 (13.0)	3 (6.0)	2 (4.0)	2 (4.0)	7 (14.0)
9 years	40 (10.4)	4 (10.0)	2 (5.0)	3 (7.5)	9 (22.5)
10 years	30 (7.8)	4 (13.3)	0 (0.0)	0 (0.0)	4 (13.3)
11 years	60 (15.6)	2 (3.3)	0 (0.0)	2 (3.3)	4 (6.7)
12 years	130 (33.9)	4 (3.1)	2 (1.5)	0 (0.0)	6 (4.6)
13 years	67 (17.4)	6 (9.0)	2 (3.0)	2 (3.0)	10 (14.9)
Total	384 (100)	26 (6.8)	8 (2.3)	9 (2.3)	44 (11.5)

$X^2 = 37.75$; df = 18; Sig. = 0.004; P ≤ 0.05

Table 3 shows a clear and noticeable variation in *Enterobius vermicularis* infection among age groups, with the highest infection rate among children aged 7 years (42.9%), while the lowest infection rate was recorded among 11- and 12-year-olds at 3%. The overall infection rate was 6.8% among all children, with a decrease in infection rates with age, except for a slight increase at age 13 (9%), indicating that younger children are more susceptible to parasitic infection.

Table 2. Distribution by age group of *Enterobius vermicularis* prevalence among male students (N=384).

Age Group	Total Number of Children (N)	Number of *Enterobius vermicularis* cases	Prevalence of *Enterobius vermicularis* (%)
7 Years	7	3	42.9%
8 years	50	3	6.0%
9 years	40	4	10.0%
10 years	30	4	13.3%
11 years	60	2	3.3%
12 years	130	4	3.1%
13 years	67	6	9.0%
Total	384	26	6.8%

$X^2 = 21.80$; df = 6; Sig. = 0.001; $P \leq 0.05$

Table 4 shows that infection with the parasite *Entamoeba histolytica* was low among children, with an estimated prevalence of 2.1%, with clear differences in infection rates between age groups (8, 9, 12, and 13), with rates ranging from 1.5% to 5%, while no infections were recorded for the 7, 10, and 11-year-old groups. The highest infection rate was recorded for the 9-year-old age group at 5%, while the majority of children remained uninfected at an estimated rate of 97.9%.

Table 3. Age-specific distribution and prevalence of Entamoeba histolytica infection among male school children (N=384).

Age Group	Total Number of Children (N)	Number of *E. histolytica* Cases	Prevalence of *E. histolytica* (%)
7 years	7	0	0.0%
8 years	50	2	4.0%
9 years	40	2	5.0%
10 years	30	0	0.0%
11 years	60	0	0.0%
12 years	130	2	1.5%
13 years	67	2	3.0%
Total	384	8	2.1%

$X^2 = 5.00$; df = 6; Sig. = 0.543; $P > 0.05$

In Table 5 data shows that the highest rate of Giardia lamblia infection occurred among 9-year-old children, reaching 7.5%, while no infections were recorded in three age groups (7, 10, and 12 years). The overall prevalence among all male pupils was 2.3%, indicating a limited distribution of the parasite within the study population.

Table 4. Age-specific distribution and prevalence of Giardia lamblia infection among male school children (N=384).

Age Group	Total Number of Children (N)	Number of *G. lamblia* Cases	Prevalence of *G. lamblia* (%)
7 years	7	0	0.0%
8 years	50	2	4.0%
9 years	40	3	7.5%
10 years	30	0	0.0%
11 years	60	2	3.3%
12 years	130	0	0.0%
13 years	67	2	3.0%
Total	384	9	2.3%

$X^2 = 9.58$; df = 6; Sig. = 0.143; $P > 0.05$

Discussion

The current study revealed an 11.5% prevalence of intestinal parasites among schoolchildren in riverine areas of Misan Governorate, with Enterobius vermicularis being the most common (6.8%). This finding is consistent with the) (21in Diwaniyah (11.6%) and the study [15] in Pakistan (5.75%), but differs significantly from other Iraqi studies that recorded much higher rates, such as the study [16] in Baghdad (84.3%) and the study [17] in Wasit (46.8%).

In terms of age distribution, the current study aligns with most local and international studies in recording the highest rates among the youngest age group (7-9 years old, at 42.9%). This finding is consistent with the studies [18] in Baghdad, [19] in Wasit, and [20] in Pakistan.

Regarding influencing factors, this study agrees with previous research on the impact of environmental and social factors. Several factors contributed to the high rates, including water source pollution, high student density, unhealthy practices, and the low economic status of some families [21], [22], [23], [24].

CONCLUSION

Fundamental Finding : The study demonstrated a modest yet noticeable decline in *Enterobius vermicularis* infections compared with earlier Iraqi reports, suggesting that ongoing preventive measures, treatment programs, and hygiene initiatives implemented

by the Ministry of Health are yielding positive public health outcomes. **Implication :** These findings highlight the effectiveness of sustained health education, improved sanitation services, and periodic awareness campaigns in reducing parasitic infections among rural schoolchildren, reinforcing the need for continuous community-based intervention strategies. **Limitation :** However, the study is limited by its focus on a single governorate, its exclusive inclusion of male pupils, and its reliance on a single diagnostic technique, all of which may restrict the generalizability and sensitivity of the detected prevalence rates. **Future Research :** Further investigations should expand to multiple regions, include both genders, employ more sensitive diagnostic methods such as adhesive tape tests for *E. vermicularis*, and explore behavioral, environmental, and socioeconomic determinants to provide a more comprehensive understanding of infection dynamics and guide more targeted prevention policies.

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