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Prevalence of cestodes infection among school children of urban parts in Iraq

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ABSTRACT

Background: Tapeworms that are of zoonotic significance have been identified as a prominent issue in public health. **Aim of study**: the objective of the present study was to determine the occurrence rate of tapeworm infections among schoolchildren aged 5–12 living in metropolitan areas of Iraq over the period from September 2023 to December 2023. **Methods:** the stool examination utilized wet mount preparation in saline/iodine methods. The data was evaluated using suitable descriptive statistical methods. **Results and conclusion:** A total of 379 people were found to be infected with Helminthes, demonstrating a statistically significant difference among us (P≤0.01), as well as between males and females by using SAS.

Introduction

Intestinal parasitic infections (IPIs) are prevalent worldwide. Specifically, a large number of individuals in impoverished countries are afflicted and suffering from parasitic diseases [1]. Children are at a higher risk of contracting intestinal parasitic illnesses compared to adults because of their underdeveloped immune systems and inadequate sanitary conditions [2]. The primary risk factors associated with these diseases include inadequate sanitation practices, limited access to sanitary water, substandard cleanliness, and deficient health care [3]. The reason for the decline is attributed to adverse environmental conditions and an excessive population [4]. The incidence of various intestinal parasites has risen as a result of the need for treatment and the unsanitary environment, particularly in households with low socioeconomic status. These risk factors create the perfect environment for the rapid growth, spread, and a higher likelihood of coming into contact with intestinal parasites [5]. Moreover, the applied analytic procedures and the number of stool samples tested have had an impact on it [6]. Intestinal parasites such as *Entamoeba histolytica*, *Giardia lamblia*, *Cryptosporidium* spp., *Balantidium coli*, and *Dientamoeba fragilis* are widely recognized protozoa that infect the intestines. Intestinal helminths such as *Ascaris lumbricoides, Trichuris trichiura*, and *Strongyloides stercoralis* are a few examples. These infections are indicative of substantial community health concerns, resulting in impaired growth, deficiency of iron anemia, and various other physical and mental health complications in children [7]. Intestinal parasite infections are significant public health issues in certain provinces of Iraq, similar to other underdeveloped countries. Multiple epidemiological studies have demonstrated variations in illness incidence across different

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geographical regions [13]. This study was conducted in response to the limited availability of data on the prevalence of intestinal parasite infections and the factors that contribute to them among children in urban settings. The aim of this study was to determine the occurrence rate of tapeworm infections among schoolchildren aged 5–12 living in metropolitan areas of Iraq over the period from September 2023 to December 2023.

Material and method

Location and boundary

Urban areas in Iraq are situated in the southern region, surrounding the city. These areas mostly accommodate people who live near rivers and engage in farming. The population in these areas tends to have lower levels of education.

Questionnaire survey

Initially, a conference was organized with the head teachers and staff members of the schools located in the study region. The principals and staff were requested to grant authorization. The survey was designed to gather data on the demographic characteristics (age and gender) and socioeconomic status of the residents (access to food and water, pet ownership, availability of toilet facilities, nail condition, height, weight, and location), symptoms of illness (abdominal and stomach pain), sanitation of the environment, and living conditions (season, contact with animals that are domesticated, and soil). Stool samples were collected from every student and stored in a 10% formalin solution for preservation. Subsequently, the samples were transported to the Laboratory of Parasitology for analysis. They underwent meticulous examinations using the direct smear technique, which the World Health Organization recommended in 1991, under a microscope there. The students who tested positive for parasites were advised to notify their healthcare providers via their parents, guardian, sibling or warden.

Examination of stool specimens

The stool samples were taken to the laboratory and subjected to macroscopic analysis to identify any apparent abnormalities, such as changes in color, texture, the existence of blood, mucus, pus or large worms. When looking at things under a microscope, direct smears and concentration techniques like flotation and sedimentation were used to find the different stages of gastrointestinal protozoa and helminths. The modified acid-fast stain techniques were employed to determine the presence of Coccidian parasites. There are other techniques available for identifying intestinal infections that result from parasites, such as the use of comprehensive guidelines [8, 9, 10].

Parasite identification

The intestinal parasites were observed using a microscope and identified by analyzing the morphological features of their eggs, larvae and mature forms, employing reliable and widely accepted identification methodologies.

Statistical analysis

The SAS (2018) program was utilized to identify the impact of various factors on research parameters through statistical analysis. The chi-square test was employed to examine the significance between percentages at probabilities of 0.05 and 0.01 in this investigation.

Results

The incidence rates for several parasitic infections were as follows: *Ascaris lumbricoides* (30.3%), *Taenia saginata* (20.6%), Hookworm (17.7%), *Hymenolepis nana* (23.2%), *Enterobius vermicularis* (2.4%), *Hymenolepis diminuta* (1.9%), *Trichuris trichura* (2.1%), *Schistosoma japonicum* (1%), and *Toxocara* spp. A total of 379 individuals were determined to be infected with Helminthes, showing a highly significant difference among us ($P \leq 0.01$) as well as between males and females as seen in **Tables 1 and 2.**

Table 1 illustrates the frequency and proportion of intestinal parasites found in the stools of schoolchildren**.**

Group	Parasite species	Population infected	Prevalence (%)
	Ascaris lumbricoides	115	30.3
	Taenia saginata	78	20.6
	Hook worms	67	17.7
	Hymenolepis nana	88	23.2
	Enterobius vermicularis	9	2.4
	Hymenolepis diminuta	7	1.9
	Trichuris trichura	8	2.1
	Shistosoma japanicum spp	4	1
	Taxocara spp	3	0.8
Total helminth infection	---	379	100
	Chi-Square: χ^2 (P-value)		27.305 ** (0.0001)
** (P≤0.01).			

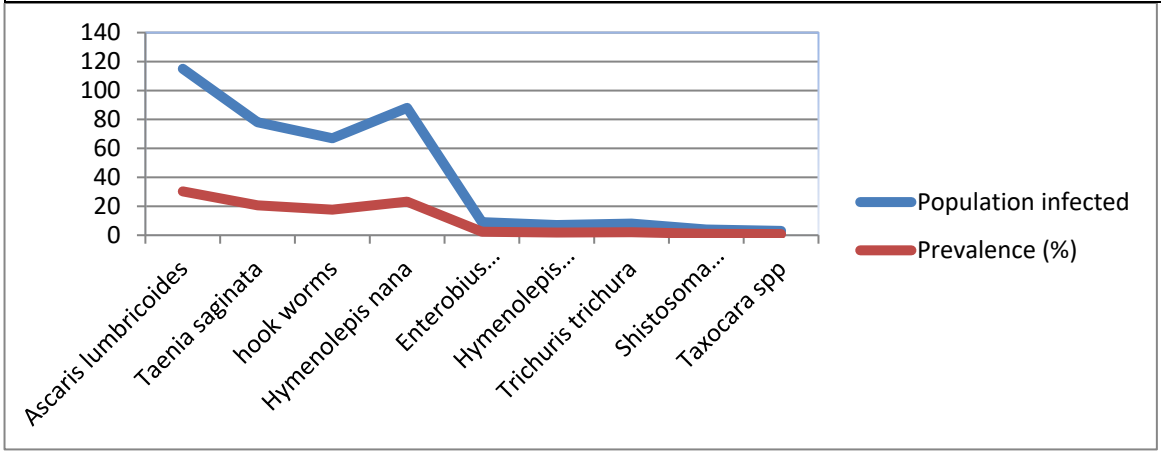

Table 2: presents the prevalence rates of intestinal parasitic diseases among school childhood in iraq

	Age		Sex			
Parasites					**Overall**	%
	<8	**>8**	**Male**	**Female**		Chi-Square: χ^2 (P-value)
Ascaris lumbricoides	70	45	90	25	115	30.3
Taenia saginata	35	43	50	28	78	20.6
HOOK WORM	33	34	40	27	67	17.7
Hymenolepis nana	53	35	62	26	88	23.2
Enterobius vermiculars	5	4	7	2	9	2.4
Hymenolepis diminuta	4	3	6	1	7	1.9
Trichuris trichura	5	3	4	4	8	2.1
Schistosoma japonicum	3	1	4	0	4	1
Toxocara spp	2	1	0	3	1	0.8
Total No. of infection	210	169	263	116	379	100
Chi-Square: χ^2 (P-value)	--	--	21.08 ** (0.0001)	25.62 ** (0.0001)	27.305 ** (0.0001)	
** (P≤0.01).						

Discussion

This study's findings can be compared to those of other studies: **Dar et al**. (2013) reported a rate of 25%, **Noor-un-Nisa et al**. (2011) reported a rate of 12.8%, **Khan et al.** (2017) reported a rate of 9.98%, **Khan et al.** (2018) reported a rate of 32.6%, and **Khan et al**. (2015) reported rates of 16.7% and 12.8%. The consumption of raw or undercooked beef as well as the unintentional consumption of intermediate hosts, which promotes the growth of the larval stages, facilitate the transmission of these tapeworms.

The fluctuating occurrence of intestinal pathogenic tapeworms in different regions can be attributed to alterations in ecological circumstances, human activities, cultural practices, and geographical boundaries. Based on many authors [11, 12, 13, 14, 15, 16, 17, 18, 19, 20]. The infection rate of cestodes is comparatively lower in various studies, with rates of 33.79% in Islamabad [21], 32.6% in district Swat [14], and 25% in Punjab [22].

Tapeworm-related diseases pose a significant public health problem in low- and middle-income countries, such as Pakistan [14]. *Hymenolepis nana*, often known as the dwarf tapeworm, is widely distributed and mostly affects people in Africa, Eastern and Southern Europe and Asia. An estimated 75 million people worldwide are infected with *Hymenolepis nana*. Its life cycle takes place inside a single host, and it is easily transmissible from one person to another (autoinfection). In the urban area of Lower Dir district, *Hymenolepis nana* was the most common, accounting for 18.81% (n = 54). This percentage is similar to the prevalence of 10.7% in the Swat district [14]. The present rate of infection surpasses that of another research. The following rates of frequency have been found in different studies: These are the numbers that were found in the studies: There were 10.1% [12], 10.1% [11], 10% [12], 9.36% [15], 8.7% [17], 8.09% [23], 6.78% [13], 6.3% [20], 6.2% [24], 5.9%, 4.82% [21], 4.6%, 2.77% [14], 2.7% [19], and 1.7% [18]. The infection rate in Lahore is 27.8%, which is lower than what was found in earlier studies.

Hymenolepis diminuta is widely distributed and primarily infects rodent species as its definitive hosts. Infections in humans are rare and usually happen when people eat arthropods (intermediate hosts) that carry cysticercoids, the parasite's infective larvae [25, 26]. The current research design is to determine the overall prevalence of *Hymenolepis diminuta* in schoolchildren in chosen regions of Lower Manhattan. The prevalence rate is 1.39 (n = 4). *Hymenolepis diminuta* is a prevalent parasite seen in rats and mice. However, it has also been detected in schoolchildren, which may be attributed to the consumption of contaminated water and food. This can occur when children come into contact with mud and subsequently transfer it to their mouths. The unintentional consumption of fleas, which act as the parasite's hosts, is what causes the infection.

The current study examined socio-demographic, environmental, and hygienic aspects. Both males and females were susceptible to intestinal parasitic disorders. However, boys had a higher infection rate compared to girls. An analogous study conducted in Saudi Arabia revealed a greater prevalence of infection among males compared to females [27].

This can be ascribed to the higher amount of male interaction with environmental situations in comparison to females. Men face an increased susceptibility to unsanitary situations as a result of their involvement in behaviors such as playing in polluted soil, socializing with dogs in filthy environments or swimming in dirty water during outdoor pursuits. Simultaneously, females have the option to remain within the confines of the household. Intestinal parasite infections were prevalent across all age groups. Based on a local study carried out in the Erbil governorate of the Kurdistan Region in Iraq, it was noted that the highest incidence of infection occurred among children between the ages of 1 and 5. The age group under one year exhibited a comparatively elevated infection rate. Conversely, the age cohort of 5–12 years exhibited a relatively low infection rate. Young infants are capable of crawling over dirty surfaces. The participation of this group of children in outdoor activities could result in the transfer of intestinal parasites. A study conducted in Mosul revealed that children over the age of 5 had the greatest infection incidence, with a prevalence of 29%.

The present investigation identified feeding practices as the most prominent risk factor for parasite infections. Artificially fed children exhibited a greater prevalence of infections in comparison to children who were breastfed. This discovery aligns with a prior investigation carried

out in Baghdad [28]. The occurrence of infections varied in response to seasonal and environmental changes. The winter and spring seasons exhibited the lowest infection rates, whereas the autumn season demonstrated the highest prevalence of infection. A clear correlation was observed between the season and the severity of gastrointestinal parasite infections.

A research investigation conducted in Riyadh, Saudi Arabia, found that the fall season had the highest prevalence of illnesses among patients [29]. This can be ascribed to the heterogeneity among the examined samples of patients' fecal specimens. The summer season, characterized by favorable climatic conditions like high temperatures and humidity, significantly contributes to the increased transmission of intestinal parasites among youngsters.

Recommendations: Steps one can take to prevent worms in a child:

Promote good hygiene Encourage your child to wash their hands often with soap and water, especially before eating, while using the bathroom, and while playing outside or with pets. Cook food thoroughly to kill potential worms, make sure meat and fish are fully cooked. Avoid eating raw or undercooked foods. Before eating fruits and vegetables, wash them thoroughly to remove any potential worm eggs, Avoid contaminated water. Do not allow your child to drink untreated or contaminated water and practice good sanitation. Parents can help reduce the spread of worm infections and promote healthy growth and development by encouraging children to practice good sanitation.

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