Sawa Medical Journal
Reprint from
Vol.2 Issue.1 2026
ISSN : 3007-4738 (online)

Review Article: Diagnosis of The Soil-Transmitted Parasites in Wasit Province-Iraq

Noor Naeem Shakir, Suadad B. Khairi

Department of Biology, College of Education for Pure Science, Wasit university, IRAQ

Article Information
Received: 11-2-2026
Accepted: 1-3-2026
Published: 1-4-2026

Abstract

Such places of leisure as the dirt found in parks and public places can be infected with the stray animals in these gardens, which can lead to contagious stages of parasites. A great number of individuals sleep in them and could be exposed to infection by the parasites since the parasites' infectious phases are able to endure years or even months. regardless of the weather. This is the reason why the study was carried out in various distinct locations of Wasit Governorate.

Simple random selection was used to collect soil samples which were used to collect a total of 35 soil samples at different locations in Wasit and the modified flotation technique was used to process them. The overall parasite contamination percentage of all the studied soil samples was 86 (30 / 35). Eight different forms of helminthes were identified from all of the soil samples that were examined. (35) *Toxocara* and *Ascaris* ova had the highest frequently occurring helminthes in 28% (20) of the samples followed by of *Ancylostoma* in 14 percent (10), *Trichuris* in 3 percent (2),*Enterobius* in 6 percent (4), *Fasciola* metacercariae in 3 percent (2),Diphyllobotherium in 6 percent (4) .The results indicate that the communities that are at risk of zoonotic transmission are those that are at parks and other places of community.

Keywords: Soil transmitted helminths: STH: soil contamination: Flotation technique

Introduction

Helminths also known as soil-transmitted helminths or STHs, are a diverse group of intestinal parasites. the causative agents of some of the most prevalent intestinal infections, in particular, in the world [Caldrer *et al*., 2020; Loukas *et al.*, 2021]. The most widespread ones are *Ascaris lumbricoides, Trichloroe* thene *Trichuris trichiura*, hookworms, including *Ancylostoma duodenale* and *Necator americanus* [Nath *et a*l., 2020 ; Raj *et al*., 2022]. These parasites are similar in terms of methods of transmission: their eggs or

larvae are present in the feces of sick people and pollute the environment, and in particular, the soil. These eggs can take very long durations of time in warm and damp conditions hence a source of constant infection. STH infections can cause many health problems, including undernourishment, anemia, stunted growth, and delayed cognitive development in kids [Caldrer *et al*., 2020; Masangcay *et al*., 2021; Scott and Koski , 2021].

This health impact and economic cost associated with the parasitic helminths, i.e. Human and animal soil-transmitted helminths (STHs) constitutes a significant burden of illnesses in terms of morbidity and mortality, particularly in the disadvantaged populations with minimal resources, which has a significant impact on The worldwide chain of food handling. The World Health Organization (WHO) states that the most prevalent STH species in humans are *Ascaris lumbricoides*, *Trichloro trichiura*, and hookworms *Ancylostoma duodenale and Necator americanus*. [WHO , 2023].

The poor environmental conditions, absence of sources of clean water, as well as low socioeconomic standing, which are the characteristic features of The high prevalence indexes in low- and middle-income nations are predisposed by their populations [Ihnacik *et al*., 2022; Montresor *et al*., 2020]. In addition to that, these zoonotic agents are distributed depending on the Soil types, wet and warm soils and the local conditions [Afonso *et al*., 2008; Collender *et al*., 2015 ; Thevenet *et al*., 2020; Umhang *et al*., 2017]. The stages of the parasite are also encouraged to develop throughout tropical and subtropical regions of the world and directly infect diseased people or animals [Ihnacik *et al*., 2022].Geophagia and placing dirty hands in the mouth also become risk factors [Otero *et al*., 2018; Otranto and Deplazes , 2019; Traversa *et al*., 2014]. Therefore, the congestion of the beach, park, backyard or sandbox with zoonotic parasite poses a health risk to people [Traversa *et al*., 2014; Eisen *et al*., 2019]. There is also a growing realization that zoonotic diseases can be transmitted by eating of raw and fresh foodstuff, which has been exposed to the foodborne parasites contaminated soil [Koutsoumanis *et al*., 2018 ; Oranto and Deplazes , 2019; Utaaker *et al*., 2017].

Even though these parasitic infections don't kill many people, They can result in several health issues and impairments [Gosha *et al*., 2012] in vulnerable populations such as women of reproductive age (WRA), school-aged children (SAC), and preschool-aged children (PSAC) [Zeynudin *et al*., 2022] and young animals [Kalkal *et al*., 2020]. This means that a lot of work needs to be done to control them. The condition is thought to be responsible for 3.4 million disability-adjusted life years (DALYs) globally , with at least one of these STH species believed to infect over one-fifth of the population [Jourdan *et al*., 2018; WHO , 2018].

The current study aims to ascertain the Wasit province's soil-transmitted helminthes (STH) infection prevalence.

Methods

1. Soil collection and processing

In the year 2024- 2025; 35 soil samples were picked randomly in different locations in Wasit. Initially, the town was physically divided into five areas, which were north, south, east, west and center. Each region had thirty samples. The research was based on parks, communal areas. About 50 g were taken out of 3 cm depth of the ground per collection. Since some of the samples were moist, hence all the samples were dried at room temperature and in an air-dry in approximately 24 h on tray.

2. Sucrose flotation method

A modified flotation technique was used to process soil samples [Horiuchi and Uga ,2016]. In short, a 150-um sieve was used to sift the soil samples after they had been air dried for 24 to 48 hours. A vortex mixer was used to combine three grams of sieved soil with eight milliliters of distilled water in a ten milliliter test tube. After that, the suspension was centrifuged for five minutes at 1000 rpm. After removing the supernatant, we filled the tube with 8 milliliters of sucrose solution with a specific gravity of 1.2.Then we stirred it well with a vortex mixer. The tube was centrifuged for 800 × g for 5 min. After centrifugation, sucrose solution at 1.3 specific gravity was slowly added up to the brim of the tube using a 10-ml syringe until an upper meniscus was formed. To gather the uppermost part of the sucrose suspension, a cover slip was carefully positioned on the meniscus. STH eggs were detected on the slides using a compound light microscope set to 100× and 400× magnification

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS), version 25.0 (IMB Corp, Armonk, New York, USA), was used to analyze the data. Achi-squared test was used to compare the associations between proportions . P< 0.050 was considered statistically significant .

Results

The percent contamination of all the soil samples analyzed with parasites was 86% (30 / 35). As per the types of helminthes 8 types were reported, out of the total number of sampled soils (35), *Toxocara* and Ascaris ova were the most common helminthes in 20 samples 28% , followed by *Ancylostoma* with 10 positive 14% , *Trichuris* 2 (3%),*Enterobius* 4 (6%), *Fasciola* metacercariae 2(3%), *Diphyllobotherium* 4(6%) , *Strongyloides* 10(14%). as reported in Table (1) and figure(1)

Table (1): Total numbers and percentages of helminthic genera' eggs contaminating soil (n = 35)

Type of helminthes	No. of contaminated soil	samples Percentage
Toxocara	20	28%
Ascaris	20	28%
Ancylostoma	10	14%
Trichuris	2	3%
Enterobius	4	6%
F. metacercariae	2	3%
Diphyllobotherium	4	6%
Strongyloides	10	14%
P value	0.001**	

Chi-square test; **: significant at *P* <0.05.

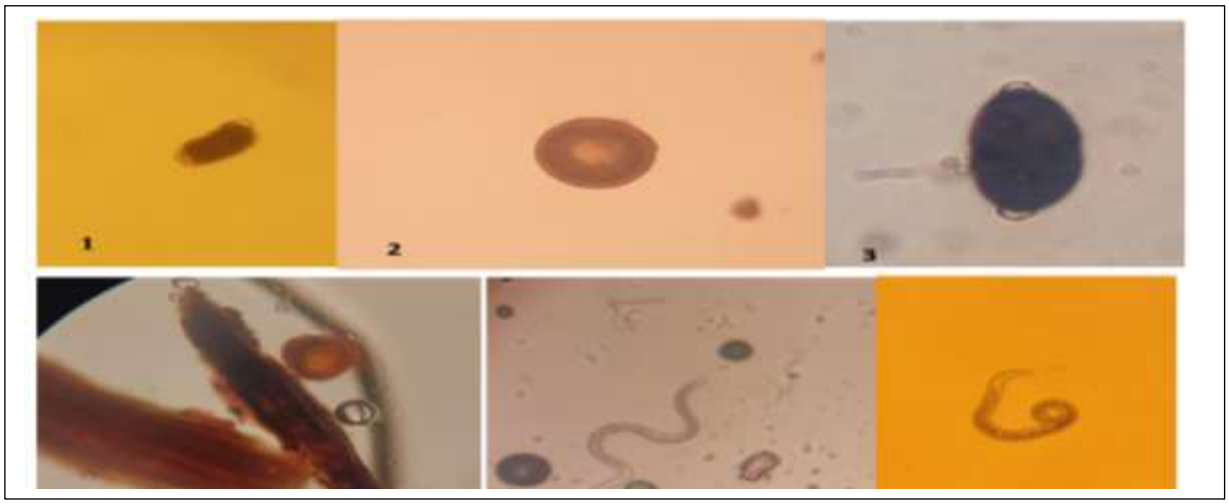

Fig (1): Typical pictures of the parasites discovered during this investigation, 1*: hook egg* 2: *Toxocara*, 3 *Trichuris* 4: *Ascaris lumbricoides* 5*: Strongyloides* 7: *Enterobius*

The overall parasite contamination level of all soil samples analyzed was 86% (30 / 35). The parasite contamination rate of the soil samples, which studied in Kut, was the highest, at 19% and the lowest contamination rate was 6% in the Al Numaniya district. The occurrence of parasites in the soils of Badra ,Al Hayy, Sheak saad, Al Dujaly and Al Muwafaqia were 11% 14% 13% 17% and 21%, respectively.

In Kut, eight different species of helminthic ova were identified from contaminated soil samples taken from several areas in the Wasit Governorate (Table 4), with Ascaris having the highest rate at 14% of the samples, followed by *Ancylostoma* 3(21%), *Strongyloid*es 4(29%), *Trichuris* 1(7%), *Toxocara* 1(7%), *Enterobius* 1(7%), *Diphyllobotherium* 1(7%) , *Fasciola* metacercariae 1(7%).

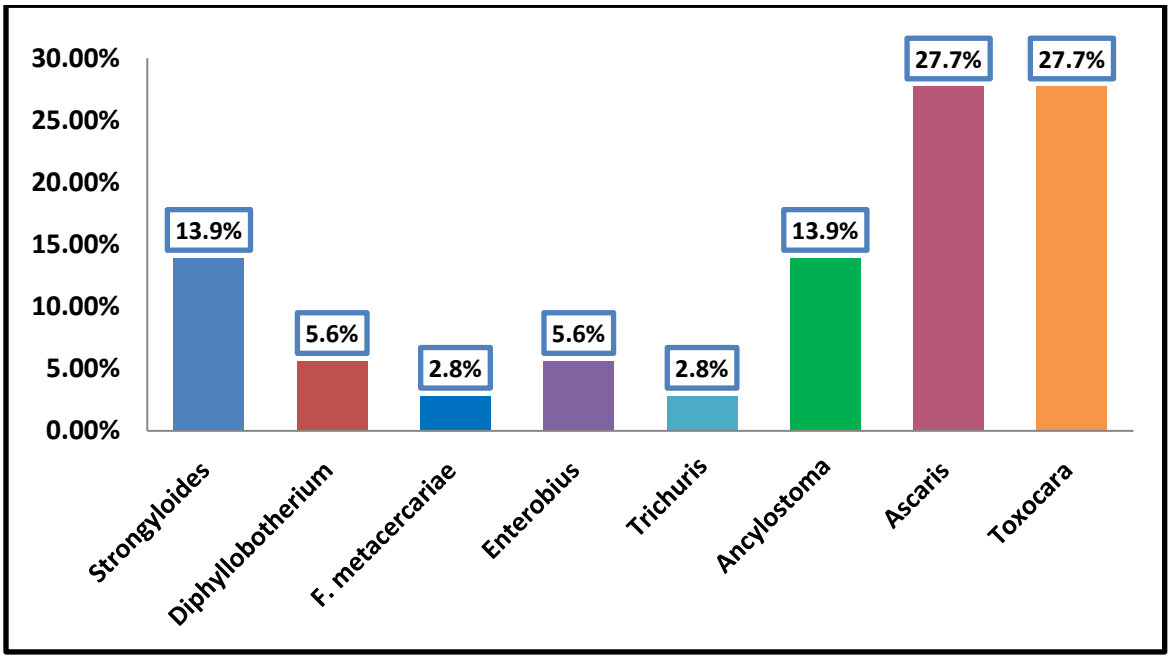

Figure (2) : Pie chart showing the frequency distribution of soil pollution by helminthic genus' eggs.

The Badra district's soil samples were analyzed, and the findings showed that *Ascaris and Toxocara* had the highest percentage of contamination (38%) ,followed by *Strongyloides* 1 (13%) *Toxocara* 3(38%) and *Fasciola* metacercariae 1 (13%). The results showed that *Toxocara* had the highest rate of contamination

in the Al-Numaniya district at 75% (3), followed by *Ascaris* 1 at 25% .In Al- Hayy district, the findings showed that the highest pollution rate was with *Toxocara* at 40 %(4) , followed by *Ascaris* 30%(3),followed by *Ancylostoma* ,*Strongyloides and Enterobius* the same rate of 10% for each of them. In Sheak saad district, the findings showed that the highest pollution rate was with *Ascaris* 4(44%) followed by *Toxocara* 22% and *Ancylostoma* , *Enterobius Diphyllobotherium* the same rate of 11% for each of them, and in Al- dujaly the results revealed that the highest rate of contamination was with *Ascaris and toxocara* 4(33%) followed by *Ancylostoma* 2(17%), *Enterobius Diphyllobotherium* the same rate of 8% (1) for each, In Al- muwafaqia The findings showed that the greatest contamination rate was with *Strongyloides* 4(27%) followed by *Ascaris , toxocara* and *Ancylostoma* 3(20%), *Diphyllobotherium and Trichuris* the same rate of 1 (7%) for each. table (2).

Table (2): Soils contamination of Helminthes type versus Districts -Wasit province.

Districts							
Contaminated with parasite types	Kut	Badra	Al-Numaniya	Al-Hayy	Sheak saad	Al-dujaly	Al-muwafaqia
Ascaris	29 (14.3%)	3(37.5%)	1(25%)	3(30%)	4(44.4%)	4 (33.3%)	3 (20%)
Ancylostoma	3 (21.4%)	0	0	1(10%)	1(11.1%)	2 (16.7%)	3 (20%)
Strongyloides	4 (28.6%)	1 (12.5%)	0	1(10%)	0	0	4 (26.7%)
Trichuris	1 (7.1%)	0	0	0	0	0	1 (6.7%)
Toxocara	1 (7.1%)	3(37.5)	3(75%)	4(40%)	2 (22.2%)	4 (33.3%)	3 (20%)
Enterobius	1 (7.1%)	0	0	1(10%)	1 (11.1%)	1 (8.3%)	0
Diphyllobotherium	1 (7.1%)	0	0	0	1 (11.1%)	1 (8.3%)	1 (6.7%)
F. metacercariae	1 (7.1%)	1(12.5%)	0	0	0	0	0
Total	14	8	4	10	9	12	15
%	19%	11%	6%	14%	13%	17%	21%
P value	0.608	0.572	0.180	0.406	0.437	0.429	0.700

Chi-square test; **: significant at P <0.05.

Discussion

The presence of soil contamination with parasite is a positive indication of the threat of transmission of the parasites to human beings or animals. In the present research, the total contamination of soil specimens was 86 percentage of 30 specimens (30/35) of analyzed specimens and this rate is a predictive indicator of a potential threat to the public health due to such ova. FKUI (2016) asserts that the habitat of Soil

transmitted helminths worm eggs is to infect the sections of the small intestine. This parasite is cosmopolitan in its occurrence particularly in the humid air of the area and is highly associated to sanitary and hygiene conditions.

The result is similar to those of other researchers across the globe which discovered higher concentrations of helminthic and helminthic ova in soil. Rates of 67%, 68.1%; 50.6 and 35% were reported in Sudan, Nigeria, and Ethiopia respectively [Mohammed *et al*., 2016 ; Hasan *et al*., 2017 ; Badaki *et al*., 2018; Tadege *et al*., 2022]. In comparison, south Cameroon had a reduced rate of 17.6% STH [Golek and Al-Saeed , 2019].

Our study also agrees with studies conducted inside Iraq such as: In Duhok Governorate, Iraq, 593 (84.71%) hof the 700 soil samples that were gathered from various locations were detected in the soil samples that were evaluated. The most common helminths were *Taenia* eggs, which were found in 117 (16.71%), followed by *Hymenolepis nana* ova in 107 (15.28%), *Toxocara* ova in 106 (15.14%), *Ancylostoma* ova in 95 (13.57%), *Ascaris* ova in 71 (10.14%), *Hymenolepis diminuta* ova in 51 (7.28%) and *Trichuris* ova in 46 (6.57%) [Khairi *et al*., 2022]. These results agree with the results of [34] It is present in veggies gathered from various marketplaces in Wasit province /Iraq Out of 300 samples of the six types of vegetables , 247 were contaminated by parasite with rate (82.33%), *Strongyloides stercoralis* was the most often found parasite with (100) , *Ascaris lumbricoides* (85) , *Iodamoeba butschlii* (76) and *Ancylostoma duodenale*(59), *Enterobius vermicularis* (50),*Fasciola hepatica* (19) and *Hookworm* egg (17) , A lower rate of infection was reported for *Hymenolepis nana, Balantidium coli, and Diphyllobothrium latum*, with 8, 7, and 2 cases, respectively.

The environment, closeness to latrines, availability of trash, and high vegetation cover of the sampling areas were some of the environmental factors that played a significant role in the survival of STH eggs in the Wasit soil. These findings support the results of [Tadege *et al.*, 2022] who emphasized that humid and shady soils promote the survival of helminth eggs. FKUI (2016) also highlighted the fact that STH eggs can take months under humid soils that are not exposed to ultraviolet sunlight that decays the viability of eggs. The warm climate with high humidity in Sindupraja provides the best environment to maintain eggs and become infected, and locations with higher sanitation and sunlight exposure, seen by [Anwar *et al*., 2020] are less contaminated with soil.

These disparities are mainly affected by the differences in sanitation, population density and hygiene practices. This is particularly common in and around the riverbanks and other areas with poor sanitation, which further confirms the interaction between the soil moisture and poor hygiene and the presence of parasites.

Conclusion

The findings of our study in conclusions show that there is a high contamination of soil by the egg and helminths parasites in the Wasit province and particularly in the parks and the areas of public places. Moreover, it was discovered that these helminthic can infect human beings and animals which in turn can lead to diseases and bring numerous health complications to them. This survey is the first survey on *Toxocara ,Ascaris, Ancylostoma, Trichuris,Enterobius , Fasciola metacercariae, Diphyllobotherium, Strongyloides* in soil in Wasit province and the outcome of this survey is useful in conducting further studies in the future.

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