

Soil-transmitted helminth infections (STH): what they are and why they matter

Shameeran Salman Ismael*, Aya Majid Abdulrahman, Lolav Azad Hasan, Sheler Ramadhan Rasheed and Nourhanne Zaki Sulaiman

Department of Medical Laboratory Sciences, College of Health Sciences, UOD, Duhok, Iraq

*Corresponding Author: shameeran.ismael@uod.ac

ABSTRACT

Soil-transmitted helminths remain highly prevalent in many low-resources tropical areas, driven by poor sanitation and hygiene. They mainly infect children and marginalized populations, causing chronic anemia, growth and cognitive deficits. Large-scale deworming programs have reduced morbidity and prevalence in several countries, but rapid reinfection and environmental contamination mean that long-term control and possible elimination require a combination of regular deworming, improved WASH, community behavior change, and—in some settings—a broader One Health focus including animal reservoirs. This article aimed to know more about soil transmitted helminth infections and their impacts.

Keywords: Soil, Helminths, Infection

To cite this article: Ismael SS, AM Abdulrahman, LA Hasan, SR Rasheed & NZ Sulaiman. Soil-transmitted helminth infections (STH): what they are and why they matter. *Biological Times*. 2026. April 5(4): 10-11.

Introduction

Soil-transmitted helminths are a group of intestinal parasitic worms that infect humans through contact with contaminated soil. The main species of concern are: [1]

- *Ascaris lumbricoides* (roundworm)
- *Trichuris trichiura* (whipworm)
- Hookworms (*Ancylostoma duodenale* and *Necator americanus*) [1]

Definition and General Characteristics

STH are nematodes whose eggs or larvae are passed in human feces and develop in warm, moist soil. Infection occurs when: [1,2].

- Infective eggs are ingested (e.g., via contaminated food, water, or dirty hands), or
- Infective larvae in soil penetrate the skin (mainly hookworms, often through bare feet).

After entry, the parasites migrate (depending on species) and establish in the intestine, where they can live for months to years, producing large numbers of eggs that are excreted and continue the transmission cycle [2,3]. These infections are most common in tropical and subtropical regions with inadequate sanitation, and they disproportionately affect children and other vulnerable populations, contributing to malnutrition, anemia, impaired growth, and reduced educational performance [1,4].

Risk Factors and Co-infections

Unsafe water, open defecation, walking barefoot, poor handwashing and hygiene, poor sanitation, and a lack of latrines are all recurring risk factors. The prevalence is significantly lower in "model" households and households with higher levels of education and hygiene training. HIV-positive individuals have a significant co-infection rate of STH (5–8% per species), and there is some indication that they are more susceptible to *Strongyloides*.

Impact of Soil-Transmitted Helminth (STH) Infections

Several of millions of people are impacted by soil-transmitted helminths, which are strongly associated with child health, poverty, and inadequate sanitation. Although results are occasionally conflicting, research reveals significant effects on growth, nutrition, anemia, cognition, and the overall burden of disease [1, 5].

STH infections, particularly moderate-heavy *Ascaris* and *Trichuris*, are linked to stunting, underweight, and wasting in children, according to numerous studies including a meta-analysis. STH infection almost doubled the risk of undernutrition in war areas in Ethiopia, while *Ascaris* was associated with both wasting and stunting [5].

Due to continuous blood loss and nutrient depletion, hookworm and mixed STH infections are frequently linked to anemia, particularly iron-deficiency anemia [4].

STH was found to be highly correlated with anemia patterns in children under five in a global analysis, although not always as an independent driver once socioeconomic considerations were taken into account. Deworming resulted in measurable hemoglobin gains in children who were moderately to severely infected; in multiple school cohorts, infected children were more anemic and had lower hemoglobin [4,5].

Life cycle

The usual life cycle is as follows:

1. Eggs are excreted by infected humans (and occasionally animals).

2. Eggs are introduced into soil and waste via open defecation, inadequate latrines, or contaminated dumpsites.

3. Under the right environmental circumstances, eggs or larvae develop into infectious stages.

4. Contaminated soil, food, or skin contact re-exposes humans; models characterize this as a human–environment–(animal) reservoir system.

A One Health perspective (human–animal–environment) is crucial since animals (dogs, pigs, goats) can carry *Ascaris*, hookworms, and other STHs, leading to zoonotic transmission [6, 7].

Age Groups of Women and Reproductive

In an Ethiopian study, over 30% of pregnant women were infected; living in a remote area, walking barefoot, using unprotected water, and not washing their hands properly significantly enhanced the risk [8].

Expert committees identified women of reproductive age (WRA) as an at-risk population that should be included in control methods since they are frequently overlooked by school-based deworming [1, 9].

Control strategies for soil-transmitted helminth (STH) infections

Reducing disease now and preventing transmission over time are the main goals of control. Mass deworming, better water, sanitation, and hygiene (WASH), health education, and more comprehensive "One Health" initiatives that take the environment and animals into account are the main instruments [10].

Preventive Chemotherapy (Mass Deworming)

Periodic mass medication administration (MDA) with albendazole or mebendazole to high-risk populations (pre-school and school-age children, women of reproductive age, some high-risk professionals) is WHO's primary approach [11].

Prevalence determines frequency: none (<20%), once a year (20–50%), twice a year (>50%) [12].

Between 2008 and 2018, more than 3.3 billion pills were supplied worldwide, resulting in significant decreases in children's STH morbidity [13].

Ascaris, *Trichuris*, and hookworm are considerably less common and less severe when community-based interventions (school-based or community-wide) are implemented [12,13, 14].

Challenges and Future Directions

In particular areas, persistent high transmission despite long-term MDA is a result of inadequate WASH, drug restrictions (such as *Trichuris*), gaps in implementation, and reinfection from untreated individuals.

Reaching adults and other at-risk populations, enhancing access to sanitation, strengthening WASH interventions, improving diagnoses, and carefully determining when (or whether) to reduce MDA in order to prevent rebound are among the priorities.

Conclusion

Particularly in environments with severe, persistent infection and standard living conditions, STH infections significantly contribute to child undernutrition, anemia, development retardation, and overall disease burden. Evidence suggests continuous, integrated interventions (deworming, nutrition, WASH, education) to lessen the long-term impact on health and development, but immediate observable consequences may be reduced where infections are low and control programs are strong.

References

- [1] Lebu S, Kibone W, Muoghalu CC, et al. Soil-transmitted helminths: A critical review of the impact of co-infections and implications for control and elimination. *PLoS Negl Trop Dis*. 2023;17(8): e0011496. Published 2023 Aug 10. doi: 10.1371/journal.pntd.0011496
- [2] Mascarini-Serra L. Prevention of Soil-transmitted Helminth Infection. *J Glob Infect Dis*. 2011;3(2):175-182. doi:10.4103/0974-777X.81696
- [3] Sartorius B, Cano J, Simpson H, et al. Prevalence and intensity of soil-transmitted helminth infections of children in sub-Saharan Africa, 2000-18: a geospatial analysis. *Lancet Glob Health*. 2021;9(1): e52-e60. doi:10.1016/S2214-109X(20)30398-3
- [4] Gitore WA, Ali MM, Yoseph A, Mangesha AE, Debiso AT. Prevalence of soil-transmitted helminthes and its association with water, sanitation, hygiene among schoolchildren and barriers for school's level prevention in technology villages of Hawassa University: Mixed design. *PLoS One*. 2020;15(9): e0239557. Published 2020 Sep 24. doi: 10.1371/journal.pone.0239557
- [5] Parija SC, Chidambaram M, Mandal J. Epidemiology and clinical features of soil-transmitted helminths. *Trop Parasitol*. 2017;7(2):81-85. doi:10.4103/tp.TP_27_17
- [6] Zerdo Z, Bastiaens H, Anthierens S, et al. Prevalence, intensity and endemicity of intestinal schistosomiasis and soil-transmitted helminthiasis and its associated factors among school-aged children in Southern Ethiopia. *Sci Rep*. 2022;12(1):4586. Published 2022 Mar 17. doi:10.1038/s41598-022-08333-7
- [7] Chen S, Gong Y, Chen Q, Li S, et al. Global burden of soil-transmitted helminth infections, 1990–2021. *Infectious Diseases of Poverty* 13 (2024). <https://doi.org/10.1186/s40249-024-01238-9>
- [8] Dheresa M, Tura AK, Daraje G, et al. Trend and Determinants of Mortality Among Women of Reproductive Age: A Twelve-Year Open Cohort Study in Eastern Ethiopia. *Front Glob Womens Health*. 2021; 2:762984. Published 2021 Dec 14. doi:10.3389/fgwh.2021.762984
- [9] Hayes DK, Robbins CL, Ko JY. Trends in Selected Chronic Conditions and Related Risk Factors Among Women of Reproductive Age: Behavioral Risk Factor Surveillance System, 2011-2017. *J Womens Health (Larchmt)*. 2020;29(12):1576-1585. doi:10.1089/jwh.2019.8275
- [10] World Health Organization (WHO). Soil-transmitted helminth infections. (2023). <https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections/>
- [11] Jourdan, Peter Mark et al. Soil-transmitted helminth infections. *Lancet* 391 10117 (2017): 252-265.
- [12] Lapat J, Opee J, Apio M, Akello S, et al. A One Health approach towards the control and elimination of soil-transmitted helminthic infections in endemic areas JID One Health 2024. <https://doi.org/10.1016/j.ijidoh.2024.100021>
- [13] Montresor A, Mupfasoni D, Mikhailov A, et al. The global progress of soil-transmitted helminthiasis control in 2020 and World Health Organization targets for 2030. *PLoS Neglected Tropical Diseases*, 2020. <https://doi.org/10.1371/journal.pntd.0008505>
- [14] Ismael SS & SA Ajeel. Why Intestinal Parasitic Infections Peak Among Children During Summer. *Biological Times*. 2025. May 4(5): 8-9.