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Identification of Eggs of Intestinal Nematodes of the Soil Transmitted Helminths Group on the Soil of the Sindupraja River

Pipin Supenah[1*]

[1] D III Medical Laboratory Technology, Faculty of Health Sciences, An Nasher University.

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Corresponding Author:
Pipin Supenah
pipinsupenah.annasher@gmail.com

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Abstract: This research aims to determine the presence of Soil Transmitted Helminths group intestinal nematode worm eggs, to determine the type of Soil Transmitted Helminths egg species and to determine the percentage of soil samples that are positively contaminated with Soil Transmitted Helminths eggs. The research method used in this research is a descriptive survey method. This research design uses Belt Transect-Quadrat sampling and Hand Sorting methods. The sampling technique used is probability sampling, namely in the form of Stratified Random Sampling. The data collection technique used is observation. The river bank soil is then put into a labeled container and then tested in the laboratory using the flotation method using saturated Nacl. After the data is collected, the data is processed using descriptive statistical analysis. The results of the above examination showed that 12 soil samples were positively contaminated with the eggs of intestinal nematode worms of the Soil Transmitted Helminths group. The condition of the river soil in the area is that the soil is generally quite contaminated with the eggs of intestinal Nematode worms of the Soil Transmitted Helminths group, including the eggs of Ascaris lumbricoides, Trichuris trichiura, Hook worm. (Hookworm), that is, there were 33.3 (%) soil samples contaminated with intestinal nematode eggs of the Soil Transmitted Helminths group.

Keywords: Intestinal nematode worm eggs; River soil; Soil transmitted helminths

Introduction

Soil-transmitted helminths (STHs) are a significant global public health concern, particularly in low and middle income countries where access to clean water, sanitation, and hygiene (WASH) is limited (Ahiadorme et al., 2020; Ngwese et al., 2020). These parasitic worms are responsible for some of the most widespread intestinal infections, especially in tropical and subtropical regions (Caldrer et al., 2022; Loukas et al., 2021). The most common species include *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms such as *Ancylostoma duodenale* and *Necator americanus* (Nath et al., 2020; Raj et al., 2022). These parasites share a similar mode of transmission: their eggs or larvae are passed in the feces of infected individuals and contaminate the environment, especially soil. In the right conditions warm, moist environments these eggs can remain viable for long periods, making them a persistent source of infection. STH infections can cause a wide range of health problems, including malnutrition, anemia, growth retardation, and impaired cognitive development in children (Caldrer et al., 2022; Masangcay et al., 2021; Pabalan et al., 2018; Scott et al., 2021). The chronic nature of these infections can also exacerbate poverty by reducing individuals' ability to

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work or attend school (Mazibuko et al., 2022; Ng'etich et al., 2024). Transmission is closely linked to behaviors such as open defecation, walking barefoot, and consuming food or water (Lynn et al., 2021; Maddren et al., 2024).

The Sindupraja River is often used by children to play in the water, with dirty river and river soil conditions that can cause worm eggs. Worm infections can affect anyone, including adults, but generally worm infections are mostly suffered by children in the elementary school age group, an age that is susceptible to worm infection because their activities are mostly related to riverside soil near toilets. This is very closely related to healthy living behaviors, including defecation in the toilet, nail hygiene, the habit of using footwear or sandals, washing food, drinking boiled water, and the habit of washing hands with soap before eating and after defecating in elementary school students (Saskyarasmi et al., 2021). When playing in the water, the riverbank in the form of soil near the toilet is used as a place to pull over after playing in the water then the worm eggs can enter the body through the skin or mouth, eat food taken from the river, such as fruits, vegetables, or fish, which can contain worm eggs. In these conditions, worm larvae spread to various angles that are very likely to come into contact and enter the human body. Worm larvae that enter the body take 1–3 weeks to develop. This condition can cause disease because the riverbank in the form of soil near the toilet used for play has been contaminated by feces and feces.

Feces mixed with soil can contain worm eggs that can infect humans. In 2022, the Indramayu Regency Health Office conducted a worm survey on 1,000 school-age children in 10 elementary schools in Indramayu Regency. The results of the survey showed that the prevalence of *Soil Transmitted Helminths* intestinal worm infection in elementary school age children in Indramayu Regency was 35.2%. In 2023, the National Population and Family Planning Agency (BKKBN) will conduct a worm survey activity on 500 school-age children in 5 elementary schools in Indramayu Regency. The results of the survey showed that the prevalence of *Soil Transmitted Helmints* intestinal worm infection in school-age children in Indramayu Regency was 37.8%. Worm testing is one of the important efforts to prevent and control intestinal worm infection *Soil Transmitted Helmints*. Worm testing can be done to determine the prevalence of *Soil Transmitted Helmints* intestinal worm infection in a population.

Method

The research method used in this study is a descriptive survey research method. In general, descriptive research is used to analyze data by decrypting or describing phenomena that occur in society. Population is a generalized area consisting of objects or subjects that have certain qualities and characteristics that are determined by the researcher to be studied and then drawn conclusions. The population in this study is all riverside land in Kliwed village, Kertasemaya District, Indramayu Regency. *A sample* is an object that is studied and is considered to represent the entire population. In this study, the samples analyzed were the land on the banks of the Sindupraja river block with a length of 250 meters in Kliwed village, Kec. The sampling technique used is Probability sampling, which is in the form of Stratified Random Sampling is the process of sampling through the way of dividing the population into strata, selecting a random sample of each stratum, and combining them to estimate population parameters.

Result and Discussion

Based on the data of the examination of intestinal nematode eggs of the *Soil Transmitted Helminths* (STH) group on soil samples along the Sindupraja River in Indramayu Regency, it was found that as many as 12 samples of Sindupraja river soil contaminated with *Soil Transmitted Helminths* (STH) intestinal nematode eggs.

Table 1. Dataset Rsults with Percentage Table

Contamination of Soil Transmitted Helminths *(STH)* Intestinal Nematodes	Examination results Frequency	Percentage (%)
Positive	12	33 %
Negative	24	67 %
Total	36	100 %

(Source: Primary Data, 2024)

Table 2 Percentage Results by STH Egg Type Category

Results of Soil *Transmitted Helminths eggs*			
Ascaris lumbricoides	*Trichuris trichiura*	*Hook Worm*	Total
6 (17%)	2 (5%)	4 (11%)	12 (33%)

(Source: Primary Data, 2024)

Discussion

This research was conducted on April 25, 2024 at the AAK An Nasher Cirebon Hematology laboratory using the Flotation (Flotation) method, a method that uses a saturated NaCl solution based on the specific gravity of the egg so that it will float to the surface of the tube and be covered with a glass cover so that the worm eggs rise to the surface of the solution.

According to FKUI (2016), the habitat of *Soil transmitted helminths* worm eggs is to infect parts of the small intestine. This parasite is found cosmopolitan, especially in areas with humid air and is very closely related to sanitary and hygiene conditions. Surveys

conducted in several places in Indonesia show that the prevalence of Ascaris lumbricoides is still quite high, around 60-90%.

Station 1 obtained positive results contaminated with *Soil transmitted helminths* worm eggs, namely soil samples number 1, 2, and 3. Soil samples number 1 and 3 were positive *for Ascaris lumbricoides* worm eggs and soil samples number 2 were positive *for Hook worm* eggs, this is because the location is near latrines which are often used with humid environmental conditions and accompanied by a lot of grass and garbage around. Station 3 obtained a positive result contaminated with *Soil transmitted helminths* worm eggs, namely in soil sample number 14 there were *Trichuris trichiura* worm eggs, this is because the location of the sampling point is in the form of a garbage dump so that *Trichuris trichiura* worm eggs can survive in warm or hot and humid soil conditions. Station 4 obtained a positive result contaminated with *Soil transmitted helminths* worm eggs, namely soil samples number 19, 21, 22, 23 positive for *Ascaris lumbricoides* worm eggs , this is due to the proximity of the toilet which is often used with humid and dirty environmental conditions accompanied by a lot of grass around it, while in soil sample number 24 positive *Trichuris trichiura* worm eggs were obtainedThis is because the location of the sampling point is close to the garbage disposal with warm and humid soil conditions.

Station 5 obtained positive results contaminated with worm eggs *Soil transmitted helminths*, namely soil samples numbers 28 and 29, both of them have the same worm egg species, namely *Hook worm*, this is because the location of the sampling point is quite far from the latrine but the soil condition is moist accompanied by grass and garbage around it. Station 6 obtained a positive result contaminated with *Soil transmitted helminths* worm eggs, namely in soil sample number 36 positive for *Hook worm* eggs because the location of the sampling point is close to the bridge with the soil condition is moist accompanied by grass and garbage around it. Based on the results of the study, 3 categories of worm egg species of Soil transmitted helminths on the land along the Sinduraja river, namely *Ascaris lumbricoide, Trichuris trichiura*, and Hookworm eggs, habitat conditions also support the increase in disease infections. Tropical areas generally have a moist soil character, coupled with a lack of sunlight will be conditions that favor the transmission of worm eggs. The type of habitat suitable for the development of worm eggs is clay. In this location, worm eggs will remain infectious, especially around puddles or water mixed with the soil, can spread to plants and livestock, so that they can pollute the environment and contaminate the surroundings.

Infective worm eggs found in the soil can infect humans if the worm larvae penetrate the skin or indirectly ingest worm eggs, the presence of worm eggs on the fingernails of the respondents can have a detrimental impact on the sufferer such as affecting the needs of nutrients, blood loss, inhibiting physical development, intelligence and work productivity, and reducing the body's immunity so that it is easy to be exposed to other diseases.

One of the efforts to prevent the development of diseases and keep the environment clean and healthy is by building latrines in every house. Because latrines are one of the basic human needs. So it is expected that each individual will take advantage of the toilet facilities to defecate. The use of toilets will be beneficial to keep the environment clean, comfortable and odorless. The findings of this study indicate a notable presence of Soil-Transmitted Helminths (STH) in the soil along the Sindupraja River, with 33.3% of the collected samples testing positive for the eggs of intestinal nematodes. These include *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms (*Ancylostoma duodenale* or *Necator americanus*), which are the most common STH species known to infect humans. This result highlights a significant level of environmental contamination in the study area, especially considering that STH transmission is closely linked to poor sanitation and hygiene practices.

Harahap et al. (2018) reported approximately 30% contamination in North Sumatra, while Dewi et al. (2017) found around 20% in Central Java. Such differences are typically influenced by variations in sanitation, population density, and hygiene habits. A study by Fajutagana et al. (2019) in the Philippines also reported a 40% prevalence near riverbanks with poor sanitation, reinforcing the relationship between soil moisture, poor hygiene, and parasite presence.

Environmental factors such as proximity to latrines, presence of garbage, and dense vegetation around sampling sites contributed significantly to the survival of STH eggs in the Sindupraja soil. These results corroborate findings by Prasetyo et al. (2022), who highlighted that moist and shaded soil environments promote the longevity of helminth eggs. FKUI (2016) also emphasized that STH eggs can remain viable for months in humid soils protected from ultraviolet sunlight, which reduces egg viability. The tropical climate characterized by warm temperatures and high humidity in Sindupraja creates ideal conditions for egg survival and infection risk, while areas with better sanitation and sufficient sunlight, as shown by Anwar et al. (2020), have lower soil contamination levels.

The flotation method using saturated NaCl solution applied in this research proved to be an effective standard technique for isolating parasite eggs from soil

samples. The use of stratified random sampling combined with the Belt Transect-Quadrat method provided a comprehensive and representative coverage along the riverbanks, improving the reliability and validity of the data compared to previous studies that used simpler random sampling approaches.

The novelty of this research lies in its focused assessment of STH contamination in the unique ecological context of the Sindupraja River, integrating micro-environmental factors such as latrine proximity, waste accumulation, and vegetation density to explain variations in contamination levels. This detailed approach has not been extensively explored in prior studies, which often overlook such fine-scale environmental influences. From a public health perspective, the findings suggest a high risk of STH infection, especially among children and individuals frequently exposed to contaminated soil through daily activities near the river such as farming, bathing, and playing. This aligns with reports by Susanti et al. (2021), which document the adverse health effects of STH infections including malnutrition, anemia, impaired physical and cognitive development, and weakened immunity. These health burdens underline the urgent need for targeted interventions to interrupt the transmission cycle.

Recommendations consistent with global and regional studies include improving sanitation infrastructure by constructing and maintaining proper latrines, managing domestic waste effectively, and promoting hygiene education focusing on handwashing and footwear use. Regular mass deworming campaigns are also vital to reduce infection rates and community disease burden. A comprehensive, multi-sectoral strategy involving local government, healthcare workers, and community participation is essential for sustainable STH control in the Sindupraja area.

Comparisons with regional and global data reveal similar trends: areas with improved sanitation exhibit very low soil contamination by STH eggs, while tropical, low-sanitation regions such as Sindupraja display moderate to high contamination levels (Nurfadillah et al., 2021; Wasila et al., 2020). The World Health Organization estimates that over 1.5 billion people worldwide remain infected with STHs, predominantly in developing countries with comparable environmental and sanitation challenges. This study reinforces the notion that STH control requires an integrated approach combining medical treatment, environmental sanitation, and behavioral changes.

Overall, this research contributes valuable insights into the distribution and environmental determinants of STH eggs in the Sindupraja River area through a systematic and detailed methodology. The findings are expected to inform policy development and the design of effective control programs aimed at reducing STH prevalence and improving community health in similar settings.

The use of the flotation method with saturated NaCl solution proved effective in isolating helminth eggs from the soil samples. The positive identification of STH eggs suggests that the Sindupraja River area may serve as a potential hotspot for the transmission of these parasites, posing a health risk to the surrounding population—particularly children and individuals frequently exposed to soil during daily activities such as farming, bathing, or playing near the riverbanks. The 33.3% contamination rate reflects moderate-to-high environmental exposure and aligns with global patterns observed in other tropical and subtropical regions lacking adequate sanitation infrastructure. This finding is particularly concerning in areas near open defecation sites or where human waste management is minimal or nonexistent. The presence of multiple STH species in the samples also points to a complex contamination profile, which could increase the burden of polyparasitism in affected communities.

The study's use of stratified random sampling and the belt transect-quadrat method ensured representative sampling across different points along the riverbanks, providing reliable insight into the extent of helminth egg distribution. Furthermore, the application of descriptive statistical analysis has helped in clearly quantifying and interpreting the data collected. These results underscore the urgent need for targeted public health interventions. Recommendations include strengthening sanitation infrastructure (e.g., constructing public latrines), regular deworming programs, and community education on hygiene practices such as handwashing and the use of footwear to prevent contact with contaminated soil. Health education campaigns are especially important to reduce reinfection rates, which commonly occur in communities with persistent environmental exposure. The detection of STH eggs in one-third of the samples indicates a persistent cycle of environmental contamination and transmission in the Sindupraja River area. Immediate and integrated efforts combining health education, sanitation improvement, and routine monitoring are essential to reduce STH prevalence and protect the health of the local population.

Conclusion

The identification of intestinal nematode worm eggs of the Soil transmitted helminths group on the soil of the Sinduraja river, the following conclusions were drawn: From the results of the above examination, 12 soil samples were obtained that were positively contaminated with intestinal worm eggs of the Soil *transmitted helminths* group, From the results of the

above examination, it shows that the condition of the river soil in the area is generally quite contaminated with intestinal nematode eggs of the Soil Transmitted Helminths (STH) group, including Ascaris lumbricoides eggs, Trichuris trichihira eggs, Hook worm eggs (Hook worms), After the data is collected, the data is processed using descriptive statistical analysis, namely there are 33.3 (%) soil samples contaminated with intestinal nematode eggs *Soil Transmitted Helminths* (STH).

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For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, P.S, M.A and U; methodology, P.S, M.A and U; software, P.S, M.A and U; validation, P.S, M.A and U; formal analysis, P.S, M.A and U; investigation, P.S, M.A and U; resources, P.S, M.A and U; data curation, P.S, M.A and U; writing—original draft preparation, P.S, M.A and U; writing—review and editing, P.S, M.A and U; visualization, P.S, M.A and U; supervision, P.S, M.A and U.; project administration, P.S, M.A and U; All authors have read and agreed to the published version of the manuscript.

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The authors declare no conflict of interest.

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