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Relation of Parasites in Soil with The Existence of Parasites on Farmer's Nails

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Abstract

Worms is an infectious disease caused by parasitic worms that can endanger health. Worms that often infect and have a very detrimental impact are soil-borne worm infections or Soil-Transmitted Helminths. Soil-Transmitted Helminths still considered insignificant because it is considered not to cause harm or cause death. This study aims to determine the relationship of parasites in the soil with the presence of parasites on the nails of farmers Sumber Urip 1 Village Wonorejo, East Java, Indonesia. The research method was used observational analytic with a cross-sectional study design which involved 18 Sumber Urip 1 farmers in Wonorejo Village. The sampling technique used was Total Sampling. The bivariate analysis uses Pearson correlation with decision making using significant <0.01. The identification of parasites using the floating method in 18 soil samples contained 12 flattering pieces of hookworm larvae and roundworm eggs. While the results of parasite identification with sedimentation method in 18 nail samples of farmers, there are 11 positive hookworm larvae samples, i.e. *Ancylostoma duodenale*. The correlation test result showed a relationship between parasites in the soil and nails of Sumber Urip 1 farmers in Wonorejo village (significant as $P < 0.01$). The use of gloves and footwear (shoes) when working on agricultural land, wash hands with soap and brush nails so that dirt is lost, and consume worm medicine can prevent worms infection.

Keywords

Infection, Farmers' Nails, Parasites, Soil-Transmitted Helminths.

INTRODUCTION

Worms is an endemic and chronic disease caused by parasitic worms with a high prevalence and is not lethal but affects the human body's health, resulting in decreased nutritional and public health conditions. The worm species *Enterobius vermicularis*, *Taenia saginata*, *Ascaris lumbricoides*, and *Ancylostoma duodenale* often infect and have devastating effects on soil-borne or *Soil-Transmitted Helminths*. Because it is not considered dangerous or causes death, *Soil-Transmitted Helminths* is not a problem or a severe threat to society. However, the impact of *Soil-Transmitted Helminths* infection can cause decreased health and even death (1).

Soil-Transmitted Helminth is a term that refers to a group of parasitic diseases caused by nematode worms that are transmitted to humans through fecal contaminated soil. Types of worms transmitted by significant soil concern to humans are *Ascaris lumbricoides*, *Trichuris trichiura*, *Necator americanus*, and *Ancylostoma duodenale*. The highest prevalence occurs in areas with inadequate sanitation and unsafe water (2).

More than 1.5 billion people, or about 24% of the world's population, have *Soil-Transmitted Helminths* infection in 2015 (3). World Health Organization data in 2015 stated that more than 270 million preschool-aged children and more than 600 million school-age children suffering from *Soil-Transmitted Helminths* infection require intensive care. Meanwhile, in Indonesia, worms are a common folk disease, and the condition can coincide with several types of worms at once (3). The worm disease survey results stated that 31.8% of elementary school students had worms (4). In the 2017 worm disease data at Poncokusumo Health Center, Malang Regency, Indonesia, there were 11 worm disease cases. In areas with a prevalence of around ≥20% – <50%, drug administration is carried out en masse to all elementary school children in a district/city once a year. If the prevalence is ≥50%, deworming is administered to all elementary school children in a district/city two times a year (5). Selective treatment is given when the majority is <20%. Poncokusumo Puskesmas in April 2018, 689 people in Wonorejo Village, Indonesia, needed worm medicine.

Soil-Transmitted Helminths worm infection can occur in related jobs or using moist soil as its primary raw material because it is the right place for *Ascaris lumbricoides*, *Trichiuris trichiura*, *Necator americanus*, *Ancylostoma duodenale*, and *Strongyloides stercoralis*. Often groups of agricultural workers (farmers) who are in direct contact with the ground get this worm infection (2). Vegetable farmers who are at risk of being infected with worms are the Sumber Urip 1 farmer group in Wonorejo Village, where the farmers only use gloves

made of cloth, and footwear in the form of boots is rarely use. Therefore, this study analyzes the relationship between parasites in the soil and parasites in Sumber Urip 1 farmers' nails in Wonorejo Village, Poncokusumo District, Malang Regency.

MATERIALS AND METHODS

The study was an analytic observational study with a cross-sectional study design conducted from June to August 2018. The study's population were farmers of Sumber Urip 1 in Wonorejo Village with a sample size of 18 people, and the sampling conduct by comprehensive selection. In this study, the samples were soil samples and nail samples from the farmer members of Sumber Urip 1, Wonorejo Village, Poncokusumo District, Malang Regency. This research has passed the ethical test with letter number 684/UN.8/KEPK/DL/2018.

The instrument in this study used a secondary data search guide covering the respondent's characteristics and primary data using laboratory tests. The laboratory examination in this study aims to identify parasites in Sumber Urip 1 farmland in Wonorejo Village using the floating method. This method uses a saturated salt solution or saturated sugar to float the eggs. The floating method generally used for checking feces that contain a small number of worm eggs. This method works based on the lighter specific gravity. The solution used has a heavier density compared to worm eggs so that the eggs and the large particles in the feces will float on the surface (6). The sedimentation method is a suitable method for examining old stool samples, thus the method used to identify parasites on the nails of Sumber Urip 1 farmers in Wonorejo Village. The principle of the sedimentation method is that the use of centrifugal force can separate the suspension and supernatant so that the worm eggs can settle (7). There are two data processing steps in this research, namely manual data processing and computer data processing. For the statistical analysis, the univariate and bivariate analysis used the Pearson correlation test at SPSS 16.0 for Windows.

RESULTS

The respondent characteristics grouped into four categories based on gender, age, education, and work period in years. The results of observations made on 18 farmer members of Sumber Urip 1, Wonorejo Village, Poncokusumo District, Malang Regency were 100% male. At the beginning of the formation of the Sumber Urip 1 farmer group, women farmers did not join so that currently, the members of the Sumber Urip 1 farmer group are male.

The identification of parasites in the sample of farmers' agricultural land in Sumber Urip 1, Wonorejo Village, Poncokusumo District, Malang Regency

used the floating method. The result of the floating method showed in Table 1.

Based on Table 1, it is known that the results of the examination of parasites on the soil with a sample size of 18, there were positive results for parasites in 12 samples with a percentage of 66.7% and negative consequences for parasites in 6 samples with a ratio of 33.9%. The results of identifying positive soil samples for parasites found hookworm larvae (Figure 2) and roundworm eggs (Figure 1) with the following picture.

Table 1. Frequency distribution of parasite identification results in soil using floating method

Number	Result	Frequency	Percentage (%)
1	Positive	12	66.7 %
2	Negative	6	33.9 %
Total		18	100 %

Figure 1. Roundworm eggs with a size of 60–45 microns (black arrow).

The results of the identification of parasites in the nail samples of Sumber Urip 1 farmers, Wonorejo Village, Poncokusumo District, Malang Regency using the sedimentation method with observations of the results using a microscope are shown in Table 2.

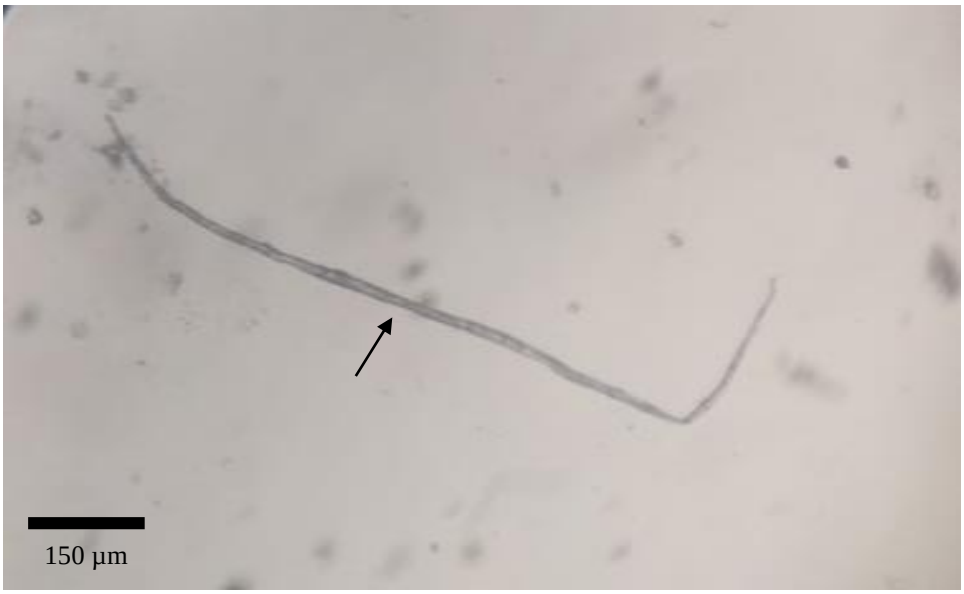

Figure 2. Hookworm larvae with a size of 600 x 25 microns (black arrow).

Table 2. Frequency distribution of identification results of parasites in nails using the sedimentation method

Number	Result	Frequency	Percentage (%)
1	Positive	11	61.6 %
2	Negative	7	38.9 %
Total		18	100 %

Figure 3. Hookworm larvae with a size of 600 x 25 microns (black arrow).

Based on Table 2, it is known that the results of parasite examination on the nails of Sumber Urip 1 farmers with a total sample of 18 are as much as sample of 11 samples of positive parasites with a percentage of 61.1%, and a negative result of parasites in 7 samples with a ratio of 38.9%. The results of identifying positive samples of parasites on farmers' nails found in the following picture of hookworm larva (Figure 3).

The results of the correlation test carried out on the identification results of soil samples and farmer nail samples are shown in Table 3.

Table 3. The results of the relationship between parasites in the soil and parasites on the farmers' nails

Variable	Significance Correlation
Soil samples	0.004*
Nail samples	

*correlation is significant (P < 0.01)

Based on Table 3, it is known that the results of the Pearson correlation test on soil samples and nail samples, amounting to 18 samples each, were significant at 0.004. The significance result of 0.004 is less than 0.01, so the soil sample and nail sample are correlated, or there is a significant relationship.

DISCUSSION

The respondents' age mostly is around 45 – 50 years. That age is likely because people who work as farmers are not in the adolescent or old age group, although a small proportion is productive (8). The education level of farmer members is mainly elementary school education. It showed that the community does not consider education as essential and does not have the awareness to complete at least nine years of education regardless of the type of work. All farmer members' working period is more than ten years. Sumber Urip 1 members' working period is more than ten years because Sumber Urip 1 farmer members are members from the beginning of the group's formation until now, and no new members added.

Hookworm is a type of Soil-Transmitted Helminths that can easily infect its host because, in addition to eggs, infective larval forms can actively enter the host's body. Plantation lands, schoolyards, and settlements are places where human activities often occur; soil contamination by hookworm eggs and larvae coupled with a lack of public awareness to maintain personal hygiene while doing activities outside the home will further increase the risk of hookworm transmission (9).

Roundworms are generally distributed throughout the world, air humidity is high, especially in tropical and subtropical areas. These roundworm eggs can survive up to one year in soil (10). From the results of parasite research on the ground at the research location, there were hookworm larvae and roundworm eggs because the Wonorejo village location was a highland area with relatively cold temperatures and was close to mountains so that the humidity of the soil was high. The form of agricultural land in Wonorejo Village is loose soil, so it is suitable for agriculture and is a breeding ground for hookworms and roundworms.

The presence of hookworm larvae can cause Sumber Urip 1 farmers have poorly maintained nails, and agricultural land processing does not use gloves. The identification results obtained hookworm larvae because they are thin shape, 600 microns elongate, white to gray, and the oral cavity does not look perfect. The spread of hookworm is widespread throughout the world, especially in tropical and subtropical areas which have high temperatures and humidity (10).

Hookworm is a type of Soil-Transmitted Helminths that can easily infect its host because, in addition to eggs, infective larvae can actively enter the host's body (9). Eggs or worm larvae are often stuck on dirty nails. This condition usually occurs in children who often play in the ground and adults who work in the garden or the fields. Transmission of worm infection can be through long fingernails where there is a possibility that worm eggs tucked in so that the worm eggs swallowed when eating (11).

The relationship between parasites in the soil and the farmer's nails is probably due to the habit of farmers who do not use gloves when processing agricultural land, lack of personal hygiene, lack of knowledge about a parasitic infection; or the use of fertilizer from livestock manure as a soil fertilizer. Soil pollution is the cause of the transmission of worm eggs from the soil to humans through hands or nails that contain worm eggs, which then enter the mouth with food. The existence of agricultural/plantation land, resident habits, and occupation of the population can be risk factors for hookworm infection incidence in humans. Hookworm larvae can grow and develop very well in loose soil because, the larvae can freely take oxygen than if they are in clay. The use of manure containing worm eggs on plantation land is likely to cause contamination of plantation soil by hookworms and other types of worms (9).

Larvae or adult worms can cause symptoms of hookworm infection. According to the place of preference, adults hookworms can live in the small intestinal cavity of the host animal. Adult hookworms cause slow blood loss because adult worms can suck blood from 0.2 to 0.3 mL every day.

Chronic infection can cause progressive anemia, hypochromic microsites, iron, and Hb deficiency can decrease to 2 g/dL. If infection situation continues to worsens, it can cause shortness of breath, fatigue, and dizziness to heart weakness. Hookworm larvae can penetrate to skin and can cause itching (*ground itch*). Hookworm larvae can also migrate to the lungs and cause pneumonitis. *Ancylostoma duodenale* infection is more severe than disease caused by *Necator americanus* This is in line with research that there is a significant relationship between cutting nails once a week using footwear, washing hands before eating, and washing the feet with the incidence of worms (13). In other studies, it has shown there was a relationship between the habit of washing hands with antiseptic soap and the incidence of worms (14). In line with this, this study showed an association between handwashing habits and worm infection (15). Worm infection can be affected by personal hygiene, such as hand and nail hygiene. Worm infection mainly transmitted through dirty hands and feet because worm eggs are usually hiding in long and dirty fingernails (16).

Lack of personal hygiene, especially defecation and sanitation habits, low socio-economic status, lack of education levels are risk factors for hookworm infection. Improved sanitation, hygiene, and chemotherapy have made hookworm infestations rare in developed countries but are still endemic in the world (17). Hookworm infection can prevent by giving worm medicine to sufferers, and it is better if mass treatment also carried out for all residents in endemic areas. Health education is given to residents to make adequate latrines to prevent soil contamination. When walking on the ground, they always use footwear to avoid skin infection by hookworm *filariform* larvae (10).

CONCLUSIONS

This study found there was a significant relationship between parasites in the soil and the nails of farmers (p-value < 0.01). Suggestions for Sumber Urip 1 farmers in Wonorejo Village for use gloves and footwear in the form of shoes when working on agricultural land, wash hands with soap and brush nails so that dirt is lost, and regularly consume worm medicine to prevent the worm infection.

AUTHOR CONTRIBUTIONS

Edza Aria Wikurendra: conceptualization, writing-reviewing, validation, data analysis, methodology. Merry Chrismiati: sampling and data collection. Globila Nurika: writing-original draft preparation.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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