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Identification of eggs of soil transmitted helminthes (STH) intestinal nemathodes in children by flotation method in Tengket village, Arosbaya district, Bangkalan regency

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Abstract
Background: Worm infections can occur in humans throughout the world regardless of age and attack children's health. This statement encouraged researchers to do this in Tengket Village, where most guardians ignore their children's PBHS and latrines in rivers around residents' houses cause worm infections. More than 1.5billion people, or 24% of the world's population, are infected with soil-borne worms. That are transmitted through the soil are also called nematodes of the STH class. *Objectives*: The study aimed to identify STH intestinal nematode eggs in children in Tengket Village, Arosbaya, Bangkalan. *Materials and Methods*: The method used is flotation using NaCl reagent with the principle of different specific gravity so the parasites in the feces will be floated on the surface. The floatation method is able to produce a clean field of view and an easy procedure, thereby minimizing false positives and false negatives. *Results*: The research was carried out in February 2023 and the results obtained were that 9 out of 30 children's feces samples tested positive for worms. The positive results in the samples could be due to river latrines still being used and the spread occurring due to lack of attention to PHBS. *Conclusions*: Based on the research results, the percentage of worms has increased.

Keywords
Stool examination, Worm infection, Soil transmitted helminthes.

1. Introduction

Infections with worms can occur in humans worldwide, especially in subtropical and tropical climates with poor sanitation. Worm infections do not discriminate by age, affecting both children and adults. More than 1.5 billion people, or 24% of the world's population, are infected with soil-transmitted worms. Infections are widespread in tropical and subtropical regions, with the highest numbers in sub-Saharan Africa, the Americas, China, and East Asia. Indonesia has the largest number of cases of ascariasis and trichuriasis, with over 90 million cases each, and 60 million cases of hookworm (Lee & Ryu, 2019). The Indonesian government initiated a deworming program in 2019

with the goal of reducing worm prevalence to below 10%, highlighting Indonesia's high potential for worm infections as a tropical country.

Parasitic worms in humans are broadly classified into two taxonomic groups: roundworms (Nemathelminthes) and flatworms (Platyhelminthes). Nematoda, derived from the Greek words "nema" meaning thread and "ode" meaning tube, make up the roundworm class. Nematodes have a complete digestive system, although their nervous and excretory systems are not fully developed, and those with a body covered by cuticle have a body cavity (Soedarto, 2016). In medical parasitology, Nematoda is divided into intestinal nematodes, which live in the intestinal cavity, and tissue nematodes, which live in various organ tissues (Padoli, 2016). Intestinal nematodes are further divided into Soil Transmitted Helminthes (STH) and Non-STH. STH species are transmitted through soil, entering the body through the skin or ingestion, causing chronic morbidity in humans (Ka'bah; Nurlaela Alydrus, 2013).

The prevalence of intestinal nematodes, specifically STH, is often detected in human feces. In 2019, 28 out of 100 respondents were reported positive for STH infections (Al-Muzaky et al., 2019). Previous research also found a 100% infection rate with the discovery of hookworm eggs, a type of STH (Paramitha, 2022). Approximately a decade ago, it was estimated that over 2 billion people were infected with these parasites, with the highest prevalence in areas with inadequate sanitation and unreliable water supplies (WHO, 2013). These data confirm that soil-transmitted parasitic worms, attacking the human intestine, belong to the Nematoda class, specifically the STH group, with transmission occurring through soil.

Sample collection took place in Tengket Village, Arosbaya Subdistrict, Bangkalan Regency. The choice of this research location was based on it being the second-highest area for stunting incidence in Arosbaya (Arosbaya, 2022a). Stunting is a chronic nutritional problem resulting from prolonged inadequate nutrient intake, leading to disrupted child growth (Tim RSUD Blora, 2022). If children are infected with worms early on, it is highly likely to cause chronic malnutrition, a leading cause of stunting. In 2018, a feces examination in Arosbaya found 4 out of 40 samples from elementary school children positive for worm infections, suspected as a cause of stunting (Arosbaya, 2022b). Subsequent feces examinations were not conducted in other areas due to budget and manpower constraints. This research aims to provide further examination in other areas, specifically in Tengket Village, with the hope of raising awareness about clean and healthy living to prevent the spread of worm infections.

2. Materials and Methods

2.1. Types of research

This research employs a qualitative descriptive research method conducted in February 2023 at the Parasitology Laboratory of the Medical Laboratory Technology Department, Health Polytechnic of the Ministry of Health, Surabaya, located at Jl. Karangmenjangan No.18A, Surabaya, East Java. The study population will consist of children in Tengket Village, Arosbaya District, Bangkalan Regency. The research sample comprises fresh feces from 30 children.

Sample selection is carried out using purposive sampling method. Fecal samples are only collected from areas with toilets or latrines near the river that are still in use. The samples are also taken from children under 5 years old who experience stunting, as they are more likely to be indicated for worm infections leading to low nutrition. The research involves primary data collection using two methods: observation, which entails direct observation of the respondents' areas that meet the criteria, and interviews with respondents willing to participate in the study.

2.2. Research methods

The examination method used in this research is the flotation or floatation method. The principle of this method is that worm eggs will float on the surface of the reaction tube due to the difference in specific gravity between saturated NaCl as the reagent and parasites in the feces (Sasongkowati & Yunita, 2020). The fecal examination procedure used aligns with the flotation method employed by Widarti (Widarti, 2018). Under the microscope, fertilized Ascaris worm eggs have a slightly elongated or oval shape and consist of three thick-walled layers: a non-permeable lipoidal vitelline membrane (inner), a transparent middle layer derived from glycogen, and an albuminoid layer (outer) colored golden brown due to bile pigment/bilirubin. The surface of the layer may appear wavy or serrated (uneven) (Rezki & Aritonang, 2018).

Trichuris eggs, on the other hand, have a thick and smooth brown wall covering the egg with two double layers patterned in brown. These eggs have two poles, resembling a clear projection or mucoid plug (Adrianto & Christiani, 2019). Another characteristic is the oval shape of Hookworm eggs with a single thin transparent wall. This study has complied with the ethical approval No. EA/1665/KEPK-Poltekkes_Sby/V/2023, following the 7 WHO 2011 standards.

3. Results and Discussion

3.1. Results

Of the 30 samples examined to identify Soil Transmitted Helminthes (STH) intestinal nematode eggs in children using the flotation method in Tengket Village, Arosbaya District, Bangkalan Regency, 9 samples were found to be positive for worm infection. The following is a Table 1.

Table 1. Results of examinations to identify Soil Transmitted Helminthes (STH) type intestinal nematode eggs in children using the flotation method in Tengket Village, Arosbaya District, Bangkalan Regency

Sample Code	Age		Check up result		
	M	F	Roundworms (*Ascaris lumbricoides*)	Whipworm (*Trichuris trichuria*)	Hookworm
1	6m		Negative	Negative	Negative
2		2y 2m	Negative	Negative	Negative
3	2y 4m		Negative	Negative	Negative
4		2y 9m	Positive (+)	Negative	Negative
5	2y 11m		Positive (+)	Negative	Negative
6	4y		Positive (+)	Negative	Negative
7	8m		Negative	Negative	Negative
8		11m	Negative	Negative	Negative
9	1y 9m		Negative	Negative	Negative
10		2y	Negative	Negative	Negative
11		2y 2 m	Negative	Negative	Positive (+)
12		2y 5m	Negative	Negative	Negative
13	4y 5m		Negative	Negative	Negative
14	1y 3m		Negative	Negative	Negative
15		1y 3m	Negative	Negative	Negative
16		1y 5m	Negative	Negative	Negative
17		2y 2m	Negative	Negative	Negative
18		3y	Positive (+)	Negative	Negative
19	3y 3m		Negative	Negative	Negative
20	3y 6m		Negative	Negative	Negative
21	4y		Negative	Negative	Positive (+)
22	1y 7m		Negative	Negative	Negative
23	1y 10m		Negative	Negative	Positive (+)
24		2y	Negative	Negative	Negative
25		2y 9m	Positive (+)	Negative	Negative
26	3y 2m		Negative	Negative	Negative
27	3y 5m		Negative	Negative	Negative
28		3y 8m	Negative	Negative	Negative
29		4y	Negative	Negative	Negative
30		4y 7m	Positive (+)	Negative	Negative

Note: Negative = no eggs of that type of worm were found; Positive = eggs of that type of worm were found.

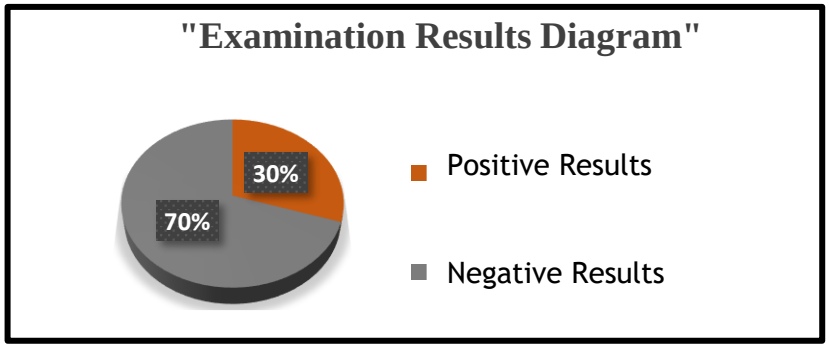

Figure 1. Diagram of the percentage results of the identification of Soil Transmitted Helminthes (STH) intestinal nematode eggs in children using the flotation method in Tengket Village, Arosbaya District, Bangkalan Regency

Another form of presenting identification can be based on the percentage of Soil Transmitted Helminthes (STH) intestinal nematode eggs, allowing us to determine the most prevalent type of STH capable of infecting children in Tengket Village, Arosbaya District, as follows Figure 2.

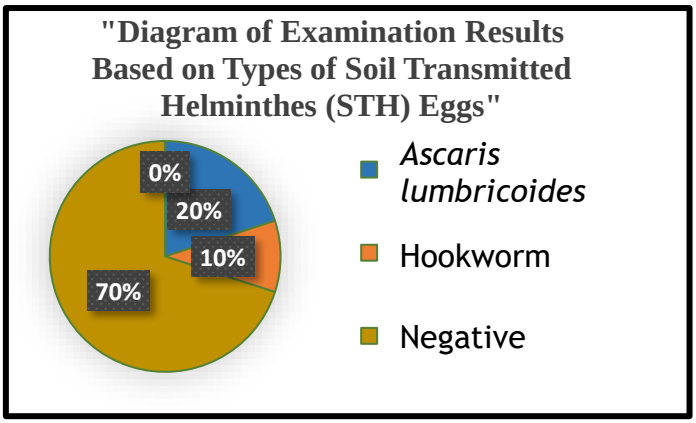

Figure 2. Diagram of Examination Results Based on Categorization of Soil Transmitted Helminthes (STH) Egg Types in Children using the Flotation Method in Tengket Village, Arosbaya District, Bangkalan Regency.

Based on the formed diagram, it indicates that the most prevalent type of Soil Transmitted Helminthes (STH) affecting children in the area is the roundworm (Ascaris lumbricoides), accounting for 20% of the positive samples. The second most common type of STH infection is the Hookworm, constituting 10%, and there were no samples infected with whipworm (Trichuris trichiura). The remaining 70% of the percentage indicates that patients are not infected with intestinal worms.

3.2. Discussion

This research was conducted with 30 fecal samples from children in Tengket Village, Arosbaya District, Bangkalan. Samples were collected weekly in February, with 14 samples from boys and the

remaining 16 samples from girls. From the conducted examinations, 70% yielded negative results, while the remaining 30% were identified as positive for Soil Transmitted Helminthes (STH) egg identification. Out of the 30 fecal samples, 9 were identified as positive for soil-transmitted helminths, with 20% being roundworms (Ascaris lumbricoides), 10% hookworms, and 0% whipworms (Trichuris trichiura), while the remaining 70% were negative. The positive results may be attributed to the lack of adherence to proper hygiene practices by parents or guardians. Similar research conducted in Puuwatu on children found 8 out of 10 to be positive for STH intestinal nematode infections (Idris & Fusvita, 2018).

The rivers in Tengket Village still have latrines, making them a dumping ground for human waste, leading to contamination of the river and soil. Eggs deposited on the soil near the river, with suitable climatic conditions, can develop into an infective stage. According to research by Wijaya, the prevalence of helminthiasis is closely related to climate and personal hygiene (N. H. Wijaya et al., 2019). Optimal temperatures in this climate support the development of worm eggs in the soil around the river into an infective stage. Contaminated soil can contribute to the spread of infection, especially in susceptible children. Meilinda's research also pointed out that poor handwashing habits and nail-biting contribute to worm infections in children (Meilinda et al., 2018). Based on these studies, it can be concluded that children are highly susceptible due to climatic factors supporting worm development and their inability to maintain personal hygiene independently, often having direct contact with the soil.

Samples containing hookworm eggs, such as Necator americanus and Ancylostoma duodenale, can be influenced by the spread of infection through the skin or contaminated water ingested, and the rapid life cycle of worms when eggs fall into humus soil. The eggs transform into filariform larvae capable of penetrating the human body through the skin. Similar research in Baranti District suggested that the spread of worm infections was due to some individuals not wearing footwear when leaving their homes (Islamiati et al., 2021).

The flotation method used in this research yielded the expected results. One notable advantage of this method is the relatively clear visibility compared to direct methods, and the procedure is easy to perform when compared to sedimentation. A study on vegetable farmers using the flotation method found it to be significant in examining soil-transmitted helminth eggs (Jatmi Wikandari et al., 2021). Conversely, a study in Minahasa involving 54 farmers using the direct slide method reported negative results for each sample (R. P. Wijaya, 2018). The direct slide method has a less clear field of view and may be a contributing factor to the failure in finding covered worm eggs.

Therefore, the flotation method in this research is considered effective in finding STH eggs, especially hookworms, which have thin walls and are more visible due to the relatively clear field of view. However, no whipworm eggs (Trichuris trichiura) were found in this study. Negative results in samples can occur due to the presence of young adult worms in the human intestines that are not yet capable of producing worm eggs (Hadidjaja & S. Margono, 2018), suggesting the possibility of false-negative results. For future researchers, it is recommended to apply other more effective methods for fecal examinations, with easy, short procedures and clear preparations. This research can serve as a reference in future studies. For the community, it is advised to pay more attention to a clean and healthy lifestyle, especially for parents and guardians who can teach children from an early age about the importance of hygiene. A clean and healthy lifestyle can be achieved by cleaning hands before and after meals, washing hands after playing, wearing footwear when outside, maintaining a balanced diet, regularly cutting nails, and ensuring the cleanliness and thorough cooking of food. The final recommendation for the community is to regularly administer deworming medication, especially for vulnerable children.

4. Conclusions

Based on the research findings, the conclusion is that the percentage results of the identification of Soil Transmitted Helminthes (STH) intestinal nematode eggs in fecal samples of children using the flotation method in Tengket Village, Arosbaya District, Bangkalan Regency, have increased.

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