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Original Article

Prevalence of Soil-Transmitted Helminthiasis and Its Association with Pediatric Diarrhea in Perobatang Village, Southwest Sumba

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Abstract:

Background: Diarrhea is a prevalent health issues in developing countries and often linked to soil-transmitted helminthiasis (STH). This study aims to investigate the association between STH and diarrhea in Perobatang, Southwest Sumba.

Method: A cross-sectional study was conducted in Perobatang, January 2017. Participants were children aged 1–15 years. Stool samples were collected from each child and examined macroscopically for signs of diarrhea and microscopically for STH eggs. Positive cases were treated with albendazole 400 mg.

Result: A total of 333 samples were analyzed and 257 children were infected with STH (77%). The prevalence of *A. lumbricoides* was 56%, *T. trichiura* was 55%, and hookworm was 5%. Mixed infections were more common in children 6–15 years. 92 children (28%) had diarrhea. There is an association between the STH infection (combination of all three worm species) and diarrhea incidence (chi-square test, p=0.041). However, there is no association between the prevalence of single infections or the combination of two worm species and diarrhea incidence.

Conclusion: STH infections are associated with incidence of diarrhea in Perobatang, Sumba Barat Daya. This finding highlights the necessity for targeted, community-based interventions by local stakeholders to effectively address and mitigate this public health challenge.

Keywords: diarrhea, perobatang village, soil-transmitted helminthiasis, prevalence

Introduction

Diarrhea is a significant health problem in developing countries, including Indonesia. This disease can affect all age groups, with children as the most vulnerable population.[1] The incidence of diarrhea in eastern Indonesia is 9%.[2] The high incidence of diarrhea was due to the lack of knowledge about diarrhea, poverty, and low hygiene in the area.[1]

Soil-transmitted helminthiasis (STH) is a common parasitic infection associated with chronic diarrhea. In Indonesia, *Ascaris lumbricoides* and *Trichuris trichiura* are the most prevalent STH infections among children. In severe infections of both species may lead to malnutrition and chronic diarrhea, often misdiagnosed as simple diarrhea. Despite the potential for STH-related complications and chronic diarrhea, many parents delayed seeking medical attention, contributing to the persistence of infection and environmental contamination.[1]

Southwest Sumba, a district in East Nusa Tenggara, has limited water resources, poor sanitation, and a contaminated environment, with a high prevalence of STH. In Perobatang Village, the prevalence of *T. trichiura, A. lumbricoides,* and hookworm were 68.2%, 77.3%, and 3%, respectively. Despite the high prevalence in the region, the association between STH and diarrhea in Southwest Sumba, East Nusa Tenggara, Indonesia remained unclear.[1] Therefore, this study aims to investigate the association between STH and diarrhea in Perobatang Village, Southwest Sumba.

Method

A cross-sectional study was conducted among children aged 1–15 years in Perobatang Village, Southwest Sumba, East Nusa Tenggara, Indonesia, from January 2017 to August 2018. Children who had received anthelminthic medication within the previous three months or were acutely ill were excluded.

To encourage community participation, village heads and officials disseminated information about the study, informing village residents regarding the upcoming stool examinations for worms on children. Children and their parents were gathered and informed on how to collect stool samples. Stool samples were collected using 10 mL plastic containers, labeled with the name of participants and a code number. Collected samples were assessed macroscopically for color and consistency to identify diarrhea and microscopically (with 40x magnification) using the Kato-Katz technique to detect STH eggs and determine the infection intensity. Positive cases were treated with three-days course of albendazole 400 mg.

Data analysis was performed using SPSS ver. 20.0. Univariate analysis was used to describe the demographic characteristics of the study population and the prevalence

of diarrhea and STH. Bivariate analysis, using the chi-square test, was used to examine the association between STH and diarrhea, and between STH prevalence and age.

Ethical approval for this study was obtained from the Faculty of Medicine Universitas Indonesia-Cipto Mangunkusumo Hospital's ethics committee (No. 876/UN2.F1/etik/2016). Additionally, permission was obtained from District Health Office Head, and the village head of Perobatang. Informed consent was obtained from participants' legal guardians prior to their inclusion in the study. The consent process ensured that the guardians understood the study's objectives and the voluntary nature of their participation.

Results

A total of 333 children participated in this study, of which 58% were female. Participants aged 6–15 years (69%) were more prevalent than those aged 1-5 years. A number of 77% subjects were diagnosed with STH infections. However, only 28% of the children had diarrhea (**Table 1**).

Table 1. Characteristics of study participants

Characteristics	Frequency n (%)
Age (years)	
1–5 years old	103 (31)
6–15 years old	230 (69)
Gender	
Male	141 (42)
Female	192 (58)
STH Infection	
Yes	257 (77)
No	76 (23)
Diarrhea	
Yes	92 (28)
No	241 (72)

In children aged 1–5 years, single STH infections were more prevalent than mixed infections. In contrast, mixed infections were more common in the 6–15 age group. Among the total of 257 children diagnosed with STH infections, a higher proportion of single infections were observed compared to mixed infections (**Table 2).**

Table 2. Prevalence of Single and Mixed Infection

Age (years)	Single Infection n (%)	Mixed Infection n (%)
1–5	49 (60)	32 (40)
6–15	83 (47)	93 (53)
Total	132 (51)	125 (49)

Table 3 presents the prevalence of each type of STH. *A. lumbricoides* was the most prevalent STH infection among the children (n=187) and *A. lumbricoides* and *T. trichiura* was the most common mixed infection (n=118).

Table 3. Prevalence of STH Types

Age (years)	STH n (%)	Al n (%)	Tt n (%)	Hw n (%)	Al+Tt n (%)	Al+Hw n (%)	Tt+Hw n (%)	Al+Tt +Hw n (%)
1–5	82 (25)	62 (19)	50 (15)	1(1)	32 (10)	0(0)	0(0)	0(0)
6–15	175 (52)	125 (37)	134 (40)	18(5)	86(25)	9(3)	14(4)	8(2)
Total	257 (77)	187 (56)	184 (55)	19(6)	118 (35)	9(3)	14(4)	8(2)

Al=*A. lumbricoides*; Tt=*T. trichiura*; Hw=hookworm

Table 4 presents the intensity of infection. The majority of the cases were classified as mild, with only four cases exhibiting severe intensity. All hookworm infections were classified as mild. There is an association between STH infection and diarrhea (p-value=0.041), however, there is no association between STH infection and diarrhea incidence (**Table 5**).

Table 4. Infection Intensity

Infection Intensity	Al n (%)	Tt n (%)	Hw n (%)
Severe	2 (1)	2 (1)	-
Moderate	89 (48)	37 (20)	-
Mild	96 (51)	145 (79)	19 (100)
Total	187 (100)	184 (100)	19 (100)

Al=*A. lumbricoides*; Tt=*T. trichiura*; Hw=hookworm

Table 5. The Association between STH Infection and Diarrhea

Type of Infection	Diarrhea		Total	p-value
	Positive n (%)	Negative n (%)		
STH				
Positive	64 (25)	193 (75)	257	0.041
Negative	28 (37)	48 (63)	76	
A.lumbricoides +*T.trichiura*				
Positive	29 (25)	89 (75)	118	0.356
Negative	63 (30)	152 (70)	215	
A. lumbricoides				
Positive	48 (26)	139 (74)	187	0.366
Negative	44 (30)	102 (70)	146	
T.trichiura				
Positive	43 (23)	141 (77)	184	0.053
Negative	49 (33)	100 (67)	149	

Discussion

This study reported a high prevalence (77%) of STH infections in Perobatang Village, Southwest Sumba. The result is consistent with a previous study in Central Sumba which shows a prevalence of 83.3%.[3] The same study identified an association between STH infection and defecating outside the latrine, poor hand hygiene, nail-biting, finger-sucking, and barefoot walking. Several factors likely contribute to the high prevalence, including limited access to clean water, open defecation due to a lack of toilets, poor hygiene practices, poverty, and low levels of education. A meta-analysis is in line these findings, demonstrating an association between the availability of sanitation facilities and reduced STH infection risk (OR=0.46–0.58).[4]

Our study find that STH infection was most commonly found in children aged 6–15 years old (68%). This is potentially due to the higher engagement of children from this age group in outdoor activities compared to those aged 1–5 years old. This also explains why children aged 6–15 years old were more prone to combined infection, while those aged 1–5 years old were more likely to have single infection. A study in Ethiopia by Alelign et al.[5] reported similar findings, showing that older children more likely to be infected compared to younger children.

The most prevalent type of STH infection in this study was *A. lumbricoides* (56%), followed by *T. trichiura* (55%), and hookworm infection (6%). The higher prevalence of *A. lumbricoides* and *T. trichiura* infections compared to hookworm infection in Perobatang Village is likely attributed to the clay soil, which provides a more favorable environment for the development of *A. lumbricoides* and *T. trichiura* eggs than hookworm eggs. Hookworm eggs thrive in more porous soil, typically found in

agricultural areas. Thus, as children in this region may have limited exposure to farms, their risk of hookworm infection is smaller.[6]

A study conducted in Central Sumba reported a different distribution of STH infections, with mixed infections of *A. lumbricoides* and *T. trichiura* being the most common (35.6%) while *A. lumbricoides* infection was the least common (14.9%).[3] *A. lumbricoides* is a prevalent and widely distributed parasite due to its ability to produce large quantities of eggs which can survive in harsh environments. Each adult female produces approximately 200,000 eggs per day in the small intestine. These eggs remain viable in warm, shaded, and moist soil for up to 10 years and become infectious within 10 to 15 days.

Chronic diarrhea is a common symptom of STH infection that should be suspected in individuals from endemic regions.[7] Of the 92 children who experienced diarrhea in this study, 64 (69%) were positive with STH infection. Furthermore, this study also revealed an association between diarrhea incidence and STH infection. In ascariasis infection, diarrhea may occur due to the mechanical effects of the large *A. lumbricoides* worms, as well as the toxic and inflammatory responses triggered by the worms, increased the intestinal peristalsis.[8] Meanwhile, in trichuriasis infection, diarrhea was resulted from adult worms embedding their heads into the intestinal mucosa, causing damage, stimulating intestinal peristalsis, and potentially leading to bloody diarrhea.[9]

In single infections case with *A. lumbricoides*, *T. trichiura*, or hookworms, diarrhea typically occurs high infection intensity, whereas mild infections often do not cause symptoms. Diarrhea is more likely to manifest in severe infections, such as infection with high *T. trichiura* egg counts exceeding 10,000 eggs per gram of stool, presence of adult *A. lumbricoides* in the stool, or mixed infections which involve more than two species of worms.[6,8,10] In this study, mild infections were more prevalent, with only 64 out of 257 children with STH infections experiencing diarrhea. This explains why there is no association between diarrhea and helminth infections.

STH infections can have significant health consequences beyond diarrhea, including intestinal obstruction and hepatobiliary or pancreatic involvement in ascariasis.[11] A meta-analysis showed an association between STH infections and an increased risk of stunting, which is one of the most concerning effects of the infection.[12]

The limitation of this study is the absence of patient anamnesis, which are important for determining the underlying causes of diarrhea. However, this limitation does not diminish the significance of the study's findings. The results highlight the high prevalence of STH infections and association between STH and diarrhea, emphasizing the urgent need for interventions to mitigate these health risks.

We reccommend that the study findings to be disseminated to the District Health Office of Southwest Sumba to inform local health policies and programs. In cases of diarrhea, fecal examination for STH should be considered, and appropriate preventive measures, such as periodic deworming programs, be implemented to control STH.

Conclusion

The prevalence of STH infections is high in Perobatang Village, with *A. lumbricoides* being the most common type. While the overall intensity of infections is mild and diarrhea is uncommon, an association between STH infections and diarrhea persists.

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Conflict of Interest

None declared.

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