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Prevalence and Intensity of Soil-Tansmitted Helminth Infections Among Elementary School Students in West Sumba and Central Sumba Districts East Nusa Tenggara, Indonesia

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Abstract
Soil transmitted helminths (STH)still become a major public health problem in Indonesia.Affecting the physical growth and cognitive development especially in children.Knowing the prevalence of soil-transmitted helminth infections is necessary to plan control strategies and focusing on highly endemic regions for preventive chemotherapy and improved sanitation facilities. The purpose of this research is to know the prevalence and intensity infection of STH on school age childrenin West Sumba and Central Sumba Districts. Descriptive and cross sectional study were conducted.Six hundred and twenty-four stool sample were collected from students aged 5-14 years, and examinedwith Kato Katz method
Results: *568 (91.0%) have STH infected.The highest prevalence of single infection by A.lumbricoides was 28.5 percent followed by T.trichiura 5.9 percent and multi infections 65.6 % with mild to moderate infections in West Sumba. In Central Sumba District, the highest prevalence of A.lumbricoides infection was 30.0%, followed by T.trichiura17.1% and mixed infections of A.lumbricoides and T.trichiura 46.8%. Severe intensity infection was found in hookworm infection (6.25 percent). More education to raised the personal hygiene among student was needed to prevent and decreasing STH infection.*
Keyword: *soil-transmitted helminth, intensity, prevalence, sumba island.*

Introduction

Soil transmitted helminths (STH) still become a major public problem in tropical and sub-tropical countries, infects nearly 2 billion people world wild specifically in children. World Health Organization (WHO) estimates 870 million children live in the area of high STH prevanlace.[1)] In Indonesia, incidence of STH infection still high, but the intensity varies between regions. In 2015 the prevalence of worm infection in Indonesia reached 28.12%.[2)]

STH infection rarely causing mortality. The aerly symptoms of this infection are: diarhea, abdominal pain and low hemoglobin levels but the long term effects of these infections moreserious because it can affecting in r work productivity, physical growth and cognitive development also intellegence.[3)]

STH infection caused by four different species: roundworm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*) and hookworm (*Ancylostoma duodenale* and *Necator americanus*) can infected to human with infected eggs.[4] Adult worms live in the intestine, and producing thousands of eggs each day. The warm and moist of tropical and subtropical countries climate provides the ideal environment for the survival of parasite eggs or larvae.[5]

The strategy to monitor and controlling STH in endemic contries shoudstart seriously with e periodic treatmenth in high risk community : apreschool children, school age children, women of chilbearing age (including pregnant women in the second and thirt trimesters and breastfeeding women).[6]

Several studies about STH have been published from various regions of Indonesia, but no much data from East Nusa Tenggara. The aim of this research was to measured the prevalence and intensity of STH infection among school age children in West Sumba and a Central Sumba districts.

Methods

Study areas and population: A descriptive, with cross sectional study designwas Implemented from March to December 2016.research sites are located in West Sumba and Central Sumba districts, East Nusa Tenggara Province. The sample of this research were children in Elementary School and Kindergarten age. The inclusion criteria for students who are willing to be respondents by providing voluntary feces. students with other infectious diseases and refused to submit his feces were excluded. The number of samples is calculated by using the equation N = [Z 1- α / 2] 2 P (1-P)] / d2, where N = number of samples, P = proportion of occurrence of worms, Z1-α / 2 = CI of 95% d = margin error used. With 95% confidence and it is estimated that the lowest proportion of cases in the district is 80% (0.8) with 5 percent precision research, the sample size is 246, with 20 percent dropout estimate, the sample is 296 samples per district.

Screening for STH: sample of 5 grams stool from each respondent were collected in a clean 50 ml volume pot with a threaded.Stool samples shouldn't contacted withe urine because worms eggs and protozoa will damage with urine contamination. 10% formalin was added on the entire surface of the submerged stool to preserved the sample and then stored in room temperature. Sample were examined in the Parasitologi Laboratory of Loka Litbang Waikabubak using the Kato Kats methodology for determining the prevalensi and intensiy of STH using WHO gudeline [7] (Tabel 1)

Table 1. Classification criteria for intensity of STH

STH* Infection	Severity of Infection (eggs per gram)		
	Mild	Moderate	Sever
A. lumbricoides	1-4,999	5,000-49,999	≥ 50,000
T. trichiura	1-999	1,000-9,999	≥ 10,000
Hookworm	1-1,999	2,000-3,999	≥ 4,000

*STH: Soil-transmitted helminths

Ethics: The study was reviewed by Ethics Committe of National Institute of Health and Development. Ethical Approval number: LB.02.01/5.2/KE.208/2016

Results

Total sample of the study were 624 children, consist of 305 children in West Sumba District and 319 children in Central of Sumba. The results showed positive STH respondents in west Sumba District 100% and Central of Sumba district 82.40% (fig 1).

The prevalence of STH infection in West Sumba and Central of Sumba districts showed the highest infection was multi infection of *A.lumbricoides* and *T.trichiura* worms as much as 65.6 percent for West Sumba and Central of Sumba 46.8 percent (tables 2 and 3).

STH infection with severe intensity was not found in West Sumba District. infection caused by*A.*

lumbricoides and *T.trichiura* only have mild to moderateitensity infections. severe intensity of worm infection in Central Sumba District was found in hookworm infection, which was 6.25 percent. While infection cause by *A. lumbricoides* and *T.trichiura* onlycorellated with mild and moderate infections (table 4).

Distribution of STH infection by gender in West Sumba district, there were 165 (54.1%) boys and 140 (45.9%) girls infected with STH, whereas in Sumba districtwere144 (54.8%) boys and 119 (54.2%) girls infected with STH. The age group 9-11 years have the highest STH infection (44,2%)in West Sumba and 41,7% in Central Sumba Regency (table 5).

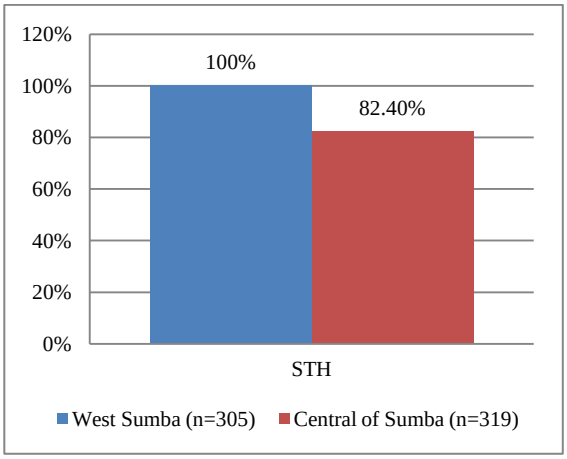

Figure 1. Chart of prevalence of soil-transmitted helminths (STH) in West Sumba and Central of Sumba

Table 2. Distribution of Parasite with Genderin West Sumba District, 2016

Sex		Parasite				Total
		Hookworm	*A.lumbricoides*	*T.trichiura*	Mix	
Male	n	0	53	7	105	165
	%		32,1 %	4,2%	63,6%	100%
Female	n	0	34	11	95	140
	%		24,3%	7,9%	67,9%	100%
Total	n	0	87	18	200	305
	%		28,5%	5,9%	65,6%	100%

Table 3 Distribution of Parasite with gender in Central of Sumba District, 2016

Sex		Parasite						Total
		Hookworm	*A.lumbricoides*	*T.trichiura*	Mix (*A.lumbricoides* + *T.trichiura*)	Mix (*T.trichiura* + Hookworm)	Mix (*A.lumbricoides* + *T.trichiura* + Hookworm)	
Male	n	2	40	28	65	1	8	144
	%	1,4%	27,8%	19,4%	45,1%	0,7%	5,6%	100%
Female	n	0	39	17	58	0	5	119
	%		32,8%	14,3%	48,7%		4,2%	100%
Total	n	2	79	45	123	1	13	263
	%	0,8%	30,0%	17,1%	46,8%	0,4%	4,9%	100%

Table 4. Severity of Infection in West Sumba and Central of Sumba District, 2016

District	Parasite		Severity of Infection			Total
			Mild	moderate	severe	
West Sumba	Hookworm	n	0	0	0	0
		%				
	A.lumbricoides	n	286	1	0	287
		%	99,7%	0,3%		100%
	T.trichiura	n	215	3	0	218
		%	98,6%	1,4%		100%
Central of Sumba	Hookworm	n	15	0	1	16
		%	93,75%		6,25%	100%
	A.lumbricoides	n	203	12	0	215
		%	94,4%	5,6%		100%
	T.trichiura	n	155	27	0	182
		%	85,2%	14,8%		100%

Table 5 Distribution of age with Gender in West Sumba and Sumba Tengah districts

District	Sex		Age (Year)				Total
			3 – 5	6 - 8	9 - 11	12	
West Sumba	Male	n	20	50	73	22	165
		%	12,1%	30,3%	44,2%	13,3%	100%
	Female	n	19	48	55	18	140
		%	13,6%	34,3%	39,3%	12,9%	100%
	Total	n	39	98	128	40	305
		%	12,7%	32,1%	42,0%	13,1%	100%
Central of Sumba	Male	n	13	53	60	18	144
		%	9,0%	36,8%	41,7%	12,5%	
	Female	n	11	41	59	8	119
		%	9,2%	34,5%	49,6%	6,7%	
	Total	n	24	94	119	26	263
		%	9,1%	35,7%	45,2%	9,9%	100%

Discussion

Soil-transmitted helminth infections is one of the contributor the burden of disease in the world and also in Indonesia. Although the infection controls of worms infection in Indonesia have been done since 1975 but the burden of this disease has not decreased significantly.[8)]evident from the results of research showing that STH infection in West Sumba district reaches 100 percent and Central of Sumba district reach 82.40 percent is a major public health problem among the people of West Sumba and Central Sumba and greatly affects the global targets to eliminate morbidity due to the

disease transmitted by helmitiasis in children in 2020.[9)]

Prevalence of infection of all STH species in this study in both West Sumba and Central of Sumba districts found that the prevalence of single infection *A. lumbricoides* was 94.10% higher than *T. trichiura* at 67.40%. Infection of *A. lumbricoides* occurs almost equally in all age groups and is present in the gender. Similarly, it was found by researchers in India and China, but unlike the results of research in Malaysia where the prevalence of *T. trichiura* infection was 26% - 98.2% higher than that of *A. lumbricoides* species 19% - 67%.[10),3),5)]

This study found that there were several multi infections between two species of *T. trichiura* and hookworm and multi infections of three species, *A. lumbricoides*, *T.trichiura* and hookworm, but most multi infections were *A. lumbricoides* and *T.trichiura* 46.8 percent. Similarly, researches among several schools in Jakarta and Pakistan found multi infection between *A. lumbricoides* and *T.trichiura*.[11)]

The high prevalence rates for all STH, ascariasis and trichuriasis indicate that the pattern of Ascaris and Trichuris infection spreads almost equally, indicates that STH infections through oral transmission occurs.8) Several surveys conducted in Indonesia as well as in other countries show that often high prevalence of Ascaris is accompanied by a prevalence of Trichuris, this is related to behavior of clean and healthy life patterne specially in hygiene and environmental sanitation. High prevalence rates are also influenced by socioeconomic and dense conditions.[11),12)]

Although the prevalence of infection was found to be high in species *A. lumbricoides* and *T. trichiura* however intensity infection only mild to moderate but in Central of Sumba District were found hookworms with a low prevalence of 5 percent but hookworms were higher in intensity than *A. lumbricoides* and *T. trichiura*. The different findings were found in other countries where the prevalence and intensity of hookworm infection is high. The results of the study are not consistent with similar studies in Nigeria intensity of hookworm an infection mild 0.5% and China where it was found mild to moderate intensity 0.1% to 0.8%.[13)]

STH infection by gender was found in boys aged 9-11 years higher than girls. In West Sumba district found 54.1 percent and Central of Sumba found 54.2 percent. Similar results were found in India and Nigeria where in boys aged 9-10 years the prevalence of infection was found to be 60%. This happens because boys have more activities outside the home and more interacting with soil and gardens and thus have a greater chance of being infected.[14)]

The problem high STH infection can be affected by several factors, from the results of many studies found that some school agechildren do not have water closet so there are still many children defecating in the open area. The other factor, children in this area have ahabit of do not wearing footwear when playing or doing activities outside the home.[2)]

Our study also showed that the prevalence of transmittance helminthiasis is higher in male than female. This could be because most population studies are farmer's children and men usually accompany their fathers to the farm. Boys are also known to be more adventurous in this manner according to the report, and primary school age children aged 5-16 years in Indonesia.[15),16)] This is similar to findings from other studies in other location of Indonesia that also found helminthiasis to be common among elementary school children. A similar pattern of infections tends to occur in many other communities in the states and other parts of Indonesia.[17)]

Conclusion

Almost all of the school children examined were infected with one and/or more than one soil transmitted helminth(s).The results showed the prevalence of STH in school age children in West Sumba and Central of Sumba district sufficiently high with intensity mild to moderate infection.

Infections caused by *A. lumbricoides* and *T.trichiura* indicate the pattern of STH infection by oral transmission. The results of this study can be used topreventive control program, through the treatment and increasing awareness of the importance of personal hygiene and environmental.

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