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Prevalence of Soil Transmitted Helminths in Elementary School Students with Behavioral Risk Factors

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ABSTRACT

The high prevalence of Soil Transmitted Helminths (STH) infection cases is due to several complementary risk factors, including tropical climate factors which provide ideal conditions for the development of worm eggs, unhealthy living behavior factors including defecation habits, eating habits and wearing bedding. feet, not washing hands, not cutting nails regularly. The purpose of this study was to determine the correlation between the prevalence of Soil Transmitted Helminths (STH) infection with behavioral risk factors in school children. This type of research is an analytical epidemiological study in two different areas. The research design used was a cross sectional study. This research was conducted in Bukit Village and Srikembang Village, Betung District, Banyuasin Regency, South Sumatra for 30 days. The research sample was 252 children. Data analysis showed that the type of STH with the highest prevalence in SDN 1 Bukit was A. lumbricoides, while at SDN 1 Sri Kembang was T. trichiura. It can be concluded that the supporting factors for transmission in the two research locations were the habit of washing hands before eating, the habit of children playing in the garden / field, the habit of cutting nails, the habit of defecating, the habit of wearing footwear while playing / working. It is suggested to do further research with environmental risk factor variables.

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Kata kunci:

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ABSTRAK

Tingginya prevalensi kasus infeksi Soil Transmitted Helminths (STH) dikarenakan oleh beberapa faktor resiko yang saling melengkapi, antara lain faktor iklim tropis yang menyediakan kondisi ideal bagi perkembangan telur-telur cacing, faktor perilaku hidup yang kurang sehat meliputi kebiasaan defekasi, cara makan dan pemakaian alas kaki, tidak mencuci tangan, tidak rutin memotong kuku. Tujuan penelitian ini adalah untuk mengetahui korelasi antara prevalensi infeksi Soil Transmitted Helminths STH dengan faktor resiko perilaku pada anak sekolah. Jenis penelitian ini adalah studi epidemiologi secara analitik di dua daerah yang berbeda. Desain penelitian yang digunakan adalah potong lintang (cross sectional study). Penelitian ini dilakukan di Desa Bukit dan Desa Srikembang Kecamatan Betung Kabupaten Banyuasin Sumatera Selatan selama 30 hari. Sampel penelitian adalah murid SDN sebanyak 252 orang. Analisis data didapatkan Jenis STH dengan prevalensi tertinggi di SDN 1 Bukit adalah A. lumbricoides, sedangkan di SDN 1 Sri Kembang adalah T. trichiura. Dapat disimpulkan bahwa faktor pendukung transmisi di kedua lokasi penelitian adalah, kebiasaan cuci tangan sebelum makan, kebiasaan anak-anak bermain di kebun/lading, kebiasaan potong kuku, kebiasaan buang air besar, kebiasaan memakai alas kaki saat bermain/bekerja. Disarankan untuk dilakukan penelitian lebih lanjut pada dengan variable faktor resiko lingkungan.

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Introduction

Indonesia as a tropical country with high humidity is a supportive environment for the proliferation of worms, especially intestinal worms that are transmitted through soil (Soil Transmitted Helminths / STH) (Maharani, 2005; Annisa, 2018; Paun, R, 20190). Five species of worms including stomach worms that are transmitted through soil, namely Ascaris lumbricoides (roundworms), Trichuris trichiura (whipworms), Necator americanus (hookworms), Ancylostoma duodenale (hookworms), and Strongyloides stercoralis (Suriptiastuti, 2006; Noviastuti, AR, 2015; Annisa, 2018). It is estimated that more than one billion people are infected worldwide (Rahmayanti, 2014; WHO, 2015), of whom about 300 million suffer from severe helminth infections and around 150.000 deaths occur annually due to STH infection (Suriptiastuti, 2006; Rahmayanti, 2014).

The high prevalence of STH infection cases is caused by several complementary risk factors, including tropical climate factors which provide ideal conditions for the development of worm eggs (Supriastuti, 2006; Shang Y., 2010), unhealthy life behavior factors include, habits. defecation, how to eat and use footwear (Simarmata, N., 2015; Ahdal, MT, 2014), not washing hands, not cutting nails regularly (Rahmayanti, 2014), defecating (BAB) carelessly (Wahyuni, D. 2016)). T. trichiura and A. lumbricoides infections typically affect children 5–10 years of age. As you get older, the cases of infection will decrease. A different profile occurs in hookworm infections whose maximum intensity is at the age of 20-25 years. School-age children have the highest risk for clinical manifestations of this infection, transmission can occur due to hand contact with children whose nails are contaminated with worms (Suriptiastuti, 2006; Rahmayanti, 2014; Depkes RI, 2016).

According to research by Alamsyah (2017), the habit of not using footwear while working, and rarely washing hands, is a supporting factor for finding worm eggs in fecal samples. Samples that do not use hand protection are a good intermediate medium for the development of worm larvae that infect humans through hands and nails (Elfred, 2016). According to Umamah's research (2019), hookworm infections found in the feces of adults who are looking for farmers are due to low personal hygiene, such as rarely wearing gloves and footwear while working, rarely washing hands before and after working and eating. Worm eggs or larvae that stick to the hands will enter the body when the person feeds his food.

According to Wahyuni's research (2016), the prevalence of STH is still high, allegedly due to poor sanitation of the living environment, moist soil conditions and protected by close proximity to houses due to the density of the population, flood-prone areas, the habits of children playing on the ground and low personal hygiene. The purpose of this study was to determine the correlation between the prevalence of STH infection and behavioral risk factors in school children.

This study is different from other similar studies, in this study using behavioral variables that support each other as many as 10 variables. In this study also showed the types of STH infection single, double 2 and double 3, which had not existed in previous studies.

Method

This type of research is an analytical epidemiological study in two different areas. The research design used was a cross sectional study. This research was conducted on elementary school students in Bukit Village and Srikembang Village, Betung District, Banyuasin Regency, South Sumatra for 30 days. This location is located approximately 65 km north of Palembang city. The samples of this research were students of SDN 1 Bukit and students of SDN 1 Srikembang. The number of samples was 252 people. Stool samples were taken from SDN 1 Bukit and SDN 1 Srikembang students using the simple random sampling method. All students at SDN 1 Bukit were taken as samples regardless of age and gender. All samples were given an explanation of the objectives, procedures for examining the benefits and risks of being sampled in this study. After obtaining the consent of the sample (represented by the parents), he signed the concent informed. The variables in this study were the dependent variable (dependent) the prevalence of STH infection and the independent variable (independent) behavioral effects.

The collection and examination of feces is carried out by officers from the parasitology laboratory, Faculty of Medicine, Sriwijaya University. Examination of eggs in feces using the Kato Katz method. Equipment and materials used, among others; cellophane measuring 2.5x3cm, malachite green glycerin solution (100 ml glycerin, 100 ml distilled water and 1 ml malachite green 3% in distilled water), cellophane soaked in solution for 18-24 hours before use, 3x4 cm gauze for filtering feces, 3x4 cm thick cardboard with a hole in the center with a diameter of 6 mm, glass objects, rubber bottle caps, filter paper measuring 10x10 cm, oil paper 10x10 cm, stick, microscope, stool. The procedure for examining the stool is that the stool is taken from the stool bottle as much as possible with a stick, then placed on oil paper, then the gauze is placed over the stool. On a glass object, vinyl is placed with a hole in the middle of the glass, the gauze placed on top of the stool is pressed with a stick. Then, with the stool that comes out on the gauze, it is inserted into the vinyl hole using a stick. After the vinyl hole is full, the vinyl is removed, and the stool that is located on the glass is covered with cellophane which has been soaked in malachite green glycerin solution. Cellophane is pressed with another glass object or rubber bottle cap to flatten the stool under the cellophane. The excess of malachite green glycerin is drained by placing the stool preparation upside down on filter paper for 20-30 minutes. The dried stool is examined under a microscope, the eggs found are counted, then the number of eggs obtained is multiplied by 26 to determine the number of eggs in 1 gram of feces.

Tools and materials for fecal examination using the Harada-Mori modified method are that the bottom part of the plastic ice bag is partially folded inward so that the bottom will be in the shape of a point, distilled water, filter paper measuring 4x8 cm, stick, microscope, binocular

microscope, scissors, spirit lamp, solution lugol, matches, stool. How the Harada-Mori modification method works, among others: feces are taken with a stick, then rubbed lengthwise on filter paper, then filter paper that has been given feces is put into a plastic bag. then the bag is filled with enough distilled water to touch the bottom of the filter paper. The top of the plastic bag is closed tightly by burning then the plastic bag is hung on the rope for 5-7 days. After that, the preparation is viewed under a binocular microscope to confirm the presence or absence of larvae. If the larvae are present, the lower end of the plastic bag is cut off and the contents are placed in a petri dish. The larvae are killed by heating them on a spirit lamp or by giving them a few drops of lugol solution, then the larvae are identified as one. The measuring instrument uses a behavior questionnaire that has been used previously by other researchers (Nuryanti, NM., 2018; Anwar, C., 1997) and has been modified is distributed to each student to ask the parents/ guardians' willingness to be filled in.

Results and Discussion

An analytical epidemiological study has been conducted in two different areas using a cross sectional design. The research data were collected in a research formula that had been prepared, then statistical analysis was carried out including descriptive analysis to determine the frequency distribution of each variable, Fischer's exact test for categorical data, regression test was used to see the effect of behavioral aspects on the prevalence of STH.

The Table 1. it is found that most of the respondents parents education has graduated from elementary school. Meanwhile, most of the respondents parents work as farmer.

Table 1.
Characteristics of Respondents

Variable	SDN 1 Bukit Frequency		SDN 1 Sri Kembang Frequency	
	n (100)	%	N (152)	%
Fathers Education				
Not completed in primary school	7	7	11	7.2
Graduated from SD/ SLTP	93	93	141	92.8
Mothers Education				
Not completed in primary school	16	16	35	23
Graduated from SD/ SLTP	84	84	117	77
Parents job				
Labor	26	26	9	52
Farmer	34	34	73	48
Gender				
Female	38	38	70	46,1
Male	62	62	82	53,9

Table 2.
Prevalence of *A. lumbricoides, T. trichiura* and Hookworm in Respondents

School	Prevalence			
	A. lumbricoides	*T.trichiura*	Hookworm	STH
SDN 1 Bukit (n = 100)	20 (20%)	12 (12%)	0 (0%)	23 (23%)
SDN 1 Sri Kembang (n = 152)	19 (12,5%)	23 (15,1%)	0 (0%)	33 (21,7%)

The Table 2 shows that SDN 1 Bukit A. lumbricoides is the type of STH with the highest prevalence, while SDN 1 Sri Kembang T. trichiura is the type of STH with the highest prevalence. A total of 45 samples of SDN 1 Bukit and 77 samples of SDN 1 Sri kembang were not found type of infection is the number of worms present in one individual, which are further classified into single infection, double infection 2 and multiple infection 3. Types of infection STH for SDN 1 Bukit students and SDN 1 Sri Kembang students are shown in Table 3.

Table 3.
Infection Type in Respondents

Infection Type	Students of SDN 1 Bukit		Students of SDN 1 Sri Kembang	
	Positif	%	Positif	%
Single:	14	14	24	15,8
A. lumbrycoides	11	11	10	6,5
T. Trichiura	3	3	14	9,2
Hookworm	0	0	0	0
Double 2:	9	9	9	5,9
A. lumbrycoides & T. Trichiura	9	9	9	5,9
A. lumbrycoides & mining worms	0	0	0	0
T. Trichiura & Mining Worms	0	0	0	0
Double 3:	0	0	0	0
A. lumbrycoidesT. Trichiura & Mining Worms	0	0	0	0
Total	23	23	33	21,7

From Table 3, it can be seen that the percentage of single infections is almost the same among primary school students in the two villages. For SDN 1 Bukit the percentage of single infections was 14%, while SDN 1 Sri Kembang was 15.8%. For double infection the percentage is larger at SDN 1 Bukit than at SDN 1 Sri Kembang. Table 3 shows the percentage of multiple infections for SDN 1 Bukit as much as 9%, while SDN 1 Sri Kembang is 5.9%.

Table 4.
The Intensity Number of A. lumbricoides, T. trichiura and Hookworms in Respondents

School	Intensitas (NEPG)		
	A. lumbricoides (%)	*T. trichiura* (%)	Hookworms (%)
SDN 1 Bukit	2.236 (51.428)	1.690 (38.870)	0
SDN 1 Sri Kembang	1.684 (38.732)	3.172 (72.956)	0

Information: NEPG = Number of eggs per gram of feces=X x 23 (X is the number of eggs found)

Table 5.
The Frequency Distribution of the Intensity of A. lumbricoides, T. trichiura and Hookworms in Respondents

Degree of Infection	SDN 1 Bukit						SDN 1 Sri Kembang					
	Al		Tt		Ct		Al		Tt		Ct	
	n	%	n	%	n	%	n	%	n	%	n	%
Light	0	0	0	0	0	0	0	0	0	0	0	0
Moderate	12	60	5	42	0	0	14	74	10	43	0	0
Weight	8	40	7	58	0	0	4	21	13	57	0	0
Very Heavy	0	0	0	0	0	0	1	5	0	0	0	0
Total	**20**	**100**	**12**	**100**	**0**	**0**	**19**	**100**	**23**	**100**	**0**	**0**

Information:
Mild infection: 1 - 9 eggs / 1 gram of feces
Medium : 10 - 99 eggs / 1 gram of feces
Weight : 100 - 999 eggs / 1 gram of feces
Very Heavy:> 1,000 eggs

Table 6.
The Relationship between Behavior and The Prevalence of A. lumbricoides in SDN 1 Bukit

Behavioral Aspects	A. lumbricoides		Total	*p value*	*Unadjusted OR*	95% *CI*
	Positif	Negatif				
Wash hands before						
Don't use soap	12	38	50	0.453	1.658	0.612 -4.491
Using soap	8	42	50			
Cut Nails in 1 week						
Once a week	14	58	72	1.000	0.885	0.302 -2.593
Two or three times a week	6	22	28			
Wear footwear at work						
Do not use	3	17	20	0.756	0.654	0.171- 2.496
Wear sandals / boots	17	63	80			
Defecate in the garden / backyard						
Always	10	11	21	0.001*	0.600	2.124-18.529
Never / sometimes	10	69	79			
Wear footwear when playing around the house						
Always	3	11	14	1.000	1.107	0.278-4.411
Never / Sometimes	17	69	86			
Pooping around the house						
Always	2	3	5	0.261	2.852	0.443-18.344
Never / Sometimes	18	77	95			
Children love to play in the Garden / Field						
Never / sometimes	6	14	14	0.223	2.020	0.661-6.172
Always	14	66	80			
Wear footwear when playing at school						
Never / sometimes	0	1	1	1.000	1.253	1.135-1.384
Always	20	79	99			
Children like to play in the garden / field using footwear						
Always	9	38	47	1.000	0,904	0,338 – 4,420
Don't wear / sometimes	11	42	53			

Information *): Significant

From Table 4, it can be seen that the intensity of A. lumbricoides infection in SDN 1 Bukit students was higher than SDN 1 Sri Kembang students, while the intensity of T. trichiura infection in SDN 1 Sri Kembang students was higher than SDN 1 Bukit students. No hookworm infection was found in the sample because these worms are more likely to

infect productive age who work in mining or plantation areas (Wahyuni, 2016).

Using the classification from Kobayashi (1980) in the APCO Research Group, the intensity of infection was classified into four categories based on the number of eggs found, namely light, moderate, severe and very heavy. The proportions of each intensity category are shown in Table 5.

From Table 6, it can be seen that the behavioral aspects of the STH prevalence in SDN 1 Bukit generally do not have a significant effect, except for the behavioral aspect of accumulating feces after defecating in the yard / garden. Although the habit of washing hands without soap before eating did not affect the prevalence of A. lumbricoides, the number infected with A. lumbricoides was smaller than those who were not infected. The habit of cutting nails in one week is generally only once. The habit of wearing footwear when working in the fields, playing around the house, at school and playing in the garden generally uses footwear. The habit of burying feces with soil after defecation has mostly been carried out, and many still sometimes like to play in the garden or field. The results of this study are not in line with Nuryanti's (2018) study, which states that the habit of washing hands using soap has a significant relationship with the prevalence of A. lumbricoides infection.

Humans are the only definitive host for A. lumbricoides. Adult worms usually live in the intestinal cavity. These worms receive food from the host food that is being digested. Male or female worms can be found in people even if they have a mild infection. A female worm has the ability to produce 26 million eggs, and an average of 200,000 eggs a day. The eggs do not divide when removed by the host with feces. If the environmental conditions in the soil are favorable, within 3 weeks the eggs will form an infective second stage larvae. The optimum temperature for egg growth is approximately 25 ° C with a range between 21 ° and 30 ° C. Lower temperatures inhibit growth but benefit the length of life. At 37 ° C the eggs only grow to the eight-cell stage. Because eggs require charcoal, their growth is stunted when they are present in a rotting environment.

Infective eggs, when ingested by humans, will hatch in the upper part of the small intestine and release rabditiform larvae (200-300x14µ in size), which penetrate the intestinal wall and enter the small veins or lymph vessels. Through the portal circulation, these larvae enter the liver, then the heart and the lungs. The larvae may reach the lungs 1 to 7 days after infection. Because these larvae have a diameter of 0.02 mm, and the diameter of the pulmonary capillaries is only 0.01 mm, they burst and the larvae exit into the alveoli. Occasionally several larvae can enter the left heart through the pulmonary veins and be spread as embolism to various organs in the body. In the lungs of these larvae undergo second and third changes. The larvae migrate or are carried by the bronchioles to the bronchi, up the trachea to the epiglottis, and down the esophagus and into the small intestine. In the small intestine, the larvae grow into adult worms (Gandahusada, 2010; Depkes RI, 2016). For egg development A. lumbricoides and T. trichiura require clay soil, moist and protected from sunlight. This is different from hookworms because these worm larvae need oxygen for their growth, so the most suitable and profitable soil type is sandy, loose, humid soil and protected from direct sunligh.

Tabel 7.
Regression Results of Behavior Risk Factors with the Prevalence of A. lumbricoides in SDN 1 Bukit

Risk Factors	*Koeficient B*	*Unadjusted*		*Adjusted*	
		OR	*p*	*OR*	*p*
Wash hands before eating	3.895	1.658	0.453	49.167	0.021
Defecate in the yard / garden heaped up	-22.108	0.600	0.001	3.994	0.998
Pooping around the house	0.886	2.852	0.26.1	2.424	0.696
Wear footwear when playing around the house	-0.153	1.107	1.000	0.858	0.932
Cut nails in 1 week	-0.275	0.885	1.000	0.759	0.776
Children love to play in the garden / fields	-0.228	2.020	0.223	0.796	0.929
Wear footwear at work	-22.704	0.654	0.756	0.000	0.998
Wear footwear when playing at school	-19.500	1.253	1.000	0.000	1.000
Children playing in the garden using footwear	-3.252	0.904	1.000	0.039	0.029
Konstan	**40.428**			**3.610**	**1.000**

Table 8.
The Relationship between Behavior and The Prevalence of T. trichiura in SDN 1 Bukit

Behavior Aspects	*T. trichiura*		Total	*p value*	*Unadjusted OR*	*95% CI*
	Positif	Negatif				
Wash hands before						
Don't use soap	5	45	50	0.760	0.683	0.201-2.315
Using soap	7	43	50			
Cut Nails in 1 week						
Once a week	9	63	72	1.000	1.190	0.298-4.762
Two or three times a week	3	25	28			
Wear footwear at work						
Do not use	2	18	20	1.000	0.778	0.156-3.868
Wear sandals / boots	10	70	80			
Defecate in the garden / backyard						
Always	5	45	50	0.760	0.683	0.201-2.315
Never / sometimes	7	43	50			
Wear footwear when playing around the house						
Always	2	12	14	0.674	1.267	0.247-6.502

Never / Sometimes	10	76	86			
Pooping around the house						
Always	1	4	5	0,480	1,909	0,195 – 18,658
Never / Sometimes	11	84	95			
Children love to play in the Garden / Field						
Never / sometimes	4	16	20	0,251	2,250	0,603 – 8,396
Always	8	72	78			
Wear footwear when playing at school						
Never / sometimes	0	1	1	1.000	1.138	1.058 – 1.224
Always	12	87	99			
Children like to play in the garden / field using footwear	6	44	50	1.000	1.000	0.299 – 1.156
Always	6	44	50			
Don't wear / sometimes						

Information * : Significant

From the logistic regression results in Table 7. that the risk factors for washing hands before eating show a significant correlation with value (p = 0.021). The unadjusted odd ratio value of 1,658 after adjustments obtained an adjusted odd ratio value of 49,167, meaning that washing hands before eating without soap has a risk factor for infection with A. Lumbricoides at SDN 1 Bukit 49,167 times greater than washing hands with soap. A large number of adult A. lumbricoides worms, especially in children, can cause malnutrition. In addition, worm body fluids can cause toxic reactions resulting in symptoms similar to typhoid fever accompanied by signs of allergies such as urticaria, facial edema, conjunctivitis and upper respiratory irritation. Adult worms can also have various mechanical consequences, such as intestinal obstruction, intussusception or perforation of the ulcer in the intestine. Migration of worms to organs such as the stomach, esophagus, mouth, nose, rhyme glottis or bronchi can obstruct the patient's breathing. Appendicitis, liver abscess, bile duct obstruction and acute pancreatitis may also occur.

Table 8 shows the results of the analysis of the p value of the ten variables (p> 0.05), Ho failed to be rejected, which means that there is no correlation of risk factors for behavior with the prevalence of T. Trichiura. The absence of a correlation in this study is presumed because the number of respondents who had a positive T. trichiura prevalence was less than the negative result. Even so, the risk factors for this behavior should still be a concern by improving individual hygiene. The results of this study are different from Wahyuni's (2016) research, which states that there is a significant relationship between behavioral factors and the incidence of T. Trichiura infection.

Table 9.
Regression Results of Behavior Risk Factors with the Prevalence of T. Trichiura in SDN 1 Bukit

Risk Factors	Koofisien	*Unadjusted*		*Adjusted*	
		OR	*p*	*OR*	*p*
Wash hands before eating	3.971	2.250	0.251	53.039	0.016
Defecate in the yard / garden heaped up	1.547	1.909	0.480	4.697	0.369
Pooping around the house	22.114	1.000	1.000	4.018	0.999
Wear footwear when playing around the house	1.104	0.683	0.760	3.017	0.364
Cut nails in 1 week	0.114	1.190	1.000	1.121	0.902
Children love to play in the garden / fields	-2.525	0.778	1.000	0.080	0.116
Wear footwear at work	-24.377	0.683	0.760	0.000	0.999
Wear footwear when playing at school	-0.927	1.267	0.674	0.396	0.568
Children playing in the garden using footwear	-20.104	1.138	1.000	0.000	1.000
Konstan	**40.428**			**3.610**	**1.000**

From the logistic regression results in Table 9. that the risk factors for children like to play in the garden / fields show a significant correlation with value (p = 0.016). The unadjusted odds ratio value of 2,250 after adjustment, the adjusted odd ratio value was 53,039, meaning that children who never/ sometimes play in the garden / field have a 53,039 times greater risk factor for T. trichiura infection compared to children always playing. in gardens / fields that are directly related to the land. Eggs containing embryos when swallowed by humans, the larvae that become active exit through the egg wall that is no longer strong, enter the proximal small intestine and penetrate the intestinal villus, staying there for 3 to 10 days near Lieberkuhn's kripti. After becoming an adult the worms descend further down into the cecum area. A spear-like structure on the part helps the worm penetrate and then place its whip-like anterior portion into the intestinal mucosa of its host, where it takes its food. Its secretion may liquefy adjacent mucosal cells. The growth period, from swallowing eggs to adult worms laying eggs, is approximately 30 to 90 days. His life may be for several years. In severe infections, especially in children, these worms are spread throughout the colon and rectum. Sometimes seen in the rectal mucosa that has prolapsed as a result of pushing the patient during defecation. This worm inserts its head into the intestinal mucosa, causing trauma that causes irritation and inflammation of the intestinal mucosa. Bleeding may occur at the site of attachment. In addition, it seems that these worms suck the blood of the host, so they can cause anemia (Depkes, 2016).

Table 10.
The Relationship between Behavior and The Prevalence of *A. lumbricoides* in SDN 1 Sri Kembang

Risk Factors	*A. lumbricoides*		Total	*p value*	*Unadjusted OR*	95*% CI*
	Positif	Negatif				

Wash hands before						
Don't use soap	13	70	83	0.295	1.950	0.699-5.437
Using soap	6	63	69			
Cut Nails in 1 week						
Once a week	14	79	93	0.345	1.914	0.651- 5.626
Two or three times a week	5	54	59			
Wear footwear at work						
Do not use	2	3	5	0.118	0.678	
Wear sandals / boots	17	130	147			0.331-1.391
Defecate in the garden / backyard						
Always	5	72	77	0.043	0.303	0.103-0.888
Never / sometimes	14	61	75	*		
Wear footwear when playing around the house						
Always	3	3	6	0.026	0.562	0.252-1,252
Never / Sometimes	16	130	146	*		
Pooping around the house						
Always	3	5	8			
Never / Sometimes	16	128	144	0.062	0.703	0.410-1.206
Children love to play in the Garden / Field						
Never / sometimes	14	86	100	0.605	1.530	0.519-4.512
Always	5	47	52			
Wear footwear when playing at school						
Never / sometimes	5	47	52	0.606	0.653	0.222-1.927
Always	14	86	100			
Children like to play in the garden / field using footwear						
Always	14	80	94	0.377	1.855	0.631-5.454
Don't wear / sometimes	5	53	58			

Information *) : Significant

From Table 10, it can be seen that the behavioral aspects associated with the prevalence of STH in SDN 1 Sri Kembang did not have a significant effect on the prevalence of A. lumbricoides, except for the behavior of defecating in the yard / garden heaped up and wearing footwear when playing around the house. There was a significant correlation on the behavior of washing hands before eating (p = 0.025), defecating in the yard / garden heaped up (p = 0.020) and defecating around the house (p = 0.019).

According to Wahyuni (2016), A. Lumbricoides is a type of nematode that produces the most eggs and these worm eggs are able to survive in the outside environment compared to other intestinal nematode eggs.

Table 11.
Regression Results of Behavioral Risk Factors with the Prevalence of *A. lumbricoides* in SDN 1 Sri Kembang

Risk Factors	Koefisien	*Unadjusted*		*Adjusted*	
		OR	*p*	*OR*	*p*
Wash hands before eating	2.996	1950	0.295	20.000	0.027
Defecate in the yard / garden heaped up	17.912	0.653	0.606	6.011	0.998
Pooping around the house	19.593	0.914	0.345	3.231	1.000
Wear footwear when playing around the house	42.406	0.562	0.026	2.610	0.999
Cut nails in 1 week	-21.608	0.678	0.118	0.000	1.000
Children love to play in the garden / fields	-22.342	0.303	0.043	0.000	0.998
Wear footwear at work	-8.158	0.703	0.062	0.000	0.999
Wear footwear when playing at school	-18.962	1.530	0.605	0.000	0.999
Children playing in the garden using footwear	0.000	1.855	0.377	1.000	1.000
Konstan	**-1.430**			**0.239**	**.448**

From Table 10, it can be seen that the behavioral aspects associated with the prevalence of STH in SDN 1 Sri Kembang did not have a significant effect on the prevalence of A. lumbricoides, except for the behavior of defecating in the yard / garden heaped up and wearing footwear when playing around the house. There was a significant correlation on the behavior of washing hands before eating (p = 0.025), defecating in the yard / garden heaped up (p = 0.020) and defecating around the house (p = 0.019).

According to Wahyuni (2016), A. Lumbricoides is a type of nematode that produces the most eggs and these worm eggs are able to survive in the outside environment compared to other intestinal nematode eggs.

Table12.
The Relationship between Behavior and The Prevalence of T. trichiura in SDN 1 Sri Kembang

Risk Factors	*T. trichiuara*		Jml	*p*	*Unadjusted*	95% *CI*
	Positif	Negatif		*value*	*OR*	

Wash hands before						
Don't use soap	18	65	83	0.025*	3.545	1.241-10.121
Using soap	5	64	69			
Cut Nails in 1 week						
Once a week	15	78	93	0.843	1.226	0.485-3.100
Two or three times a week	8	51	59			
Wear footwear at work						
Do not use	10	48	58	0.736	1.298	0.529-3-188
Wear sandals / boots	13	81	94			
Defecate in the garden / backyard						
Always	6	71	77	0.020*	0.288	0.107-0.778
Never / sometimes	17	58	75			
Wear footwear when playing around the house						
Always	2	4	6	0.225	2.976	0.512-17.285
Never / Sometimes	21	125	146			
Pooping around the house						
Always	4	4	8	0.019*	0.576	0.287-1.155
Never / Sometimes	19	125	144			
Children love to play in the Garden / Field						
Never / sometimes	14	86	100	0.763	0.778	0.312-1.940
Always	9	43	52			
Wear footwear when playing at school						
Never / sometimes	8	44	52	1.000	1.030	0.406-2.617
Always	15	85	100			
Children like to play in the garden / field using footwear						
Always	15	79	94	0.898	1.187	0.469-3.003
Don't wear / sometimes	8	50	58			

Information * : Significant

From Table 12, it appears that the behavioral factors that have a significant correlation with the prevalence of T. trichiura in SDN 1 Sri Kembang are the habit of washing hands before eating (p = 0.025), the habit of defecating in the garden / yard heaped up (p = 0.020), the habit of throwing away large water around the house (p = 0.019).

Table 13.
Regression Results of Behavioral Risk Factors with the Prevalence of T. trichiuara in SDN 1 Sri Kembang

Risk Factors	Koofisien	*Unadjusted*		*Adjusted*	
		OR	*p*	*OR*	*p*
Wash hands before eating	17.478	1.030	1.000	3.896	0.999
Defecate in the yard / garden heaped up	24.199	0.576	0.019	3.231	0.999
Pooping around the house	39.641	3.545	0.025	1.643	0.997
Wear footwear when playing around the house	21.258	1.226	0.843	1.706	0.999
Cut nails in 1 week	0.193	1.298	0.736	1.213	1.000
Children love to play in the garden / fields	-40.507	0.288	0.020	0.000	0.997
Wear footwear at work	-21.896	2.976	0.225	0.000	0.999
Wear footwear when playing at school	-20.460	0.778	0.763	0.000	0.999
Children playing in the garden using footwear	-18.224	1.187	0.898	0.000	0.999
Konstan	-0.989			0.372	0.585

From the logistic regression results in Table 13. that the behavioral factors with the prevalence of T. trichiura in SDN 1 Sri Kembang showed that there was no significant correlation seen from the p value, unadjusted odd ratio and adjusted odd ratio. The habit of cutting nails is generally done only once a week, so this habit has no effect on STH infection. The results of this study are not in line with Wahyuni's (2016) research, which states that there is a relationship between routine nail cutting and the prevalence of T. Trichiura infection. Elementary school students have already worn footwear when working in the fields and at school, so it does not affect STH infection. In contrast to the results of Wahyuni's (2016) study, there was a significant relationship between the habit of using footwear and the prevalence of STH. The habit of defecating in the yard is generally no longer practiced. However, elementary school students who defecate in the yard or garden do not accumulate their feces, even though they sometimes still play in the garden or fields, so there are still cases of worm infection with A. lumbricoides and T. trichiura. According to Primadana (2019) and Riswanda (2016) clinical symptoms due to STH infestation in the gastrointestinal tract generally only appear when the intensity of the infestation is in the moderate and severe categories. The morbidity of the prevalence of worms is directly related to the prevalence of worms in the human body. The number of worm eggs can be an illustration of the severity of STH infestation (WHO, 2015: Primadana; 2019). The spread of A. lumricoides infection has the same pattern as T.trichuris. The spread of T.trichuris is cosmopolitan in nature, especially in hot and humid areas (Hairani, B, 2014). The way to break the chain of STH infection transmission is by improving health behavior, improving sanitation, increasing knowledge and taking antimintic drugs (Noviastuti, 2015).

Conclusions and Recommendations

Based on the results of the discussion analysis, it can be concluded that the worms found at the study site were A. lumbricoides and T. trichiura, while the hookworms were not found. The type of STH with the highest prevalence in SDN 1 Bukit was A. lumbricoides, while at SDN 1 Sri Kembang was T. trichiura. The infection intensity of A. lumbricoides in SDN 1 Bukit was higher than SDN 1 Sri Kembang, while for T. trichiura it was higher in SDN 1 Sri Kembang with mild to very severe infection degrees. The supporting factors for transmission in the two research locations were the habit of washing hands before eating, the habit of children playing in the garden / field, the habit of cutting nails, the habit of defecating, the habit of wearing footwear while playing / working. It is suggested to do further research with environmental risk factor variable.

Declaration of Conflicting Interests

The authors declared that no potential conflicts of interests with respect to the authorship and publication of this article.

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