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

Ibrahim Edy Sapada¹; Wita Asmalinda²*)

¹ Siti Khadijah Institute of Health Science Palembang
² Health Polytechnic of the Ministry of Health, Palembang

ARTICLE INFO

Received October 16, 2020
Accepted November 20, 2020
Published December 05, 2020

Keyword:
Soil Transmitted Helminths
Behavioral
Defecation habits
Eating habits

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.

Kata kunci:
Soil Transmitted Helminths
Prilaku
Kebiasaan defekasi
Cara makan

*) corresponding author
Siti Khadijah Institute of Health Science Palembang
Email: ib.edys@yahoo.co.id
DOI: https://doi.org/10.30604/jika.v5i2.368

This open access article is under the CC–BY-SA license.
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 (Suriptiastuti, 2006; Shang Y., 2010), unhealthy life behavior factors include, habits. defecation, how to eat and use footwear (Simarmata, N., 2015; Ahdul, 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 consent 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 gauge 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 gauge is placed over the stool. On a glass object, vinyl is placed with a hole in the middle of the glass, the gauge placed on top of the stool is pressed with a stick. Then, with the stool that comes out on the gauge, 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.

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%)       | 0 (0%)   | 23  |
| SDN 1 Sri Kembang (n = 152) | 19 (12.5%) | 23 (15.1%)     | 0 (0%)       | 0 (0%)   | 33  |

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:        |         |      |         |      |
| A. lumbricoides| 14      | 14%  | 24      | 15.8%|
| T. Trichiura   | 3       | 3%   | 14      | 9.2% |
| Hookworm       | 0       | 0%   | 0       | 0%   |
| Double 2:      |         |      |         |      |
| A. lumbricoides & T. Trichiura | 9  | 9%   | 9       | 5.9% |
| A. lumbricoides & mining worms | 0   | 0%   | 0       | 0%   |
| T. Trichiura & Mining Worms    | 0   | 0%   | 0       | 0%   |
| Double 3:      |         |      |         |      |
| A. lumbricoides T. 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.

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 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

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

| School          | 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  |
| Light               | 0   | 0   | 0   | 0   | 0   | 0   |
| Moderate            | 12  | 60  | 5   | 0   | 14  | 74  |
| Weight              | 8   | 40  | 7   | 0   | 4   | 21  |
| Very Heavy          | 0   | 0   | 0   | 0   | 0   | 0   |
| Total               | 20  | 100 | 12  | 100 | 19  | 100 |

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 |
|--------------------|-----------------|-------|---------|---------------|-------|
| 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      |               |       |            |
| 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      |               |       |            |

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

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

| Risk Factors                                         | Coefficient B | Unadjusted OR | p       | Adjusted 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         | 0.261   | 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   |
| 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 POSITIF | T. trichiura NEGATIF | Total | p value | Unadjusted OR | 95% CI |
|-----------------------------------|----------------------|----------------------|-------|---------|---------------|-------|
| Wash hands before eating          |                      |                      |       |         |               |       |
| 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 |
From the logistic regression results in Table 9, 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 Wahyuní'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 OR | p   | Adjusted 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 |
| Children love to play in the garden / fields     | -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 |

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 odds 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 worms 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                                      | $A. lumbricoides$ positiF | $A. lumbricoides$ negatiF | Total p value | Unadjusted OR | 95% CI |
|--------------------------------------------------|---------------------------|---------------------------|---------------|---------------|-------|

Jurnal Aisyah: Jurnal Ilmu Kesehatan
ISSN 2502-4825 (print), ISSN 2502-9495 (online)
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.

| Risk Factors                                | Koefisien | Unadjusted | Adjusted |             |             |
|---------------------------------------------|-----------|------------|----------|-------------|-------------|
| Wash hands before eating                    | 2.996     | 1950       | 0.295    | 20.000      | 0.027       |
| Defecate in the yard / garden heaped up     | 17.912    | 653        | 0.606    | 6.011       | 0.998       |
| Pooping around the house                    | 19.593    | 914        | 0.345    | 3.231       | 1.000       |
| Wear footwear when playing around the house | 42.406    | 562        | 0.026    | 2.610       | 0.999       |
| Cut nails in 1 week                         | -21.608   | 678        | 0.118    | 0.000       | 1.000       |
| Children love to play in the Garden / Field | 14.86     | 100        | 0.605    | 1.530       | 0.519-4.512 |
| Wear footwear when playing at school        | 5.47      | 52         | 0.606    | 0.653       | 0.222-1.927 |
| Children like to play in the garden / field using footwear | 14.80 | 94         | 0.377    | 1.855       | 0.631-5.454 |

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**

**Table 12. The Relationship between Behavior and The Prevalence of *T. trichuira* in SDN 1 Sri Kembang**
Students who defecate in the yard or garden do not generally no longer practiced. However, elementary school prevalence of STH. The habit of defecating in the yard is strongly related to the habit of using footwear and the prevalence of T. Trichiura infection. Elementary school students have a significant correlation seen from the p value, unadjusted odd ratio and adjusted odd ratio. The habit of cutting nails is generally a routine behavior 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).

| Risk Factors                                      | Koefisien | 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 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).
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.

References

Ahmad, M.T., Saifuddin, S., and Alharini, S. (2014). Relationship between worm disease and nutritional status in SDN Cambaya children in the coastal area of Makassar City. Retrieve from: [http://repository.unhas.ac.id](http://repository.unhas.ac.id) accessed March 22, 2019.

Alamsyah, Dedi, Saleh, Ismail and Nurijah. (2017). Factors Associated with the et al. Incidence of Soil-Transmitted Helminths (STH) Infection in Vegetable Farmers in Lingga Village, Sungai Ambawang District, Kubu Raya Regency. *Journal of Student and Health Research. Muhammadiyah University Pontianak.*

Alsakina, N., Adrial, and Afriani, N. (2018). Identification of Soil Transmitted Helminths Eggs in Lettuce (Lactuca Sativa) sold by food traders along the Pioneering Independence Street in Padang City. *Andalas Journal*, 7(3), 314 - 318.

Anisa, S., Dalilah dan Anwar, C. (2018). Relationship between Soil Transmitted Helminths (STH) and Nutritional Status in 200 Public Elementary School Students, Kemasrindo Sub-district, Kertapati District, Palembang City. *Sriwijaya Medical Magazine*, 2, 92 - 104.

Anwar, C. (1997). Roundworm disease in elementary school children and their parents in the village of Bungin Musi Banyuasin. *Sriwijaya Magazine*, 1(33), 28 - 30.

Departemen Kesehatan Republik Indonesia. (2016). *General Guidelines for the National Program for the Eradication of Worms in the Decentralization Era*. Jakarta. Retrieve from: [https://scholar.google.co.id/scholar?q=depkes+ri,+2016.+publications,+kesehatan,+kabupaten,+banyuasin,+sriwijaya+magazine,+2016&display=a](https://scholar.google.co.id/scholar?q=depkes+ri,+2016.+publications,+kesehatan,+kabupaten,+banyuasin,+sriwijaya+magazine,+2016&display=a) accessed March 18, 2019.

Elfred, Arwati, Heni and Suwarno. (2016). Basophils, TNF-α, and IL-9 in STH Infected Farmers in Kediri District. *Journal Biosaint Pascasarjana.Universitas Airlangga*. 18(3), 230 - 242. doi: [http://dx.doi.org/10.20473/jbpsv183.2016.230-254](http://dx.doi.org/10.20473/jbpsv183.2016.230-254) Retrieve from: [https://e-journal.unair.ac.id/BIOPASCASA/article/download/3036/2175](https://e-journal.unair.ac.id/BIOPASCASA/article/download/3036/2175).

Gandahusada, S., H.D. Ilahude, and W. Pribadi. (2000). *Medical Parasitology Lecture Collection*. FKUI Publisher Center, Jakarta. Indonesia. Retrieve from: [https://scholar.google.co.id/scholar?q=depkes+ri,+2016.+publications,+kesehatan,+kabupaten,+banyuasin,+sriwijaya+magazine,+2016&display=a](https://scholar.google.co.id/scholar?q=depkes+ri,+2016.+publications,+kesehatan,+kabupaten,+banyuasin,+sriwijaya+magazine,+2016&display=a)

Glinz, D., Silue, K.G, Knopp, S., Lohouignon, Yao, K.P., Steinmann, PRinaldi, L., et al. (2010). Comparing Diagnostic Accuracy of Kato-Katz, Koga Agar Plate, Ethor-Concentration, and FLOTAC for Schistosomamansoni and Soil-Transmission Helminths. *Journal Plos Neglected Tropical Diseases* 4(7),1-10. Retrieve from: [https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0000754](https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0000754)

Hairani, B., Waris, L., and Juairiyah. (2014). Prevalensi Soil Transmitted Helminths (STH) in Primary School Children in Subdistrict of Malinau Kota, District of Malinau, East Kalimantan Province. *Jurnal Buski*. 5(1), 43 - 48. Retrieve from: [http://ejournal.hibang.pemkes. go.id/index.php/buski/article/view/3614](http://ejournal.hibang.pemkes.go.id/index.php/buski/article/view/3614).

Mahanari A.P. (2005). Intestinal Nematode Infection in Students of SDN Karang Mulyo 02, Pegandon District, Kendal Regency. *Journal Kedokteran YARS*. 13(3), 24 - 34. Retrieve from: [http://academicjournal.yarsi.ac.id/index.php/jurnal-fk-yarsi/article/view/1047](http://academicjournal.yarsi.ac.id/index.php/jurnal-fk-yarsi/article/view/1047).

Mardiana, A.L., Agustina, N. and Sukidjo et al. (2000). Eggs of Ascaris lumbricoides worms in the feces and nails of children under five and on soil in Paseh District, Bandung Regency, West Java. *Indonesian Parasitology Magazine*, 13(1-2), 28 - 32. Retrieve from: [https://core.ac.uk/download/pdf/296289786.pdf](https://core.ac.uk/download/pdf/296289786.pdf)

Noviastuti, A.R. (2015). Infeksi Soil Transmitted Helminths. *Jurnal Majoriety*, 4(8), 107-115. [https://jukemekes.kemenkes.go.id/index.php/majorty/article/view/1483](https://jukemekes.kemenkes.go.id/index.php/majorty/article/view/1483).

Nuryanti, N.M., and Subrata, I.M. (2018). Soil-Transmitted Helminthiasis Infection in Elementary School Students in Highland and Lowland Areas of Gianyae Regency, *Jurnal Kesehatan Masyarakat*, 13(3), 323 - 330. Retrieve from: [http://jurnal.unnes.ac.id/nju/index.php/kemas/article/view/4119](http://jurnal.unnes.ac.id/nju/index.php/kemas/article/view/4119).

Paun, R, Olin, W., and Tola, Z. The Impact of Soil Transmitted Helminthiasis Infection in Elementary School Students in Rural Areas of Southern China. *Global Journal of Health Science*, 11(5), 117 - 122. doi: [https://doi.org/10.5539/gjhs.v11n5p117](https://doi.org/10.5539/gjhs.v11n5p117) Retrieve from: [http://www.ccsenet.org/index.php/gjhs/article/view/0/39157](http://www.ccsenet.org/index.php/gjhs/article/view/0/39157).

Primadana, A., Nurdiaan, Y., Agustina, D., Hermasyah, B., and Armiyanti, Y., et al. (2019). Eosinophilia as A Predictor towards Anemia Case in Elementary School Students of the School Student in the District of Northwest Sumba. *Journal of Health Science*, 13(1), 1 - 9. doi: [https://journal.unnes.ac.id/index.php/htara/article/view/16839/0](https://journal.unnes.ac.id/index.php/htara/article/view/16839/0).

Rahmanyati, Razali and Mudasir. (2014). Relationship of Knowledge, Attitudes and Actions with Soil Transmitted Helminths. *STH* Towards Anemia Case in Elementary School Students in Subdistrict of Malinau Kota, District of Malinau, East Kalimantan Province. *Jurnal Kesehatan Masyarakat*, 13(3), 323 - 330. Retrieve from: [http://jurnal.unnes.ac.id/nju/index.php/kemas/article/view/4119](http://jurnal.unnes.ac.id/nju/index.php/kemas/article/view/4119).

Shang, Y., Lin, H.T., Sui, SZ., Ying, D.C., Yi, C.Y., and Shao, X.L., et al. (2010). Stunting and Soil-Transmitted Helminth Infections among School Age Pupils in Rural Areas of Southern China.
Journal Parasites & Vectors, 3(97), 1 - 6. doi. https://doi.org/10.1186/1756-3305-3-97 Retrieve from: https://parasitesandvectors.biomedcentral.com/articles/10.1186/1756-3305-3-97.

Simarmata, N., Sembiring, T., and Ali, M. (2015). Nutritional Status of Soil-Transmitted Helminthiasis Infected and Uninfected Children. *Jurnal Pediatrica Indonesiana*, 55(3), 136-140. doi. https://doi.org/10.14238/p55.3.2015.136-41. Retrieve from: https://paediatrica-indonesiana.org/index.php/paediatrica-indonesiana/article/view/38

Sri Haryati. (2004). The Relationship Between Use of Footwear and Father's Work Against Mining Worm Infection in SD Sidomukti II Students, Jenawi District, Karanganyar Regency. *Jurnal Kedokteran YARSI*, 12(2), 55 - 59.

Sulani, F. (2000). Experience and Development of the Prevention and Eradication of Worms in North Sumatra Province. *Indonesian Association for Parasitic Disease Eradication (P4I)*, 14 - 24. Retrieve from: http://sehatnegeriku.kemkes.go.id/baca/rilismedia/20121210/kemenkes-lantik-perkumpulan-pemberantasan-penyakit-parasit-indonesia-p4i-di-bogor/.

Suriptiastuti. (2006). Infeksi Soil Transmitted Helminth: Ascariasis, Trichuriasis dan Cacing Tambang. *Majalah Universa Medicina*, 25(2), 84 - 91. Retrieve from: https://juke.kedokteran.unila.ac.id/index.php/majority/article/download/1483/132.accessed March 22, 2019.

Sutikno, D.H. (2000). Development of the Eradication of Worms in School Children through the Partnership Program in West Java Province. *Indonesian Association for Parasitic Disease Eradication (P4I)*, 36-42.

Umamah, S., and Nugroho, R.B. (2019). Prevalence of Intestinal Nematodes Soil Transmitted Helminth (STH) on Nails and Feces of Vegetable Farmers in Ngagrong Village Ampel Subdistrict Boyolali Regency. *Journal of Health Jurnal Gunabangsa*, 7(2), 59 - 64. doi. https://doi.org/10.30590/joh.v7i2.190. Retrieve from: https://journal.gunabangsa.ac.id/index.php/joh/article/download/190/135.

Wahyuni, D. (2016). The Relationship between Cutting Nails and Using Footwear on the Risk of STH Infection in Children in Sri Meranti Village, Rumbai District, Kota Pekan Baru. *Journal of Midwifery Science, STIKES Al-Insyirah Pekan Baru*, 5(1), 27 - 34. Retrieve from: https://jurnal.stikesalinsyirah.ac.id/index.php/kebidanan/article/download/7/2.

World Health Organization. (2015). *Soil-Transmitted Helminth Infactions*. Media Centre. Available from: http://www.who.int/mediacentre, accessed March 23, 2019.