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Associations Between Knowledge, Attitude and Behavior With Helminthiasis in Children

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ABSTRACT
Background: Soil-transmitted helminths (STH) infection is currently one of the highest prevalence neglected tropical diseases in children. Factors contributing to such case are children's hygiene, as well as the existence of helminths in the surrounding soil. **Objective:** Therefore, this research is done to determine whether there is significant association between hygiene and STH infection in children. **Methods:** This observational analysis with a cross-sectional design was conducted on elementary school children by interviewing the children and obtaining fecal samples. **Results:** Analysis of 197 fecal samples shows that 14.7% of the children were infected with STH and results of the interview show more children had poor knowledge about STH infection (69%). Good hygiene attitude and behavior were found in the majority of the subjects (58.9% and 81.7% respectively). The chi-square analysis performed shows no significant relation between knowledge (p=0.626), attitude (p=0.975), and behavior (p=0.376) and the incidence of STH infection. **Conclusion:** In this study, although children demonstrated poor knowledge of STH infection but had good hygiene attitudes and behaviors, there was no significant link between these factors and STH infection. This emphasizes the need for ongoing hygiene education in elementary school children.

Keywords: attitude, behavior, hygiene, soil-transmitted helminths, worm infection

1. Introduction

Soil-transmitted helminths (STH) infection is currently still the most commonly found Neglected Tropical Disease worldwide, especially in people of low economic class [1]. STH infection spreads through fertilized eggs in human feces which contaminates areas with bad sanitation. This infection is mostly found across tropical and sub-tropical areas, including Indonesia [2]. More than 1.5 billion people around the world are infected with worms [1]. The prevalence of worm infection in Indonesia ranges from 20% to 86% with an average of 30% [3, 4]. In North Sumatera, the highest STH infections was found in Tapanuli Tengah (66,67%) [5]. The most common species of STH infecting humans are roundworms (Ascaris lumbricoides), whipworms (Trichuris trichiura), and hookworms (Necator americanus and Ancylostoma duodenale). These worms generally infect humans through ingestion of egg-containing foods and beverages, but in children, infection can occur through direct ingestion of infectious eggs which happens when soiled hands come into contact with their mouth [2].

Elementary school-aged children's lack of hygiene is one of the leading factors contributing to STH infection which is shown by the high prevalence of STH infection in children due to lack of knowledge and the habit of inserting fingers into the mouth [6]. A survey conducted by the Indonesian Ministry of Health revealed that the prevalence of worm infections among children aged 1-6 years and 7-12 years is significantly high, ranging from 30% to 90% [4]. Children between 6 and 12 years old are particularly susceptible to these infections due to their frequent soil-related activities. This susceptibility is strongly linked to personal hygiene practices, such as using latrines for defecation, maintaining nail cleanliness, wearing footwear or sandals,

washing food, drinking boiled water, and the habit of washing hands with soap before eating and after using the toilet among elementary school students [7, 8]. However, several studies have also shown no correlation between these factors and STH infection rate in children. [9, 10] Therefore, further study is needed to determine whether knowledge, attitude, and behavior affects the incidence of STH infection.

2. Methods

This study was observational analytic with a cross-sectional design using primary data. The primary data in the form of questionnaire and feces samples were obtained from primary school students in Sunggal, Deli Serdang Regency of North Sumatera, which is one of the high-prevalence locations of children with STH infection in North Sumatera [5]. The subjects were selected using consecutive sampling, all of which fulfilled the inclusion and exclusion criteria. The inclusion criteria were students present during the study, consented to join the research, answered the questionnaire, and submitted feces samples. The exclusion criteria were students who did not answer the questionnaire completely and children who had received deworming treatment within the last 6 months. Subjects presenting with STH infection symptoms at the initial recruitment period were also excluded to prevent bias. The minimum sample size was calculated using Lemeshow's formula (minimum n=185).

The questionnaire used was previously tested for validity with 38 elementary school children. Out of the initial 44 questions, 35 were valid and then utilized to measure knowledge, hygiene attitude, and hygiene behavior. The questions were divided into 3 parts measuring knowledge (n=15), hygiene attitude (n=10), and hygiene behavior (n=10). The results of the questionnaire were deemed good if the score was 75% and above, otherwise they were considered bad [11].

The feces samples collected were analyzed in the Parasitology Department Laboratory of Universitas Sumatera Utara using Kato-Katz method which is the preferred method for detecting soil-transmitted helminth eggs in programmatic settings [12]. All data collected were analyzed using chi-square due to the categorical nature of the data and to test for independence using IBM SPSS Statistics software (24th version).

3. Results

The subjects of this research were 197 grade 3-6 primary school students aged 6-13 years old. Data on STH knowledge, hygiene attitude, and hygiene behavior were obtained through questionnaire responses, and data on STH infection rate was obtained through analysis of feces samples. Characteristics of the respondents were grouped by gender and age (table 1). Majority of the respondents were female (61.93%) gender-wise and 11-year-olds (28.43%) age-wise.

Table 1. Characteristics of the subjects

Characteristics	Frequency (n=197)	Percentage (%)
Gender		
Female	122	61.9
Male	75	38.1
Age (year)		
6	1	0.5
7	10	5.1
8	17	8.6
9	51	25.9
10	50	25.4
11	56	28.4
12	9	4.6
13	3	1.5

3.1 Univariate Analysis

In Table 2, it is indicated that the prevalence of STH infection was 14.7%. More students had poor knowledge of STH infection (65.0%) than good knowledge (35.0%), more students had good hygiene attitude (58.9%) than poor hygiene attitude (41.1%), and more students had good hygiene behavior (81.7%) than poor hygiene behavior (18.3%).

Table 2. Univariate analysis of infection rate, level of knowledge, hygiene attitude, and hygiene behavior

	Frequency (n=197)	Percentage (%)
STH infection		
Positive	29	14.7
Negative	168	85.3
Knowledge		
Good	69	35.0
Poor	128	69.0
Attitude		
Good	116	58.9
Poor	81	41.1
Behavior		
Good	161	81.7
Poor	36	18.3

Abbreviations: STH: soil-transmitted helminths

3.2 Bivariate Analysis

According to statistical analysis, there was no significant relation between the level of STH Infection knowledge and STH infection (*p value*=0.626) (Table 3), no significant relation between hygiene attitude and STH infection (*p value*=0.975) (Table 4), and no significant relation between hygiene behavior and STH infection (*p value*=0.376) (Table 5).

Table 3. Analysis of the relation between knowledge of STH infection and STH infection

Knowledge	STH Infection		Total	P value*
	(+)	(-)		
Poor	20	108	128	0.626
Good	9	60	69	
Total	29	168	197	

Table 4. Analysis of the relation between hygiene attitude and STH infection

Attitude	STH Infection		Total	P value*
	(+)	(-)		
Poor	12	69	81	0.975
Good	17	99	116	
Total	29	168	197	

Table 5. Analysis of the relation between hygiene behavior and STH infection

Behavior	STH Infection		Total	P value*
	(+)	(-)		
Poor	7	29	36	0.376
Good	22	139	161	
Total	29	168	197	

4. Discussion

In this research, no significant relationships between knowledge, attitude, behavior, and STH infection were found. The same result was found in similar research conducted by Mustafa et al which stated that there was no significant relationship between knowlege, attitude, behavior, and incidence of STH infection [13]. Daud (2012) further supports that no significant relationship were found between hygiene and STH infection [10]. The result of this research contradicts with those conducted by Dachi (2015) [14] and Rahmayanti et al. (2014)

[15] which stated that there were significant relationships between knowledge, attitude, behavior, and the incidence of STH infection in primary school children.

The absence of a significant relationship between the variables in this study might be due to the subjects' good hygiene attitude and practices despite the lack of knowledge. Kartini (2016) stated that nail hygiene is one of the factors contributing to STH infection, but 87.1% of the subjects of this study claimed that they clipped their nails weekly [17]. Fitri et al (2012) and Sandy et al (2015) stated that handwashing behavior affects the rate of STH infection. Responses to questions about handwashing before meals showed that 89.1% of respondent always wash their hands before each meal. The ratio of children with good hygiene exceeded those with poor hygiene, so it could be inferred that the respondents' hygiene attitude and behavior were appropriate to avoid the risk factors contributing to the incidence of STH infection. However, some of the factors affecting the rate of STH infections were not considered in this study such as house sanitation, family defecating habits, waste disposal conditions, and the availability of fresh clean water [16, 17, 18].

The limitation of this study were this was a cross-sectional design, it limited its ability to establish causal relationships between hygiene knowledge, attitudes, behaviors, and STH infection rates. This design only provides a snapshot at one point in time, making it difficult to determine whether changes in hygiene practices would lead to changes in infection rates or vice versa. The study found no significant relationship between knowledge, hygiene attitudes, and behaviors with STH infection rates, which contrasts with some previous studies. This discrepancy may be due to the generally good hygiene practices reported among participants, potentially minimizing observable effects. Additionally, factors such as household sanitation, family defecation habits, waste disposal conditions, and access to clean water were not controlled for, which could influence STH infection rates and affect the study's outcomes.

5. Conclusion

The prevalence of STH infection in the Sunggal district in North Sumatra was 14.7%. More children had a poor level of knowledge about STH infection, good hygiene attitude, and good hygiene behavior. There was no significant relationship between STH infection knowledge, hygiene attitude, hygiene behavior, and incidence of STH infection. Education about hygiene should still be prioritized in children, especially those living in areas with a high prevalence of STH infection.

6. Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to privacy and ethical considerations but are available from the corresponding author upon reasonable request.

7. Ethical Statement

This study was approved by the Research Ethics Committee of Universitas Sumatera Utara. Written informed consent was obtained from the children's parents and/or guardians before sample collection and the participants' identifiers were obscured in published reports and only accessible to the writers. The study was approved by the ethics committee of Universitas Sumatera Utara, with ethical clearance no. 175/TGL/KEPK FK USU-RSUP HAM/2018.

Sumatera Medical Journal (SUMEJ) is a peer-reviewed electronic international journal. This statement below clarifies ethical behavior of all parties involved in the act of publishing an article in Sumatera Medical Journal (SUMEJ), including the authors, the chief editor, the Editorial Board, the peer-reviewer and the publisher (TALENTA Publisher UniversitasSumatera Utara). This statement is based on COPE's Best Practice Guidelines for Journal Editors.

8. Author Contributions

All authors contributed to the design and implementation of the research, data analysis, and finalizing the manuscript.

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11. Conflict of Interest

Authors declares no conflict of interest.

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