

Surveillance Evaluation of the Prevalence of Childhood Helminthiasis in Toisapu Public Elementary School in Ambon City

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Abstract Helminthiasis remains a prevalent health problem worldwide. School-aged children are particularly vulnerable to various infections, with helminthiasis being a common concern. Studies have shown a prevalence of helminthiasis as high as 85.9% among elementary school children. To evaluate the prevalence in its working area, Technical Center for Environmental Health and Disease Control (BTKLPP) Class II Ambon conducts surveillance activities. This study employed a descriptive observational design with a cross-sectional approach. It involved 60 elementary school students from grades III, IV, and V at Toisapu Elementary School in Ambon City with accidental sampling. Stool samples were analyzed using microscopy and the Nafis staining method. Interestingly, the study found that most participants were male (63.33%). Additionally, a significant portion of students reported deworming twice a year (53.33%), using private toilets (78.33%), and practicing good hygiene by washing hands before eating (86.67%). Notably, all students (100%) demonstrated knowledge about the signs and transmission of helminthiasis. Despite these positive findings, laboratory

examinations revealed a lower prevalence of soil-transmitted helminth (STH) infection (2.1%). Only one female student in grade four tested positive for *Ascaris Lumbricoides* worms. These findings highlight the need for a comprehensive helminthiasis control strategy. This strategy should encompass health promotion and education initiatives, strengthened surveillance systems, targeted interventions to address risk factors, and effective case management.

Keywords *Ascaris Lumbricoides*, Deworming, Helminthiasis, Soil-transmitted Helminths

1. Introduction

Helminthiasis remains a prevalent health problem worldwide. According to the World Health Organization [1], over 1 billion people are infected with *Ascaris lumbricoides*, with *Trichuris trichiura* and hookworm

infections affecting 795 million and 740 million people, respectively [2]. These infections are most common in tropical and subtropical regions, particularly sub-Saharan Africa, the Americas, China, and East Asia.

In Indonesia, helminthiasis has long been a public health concern, especially among children and disadvantaged communities. However, our understanding of the disease and its management continues to improve thanks to advancements in medical research and innovative health approaches [3], [4]. The prevalence of helminthiasis in Indonesia varies from 2.5% to 62%. This high rate can be attributed to several factors, including Indonesia's tropical climate and high humidity, which create a favorable environment for worm development in soil [5]–[7]. Additionally, practices like open defecation, using human waste as fertilizer, and not washing hands before eating contribute to the spread of these parasites [8], [9].

Surveys conducted in elementary schools across various provinces have shown helminthiasis prevalence ranging from 40% to 60% for all age groups in Indonesia [10]. The Indonesian Ministry of Health reported results from the Sub-Directorate of Diarrhea's 2002-2003 surveys in ten provinces, revealing a prevalence range of 22% to 96.3% [11]. Schoolchildren are a vital national asset, and their health and well-being require the utmost attention. While schools serve as centers of learning, improper sanitation and hygiene practices can create a breeding ground for infections [9]. Furthermore, school-aged children are particularly vulnerable to various infections, with helminthiasis being a major concern, especially among elementary school students, where prevalence ranges from 40% to 60% [12]. Studies have shown that the prevalence and intensity of worm infections are typically highest in children aged 5 to 14. Recent research suggests that helminthiasis not only affects physical health but also has significant consequences for cognitive development and economic stability. Advancements in scientific research have provided a deeper understanding of the mechanisms of helminth infections, their impact on the immune system, and new strategies for prevention and treatment.

The prevalence of helminthic diseases is widespread in both rural and urban areas. Surveys conducted in elementary schools across several provinces between 1986 and 1991 revealed a prevalence of around 60% to 80%, with rates ranging from 40% to 60% for all ages [13]–[15]. A 2013 survey of helminthiasis prevalence in elementary school children documented rates varying from 0 to 85.9% across 175 surveyed districts in Indonesia. The average prevalence was found to be 28.12%, with low treatment coverage, limited community awareness, and insufficient staff capacity for helminthiasis control [16].

Technical Center for Environmental Health and Disease Control (BTKLPP) Class II Ambon, a unit under the Directorate of Disease Prevention and Control serving the Maluku, West Papua, and Papua regions, is responsible for conducting epidemiological surveillance of both infectious and non-communicable diseases within its jurisdiction [17].

Recognizing the importance of deworming, BTKLPP Class II Ambon actively conducts surveillance evaluations to assess the prevalence of worm infections in its service area. This study was conducted as a form of helminthiasis surveillance and evaluated compliance with deworming, defecation, and hand-washing habits. This study contributes to the prevention and control of helminthiasis and can be used to formulate policy for Ambon City.

2. Materials and Methods

Research Methods

This type of research is descriptive with a cross-sectional research design. A questionnaire instrument was used to obtain data on frequency of deworming; type of latrine; handwashing habits; knowledge of signs and transmission of helminthiasis. Stool sample analysis was conducted using microscopy with the Native method, which involves staining with eosin solution. The analysis was carried out at the Technical Center for Environmental Health and Disease Control (BTKLPP) in Ambon City. The inclusion criteria for participants included, attending an elementary school located in a rural area; having a high rate of stunting; experiencing low deworming coverage; and frequently playing barefoot outside of school hours or joining parents in gardening activities. The surveillance activity to evaluate the prevalence of helminthiasis in the BTKLPP Class II Ambon service area was conducted from September 25 to 27, 2020.

Sample Examination Method

Samples were examined microscopically using the native method, namely staining using eosin solution. Tools and materials included: microscope; object glass; deck glass; cover glass; dropper pipette; gloves; soft cloth; markers; stool pots, ice cream sticks, and toothpicks for stool samples; 2% eosin solution; labels; 70% alcohol; tissues; plastic clips for storing stool pots. The sample testing method is as follows,

Students who agreed to participate were provided stool collection containers and instructed to collect a stool sample (ideally in the morning before leaving for school). They were instructed to use the provided ice cream stick to collect approximately two grams of stool. The survey officer then labeled each container with the student's name. After collection, the container was sealed and placed in a plastic clip for transport back to the school, where it was collected by the survey officer. The officer verified that the name on the container matched the student who provided the sample. Samples were then registered with the technical service department before being submitted to laboratory staff for examination.

A drop of 2% eosin solution was placed on a microscope slide. An adequate amount of the stool sample was mixed

with the eosin solution, ensuring any large debris was removed. A coverslip was then placed slowly over the mixture to ensure even distribution and eliminate air bubbles. The prepared slide was examined under a microscope at 10 times and 40 times magnification. The presence of Soil-Transmitted Helminth (STH) eggs in the sample indicated a positive test. Conversely, the absence of STH eggs indicated a negative test. Positive samples were further analyzed to identify the specific type of worm present, allowing for the calculation of prevalence by worm type.

3. Result and Discussion

This study was conducted at Toisapu Elementary School, a state elementary school established in 1967 in Ambon City. The school currently follows the 2013 elementary school learning curriculum guide and holds a grade A accreditation. Located in the South East Lei Subdistrict of Ambon City, Toisapu Elementary School was chosen for the study. Three classes were selected for participation: Class III, Class IV, and Class V. A total of 60 stool sample containers were distributed to students, along with a questionnaire assessing their knowledge about helminthiasis. Students completed the questionnaire to the best of their knowledge. Table 1 presents the characteristics

of the participants. The sample consisted of 60 students divided across Classes III, IV, and V. Males comprised the majority of participants (38 students), with females accounting for the remaining 22 students.

Table 2 presents data on the distribution and return of stool sample containers among the 60 students across Classes III, IV, and V. Out of the 60 containers distributed, 25 were allocated to Class III, 16 to Class IV, and 19 to Class V. Sixteen samples were returned from Class III, 14 from Class IV, and 17 from Class V, resulting in a total of 47 returned samples containing feces. Table 3 summarizes data on deworming practices among the 60 students divided across Classes III, IV, and V. The data reveals that 32 students (over half) reported deworming medication twice a year, while 16 students (one-quarter) reported taking medication only once a year. The remaining 12 students (one-fifth) did not take any medication.

As shown in Table 4, the majority of Toisapu Elementary School students (over 47) use private toilets. Public toilets are used by 10 students, and 3 students utilize other facilities. This data suggests that a significant portion of Toisapu Elementary School students have access to private toilets. Table 5 reveals that a majority of students (52) reported washing their hands regularly, while eight students admitted to not washing their hands. This suggests a positive trend towards hygiene awareness at Toisapu Elementary School.

Table 1. Characteristics of Respondents at Toisapu Elementary School in Ambon City in 2023

No	Class	Number of Students n (%)	Gender	
			Male n (%)	Female n (%)
1	Class III	25 (41,67)	17 (68,00)	8 (32,00)
2	Class IV	16 (26,67)	8 (50,00)	8 (50,00)
3	Class V	19 (31,67)	13 (68,42)	6 (31,58)
Total n (%)		60 (100)	38 (63,33)	22 (36,67)

Table 2. Number of Sample Pots Distributed and Returned at Toisapu Elementary School in Ambon City in 2023

No	Class	Total of Sample Pots	
		Shared n (%)	Turned n (%)
1	Class III	25 (41,67)	16 (64,00)
2	Class IV	16 (26,67)	14 (87,50)
3	Class V	19 (31,67)	17 (89,47)
Total n (%)		60 (100)	47 (78,33)

Table 3. Number of Medications Taken by Respondents at Toisapu Elementary School in Ambon City in 2023

No	Class	Number of Students n (%)	How Many Times to Take Medicine		No Taking Medicine n (%)
			1x n (%)	2x n (%)	
1	Class III	25 (41,67)	5 (20,00)	17 (68,00)	3 (12,00)
2	Class IV	16 (26,67)	6 (37,50)	7 (43,75)	3 (18,75)
3	Class V	19 (31,67)	5 (26,32)	8 (42,10)	6 (31,58)
Total n (%)		60 (100)	16 (26,67)	32 (53,33)	12 (20,00)

Table 4. Place of Defecation Habits of Respondents of Toisapu Elementary School Students in Ambon City in 2023

No	Class	Place of Defecation N = 60		
		Private Latrine n (%)	Public Latrine n (%)	Other n (%)
1	Class III	19 (40,43)	6 (60,00)	-
2	Class IV	12 (25,53)	3 (30,00)	1 (33,33)
3	Class V	16 (34,04)	1 (10,00)	2 (66,67)
Total n (%)		47 (78,33)	10 (16,67)	3 (5,00)

Table 5. Respondents' Habit of Washing Their Hands before Eating at Toisapu Elementary School, Ambon City, 2023

No	Class	Number of Students	Handwashing Habits	
			Yes n (%)	No n (%)
1	Class III	25 (41,67)	22 (88,00)	3 (12,00)
2	Class IV	16 (26,67)	14 (87,50)	2 (12,50)
3	Class V	19 (31,67)	16 (84,21)	3 (15,79)
Total n (%)		60 (100)	52 (86,67)	8 (13,33)

Furthermore, as shown in Tables 6 and 7, all students demonstrated knowledge about both the signs of helminthiasis and the modes of transmission. This highlights the effectiveness of existing educational programs at Toisapu Elementary School.

Table 6. Respondents' knowledge about signs of helminthiasis at Toisapu Elementary School in Ambon City, 2023

No	Class	Know n (%)	Don't know n (%)
1	Class III	25 (41,67)	0 (0,00)
2	Class IV	16 (26,67)	0 (0,00)
3	Class V	19 (31,67)	0 (0,00)
Total n (%)		60 (100)	0 (0,00)

Table 7. Respondents' knowledge about helminth transmission at Toisapu Elementary School, Ambon City, 2023

No	Class	Know n (%)	Don't know n (%)
1	Class III	25 (41,67)	0 (0,00)
2	Class IV	16 (26,67)	0 (0,00)
3	Class V	19 (31,67)	0 (0,00)
Total n (%)		60 (100)	0 (0,00)

Table 8 illustrates the results of the laboratory examination through cross-tabulation based on gender. Out of a total of 47 samples, 27 (57.4%) were males, all of whom tested Negative. On the other hand, for the female gender, 1 (2.1%) tested positive, revealing the presence of Roundworms (*Ascaris Lumbricoides*), while 19 (41.3%) samples tested Negative. Moving on to Table 9, it reveals the outcomes of the laboratory examination in cross-tabulation categorized by age groups. Among 8-year-olds, 15 (31.9%) showed Negative results, with 0% testing Positive. For 9-year-olds, 1 (2.1%) tested positive, indicating the presence of Roundworms (*Ascaris Lumbricoides*), and 14 (30.4%) showed Negative results. In the case of 10-year-olds, 17 (37.0%) tested Negative, with 0% testing Positive. The total sample size for this analysis was 47 (100.0%). The laboratory examination results from BTKL PP Class II Ambon, which involved stool samples collected at Toisapu Elementary School, demonstrated a 2.1% prevalence of Soil-Transmitted Helminth (STH) infection. This was identified through the discovery of Roundworms (*Ascaris Lumbricoides*) in a fourth-grade female student.

Table 8. Cross-tabulation of Gender and Examination Results of Toisapu Elementary School in Ambon City in 2023

No	Gender	Inspection Result		Total n (%)
		Positive n (%)	Negative n (%)	
1	Male	0 (0,00)	27 (57,45)	27 (57,44)
2	Female	1 (2,13)	19 (40,43)	20 (42,56)
Total n (%)		1 (2,13)	46 (97,87)	47 (100,00)

Table 9. Cross-tabulation of Age Type and Examination Results of Toisapu Elementary School in 2023

No	Age	Inspection Result		Total n (%)
		Positive n (%)	Negative n (%)	
1	8 years	0 (0,00)	15 (31,91)	15 (31,91)
2	9 years	1 (2,13)	14 (29,79)	15 (31,91)
3	10 years	0 (0,00)	17 (36,17)	17 (36,17)
Total n (%)		1 (2,13)	46 (97,87)	47 (100)

This study investigated the prevalence of soil-transmitted helminthiasis (STH) among students at Toisapu Elementary School. Samples were collected from students in classes III, IV, and V. Analysis by BTKLPP Class II Ambon laboratory identified a single case of *Ascaris Lumbricoides* infection in a female student from Class IV. This resulted in a calculated prevalence of 2.1%. As the prevalence is below 20%, mass treatment is not necessary for Toisapu Elementary School. However, the infected student will receive individual treatment.

Our results show that the prevalence of helminthiasis in the community is significantly lower than previously reported figures in the same place. This finding suggests that the community may not have a significant helminthiasis problem. Community deworming programs may have been effectively implemented, coordinated by local health services and schools. Regular deworming campaigns can significantly reduce the incidence of helminthiasis. There may already be ongoing health education initiatives that emphasize the importance of hygiene practices such as regular handwashing with soap and wearing footwear outdoors. These initiatives may be more effective than previously assumed. The community may have a high level of engagement and adherence to health recommendations. Residents may be more aware of the risk of helminthiasis and more diligent in following prevention measures. Schools may be actively involved in health promotion activities, ensuring that children adhere to recommended hygiene practices and take deworming medication regularly.

Helminthiasis refers to infections caused by worms, which are multicellular parasites that live as endoparasites within the human body. These infections can manifest in various organs and can be chronic with severe disabilities.

Worms in the body can cause digestive disorders, malnutrition, anemia, and a negative impact on the physical and cognitive development of children [18]. Helminthiasis infection can also indirectly affect children's school attendance and performance, potentially impairing their academic performance [19].

Helminthiasis control efforts can be carried out through various strategies. Health promotion and education play an important role in raising awareness about the prevention and treatment of helminth infections [20]. Worm surveillance is important for monitoring the prevalence and transmission of helminth infections, which can inform control strategies [21]. Control of risk factors, such as access to clean water, proper sanitation, and hygiene practices, is critical in reducing helminth transmission [22]. Treatment of infected individuals is necessary to alleviate symptoms and reduce the burden of infection [23].

Health promotion strategies in the prevention and treatment of helminth infections aim to increase knowledge about appropriate prevention and control measures [24]. Health education programs in schools can be conducted through teacher-led classroom teaching, parent engagement sessions, and providing information on the effects of helminthiasis on health and learning achievement [25]. Another important aspect is promoting personal hygiene among school children, including washing hands with soap, trimming nails, and washing hands regularly [26]. Thus, a comprehensive approach through health promotion strategies can effectively prevent and control helminthiasis in primary schools.

Helminthiasis surveillance aims to monitor and assess the effectiveness of soil-transmitted helminthiasis (STH) control programs, improve and intensify surveillance efforts, and maintain control/elimination of helminth

infections [2]. It is important to optimize soil-transmitted helminth (STH) surveillance to monitor program status and ensure that no subpopulations are excluded from surveillance data [27]. With the implementation of a good surveillance system, the detection and monitoring of helminth infection cases can be well monitored so that the planning and implementation of interventions will be more effective.

Controlling risk factors is essential in reducing helminth transmission in children. Drinking uncooked water, open defecation, latrine use, and children not having toilet facilities at school are significantly associated with soil-transmitted helminth infections [28]. Improving sanitation facilities in schools such as the presence of clean water facilities, proper waste disposal, and clean and well-maintained latrines are important factors in preventing helminth infections [29]. Therefore, controlling risk factors is necessary to prevent helminthiasis in school children.

Helminthiasis in children can be prevented and treated by taking anthelmintic drugs [30]. Research conducted in the Republic of Congo in 2022 showed that anthelmintic treatment significantly reduced the prevalence of helminth infections in school children [31]. By reducing the prevalence of worm infections, anthelmintic treatment can improve children's health and well-being. Not only that, anthelmintic treatment also has a positive impact on the education sector. Worm infections can affect children's school attendance and performance, potentially improving their academic performance [32].

4. Conclusions

The prevalence of Soil-Transmitted Helminths (STH) infection in students of Toisapu Elementary School, Hutumuri Village was (2.1%) and the type of worm that infected was *Ascaris lumbricoides* or roundworms. Most students had dewormed twice a year (53.33%), used private toilets (78.33%), washed hands before eating (86.67%), had knowledge about the signs of helminthiasis (100%) and how worms are transmitted (100%). There needs to be cooperation between the primary health care and Toisapu Elementary School in terms of deworming and it is necessary to supervise the taking of deworming drugs, especially for patients who have contracted helminthiasis. There needs to be counseling from the primary health care, as well as the installation of pamphlets in each school about the importance of Clean and Health Living Behavior (PHBS) in the school environment, such as washing hands using soap before eating, using clean and hygienic toilets, and getting used to using footwear when outside the home.

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