

CORRELATION BETWEEN KNOWLEDGE, LEARNING ACHIEVEMENT AND PERSONAL HYGIENE WITH INCIDENCE OF HELMINTHIASIS ON ELEMENTARY STUDENT

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Abstract

Background: Helminthiasis is a health problem in Indonesia that affects many elementary school children. The effects of worms in children can be malnutrition, anemia and decreased academic achievement. The government has carried out control of worm diseases by providing deworming drugs every 6 months. However, the effectiveness of this program has not been widely studied, the incidence of worms in each region is not widely known, including the risk factors that influence it. Objective: This study aims to determine the correlation between knowledge, learning achievement and personal hygiene with the incidence of helminthiasis in students at Selokaton Karanganyar Elementary School II. Method: The method used is a cross-sectional study, with total sampling. Students were asked to fill out a knowledge and personal hygiene questionnaire, then collect feces. Learning achievement were obtained from final mark of the semester. Feces examination using direct smear and 2% eosin staining. Analysis used binary logistic regression test and Mann-Whitney U test. Result: The results of this study were that students who were positive for helminthiasis were 16%, hookworm infections were the highest burden (10/16), followed by ascariasis and enterobiasis. There was no significant correlation between knowledge, learning achievement and personal hygiene with the incidence of helminthiasis ($p > 0.05$). Conclusion: The conclusion of this study is that there is no significant correlation between knowledge, learning achievement and personal hygiene with the incidence of the incidence of helminthiasis ($p > 0.05$).

Keywords : *helminthiasis, elementary, knowledge, learning achievement, personal hygiene*

Abstrak

Latar Belakang: Helmintiasis (kecacingan) adalah masalah kesehatan di Indonesia yang banyak menimpa anak usia SD. Efek kecacingan pada anak dapat berupa malnutrisi, anemia dan penurunan prestasi belajar. Pengendalian penyakit kecacingan telah dilakukan pemerintah melalui pemberian obat cacing tiap 6 bulan sekali. Namun efektivitas program ini belum banyak diteliti, insidensi kecacingan tiap daerah belum banyak diketahui, termasuk faktor risiko yang mempengaruhinya. Tujuan: Penelitian ini bertujuan untuk mengetahui hubungan pengetahuan, prestasi belajar dan higiene perorangan dengan insidensi kecacingan pada siswa di SD Negeri Selokaton II Karanganyar. Metode: Metode yang digunakan adalah penelitian cross sectional, dengan total sampling. Siswa diminta mengisi kuesioner pengetahuan dan personal hygiene, kemudian mengumpulkan feses. Prestasi belajar didapatkan dari nilai akhir semester. Pemeriksaan feses menggunakan direct smear dan pewarnaan eosin 2%. Analisis menggunakan uji regresi logistik biner dan Uji Mann-Whitney U.. Hasil: Hasil dari penelitian ini adalah siswa yang positif kecacingan sebanyak 16%, infeksi cacing tambang merupakan infeksi yang paling banyak ditemukan (10/16), diikuti oleh ascariasis dan enterobiasis. Tidak terdapat hubungan yang signifikan antara pengetahuan, prestasi belajar dan higiene perorangan dengan insidensi kecacingan ($p > 0,05$). Kesimpulan: Kesimpulan dari penelitian ini adalah tidak terdapat hubungan yang signifikan antara pengetahuan, prestasi belajar dan higiene perorangan dengan insidensi kecacingan ($p > 0,05$).

Kata kunci : *helmintiasis, siswa SD, pengetahuan, prestasi belajar, higiene perorangan*

INTRODUCTION

Helminthiasis remains a health problem in Indonesia. This disease is caused by nematode worms that live in the human intestine. The intestinal nematode species that cause helminthiasis are *Ascaris lumbricoides*, *Necator americanus*, *Ancylostoma duodenale*, *Trichuris trichiura*, *Enterobius vermicularis*, and *Strongyloides stercoralis*. The highest incidence of intestinal worms is in children aged 5-13 years, which is the elementary school age⁽¹⁻³⁾

Research on the influence of risk factors on the incidence of worm infections has been conducted extensively. Knowledge about worm infections, academic achievement, nutritional status, footwear behavior, social status, and economic status influence the incidence of worm infections⁴⁻⁹.

Although the government has implemented a program of administering deworming medication every 6 months to elementary school children, the incidence of intestinal worms is still found in elementary school children^{10,11}.

This study examines the prevalence of intestinal worms and the influence of risk factors for intestinal worms, such as students' knowledge about intestinal worms, academic achievement, and personal hygiene among students at SD Negeri II Selokaton Karanganyar on the incidence of intestinal worms in the school.

METHODS

This study used a *cross-sectional* research design with *total sampling*. The study population consisted of elementary school students in Karanganyar. The

Lemeshow formula was used to determine the minimum sample size required.

$$n = \frac{z^2 \times P(1 - P)}{d^2}$$

Z-value = 1.96

P=11%, based on the study by Bestari et al. (2019)¹²

d=0.1

The minimum sample size required was calculated to be 38 children.

The inclusion criteria for this study were students who collected questionnaires and stool samples, while the exclusion criteria were students who did not attend school and whose parents did not sign *the informed consent form*.

In this study, grades 5 and 6 were taken as the sample group. Of the 126 questionnaires distributed and completed, 95 students returned stool samples containing their own feces, so these 95 student samples were used as the sample.

This study has obtained *ethical clearance* from KEPK FK UMS with No. 5393/B.1/KEPK-FKUMS/XI/2024, and has obtained permission from parents in the form of *informed consent*. Students filled out questionnaires on knowledge of worms and *personal hygiene*. Academic achievement was obtained from student grades in the final semester. These three factors are independent variables.

The level of knowledge about intestinal worms was measured using a questionnaire with 10 questions. Each correct answer was given a score of 1, and each incorrect answer was given a score of 0. The total score was interpreted into three categories: Good: 8-10; Fair: 5-7; Poor: 0-4. *Personal hygiene* level was measured with 20 questions, where each correct answer was given a score of 1. The total score was interpreted as follows: Good: 15-20; Fair: 8-14; Poor: 0-7. Academic

achievement was measured and categorized as follows: Good: 81-100; Fair: 61-80; Poor: ≤ 60 .

The diagnosis of intestinal worms was obtained from stool examinations of the 95 students. Stool examinations were conducted at the Parasitology Laboratory of the Faculty of Medicine, Muhammadiyah University Surakarta. Stool pots containing 10% formalin were distributed to the students' parents and labeled with the students' names and dates of birth. Parents and students were instructed on how to collect samples in stool pots. Every morning for 3 consecutive days, the samples were brought to school and immediately examined in the lab. The examination used the *direct slide* method, 2% eosin staining, viewed under a microscope with 4x and 10x magnification. The incidence of intestinal worms was the dependent variable.

The data obtained was then analyzed using binary logistic regression to determine the relationship between independent variables and dependent variables, and the Mann-Whitney U test to compare the difference in average scores between the two groups.

RESULTS

From this study, 95 students completed the questionnaire and collected stool samples. The characteristics of the research subjects based on gender and age are presented in Table 1, while Table 2 presents the research data based on the results of the questionnaire on knowledge, personal hygiene, and learning outcomes.

Table 1. Characteristics of research subjects regarding the correlation between knowledge, personal hygiene, and academic

achievement with the incidence of intestinal worms in elementary school students

Characteristics	Respondents
	N (%)
Gender	
Male	48 (50.5)
Women	47 (49.5)
Total	95 (100)
Age	
10 years	28 (29.5)
11 years	48 (50.5)
12 years	19 (20.0)
Total	95 (100)

Source: Primary data, 2024

Table 2. Research data on the correlation between knowledge, personal hygiene, and academic achievement with the incidence of intestinal worms among elementary school students

Variable	Subject
	N (%)
Level of knowledge about	
Good	80 (89.4)
Fair	5 (5.2)
Poor	5 (5.2)
Level of <i>personal hygiene</i>	
Good	87 (91.6)
Fair	4 (4.2)
Poor	4 (4.2)
Academic achievement	
Good	31 (32.6)
Fair	42 (44.2)
Poor	22 (23.2)
Incidence of worm	
Negative	79 (78.2)
Positive	16 (16.8)

Source: Primary data, 2024

From the feces examined, 16 samples or 16.8% were found to be positive for worm eggs. Table 3 presents the various types of worms in feces samples that were positive for worms.

Table 3. Types of worms in samples that tested positive for worm infection

No.	Type of worm	Quantitative
1.	<i>Ascaris lumbricoides</i>	5

2.	<i>Hookworm</i>	10
3.	<i>Pinworm</i>	1

Source: Primary data, 2024

Of the 16 positive stool samples, there were 5 *Ascaris lumbricoides*, 10 hookworms, and 1 *Oxyuris vermicularis*. Figure 1 shows *Ascaris lumbricoides* eggs in one of the positive samples, while Figure 2 shows hookworm larvae in one of the positive stool samples. No samples showed mixed infection.

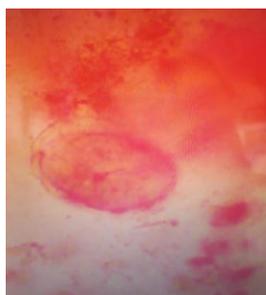


Figure 1. *Ascaris lumbricoides* eggs in a positive sample f, objective lens: 40x (Source: Bestari, 2024)



Figure 2. Hookworm larvae in a positive sample, objective lens: 40x (Source: Bestari, 2024)

Table 4. Binary logistic regression analysis

Independent Variables	Regression Coefficient (B)	Standard Error	Odds Ratio (Exp (B))	p-value
Knowledge Score	-0.106	0.284	0.899	0.709
Personal Hygiene	0.057	0.126	1.059	0.650

Independent Variables	Regression Coefficient (B)	Standard Error	Odds Ratio (Exp (B))	p-value
Report Card Score	-0.010	0.019	0.990	0.598

This analysis was used to determine whether there was a relationship between the independent variables (knowledge score, personal hygiene, and report card score) and the dependent variable (incidence of intestinal worms, i.e., positive/negative). A p-value > 0.05 indicates that there is no statistically significant relationship between the independent variables and the incidence of intestinal worms.

All three variables (knowledge score, personal hygiene, and report card score) have p-values above 0.05. This means that changes in these scores cannot predict the likelihood of a student testing positive for intestinal worms.

Table 4. Mann-Whitney U Test Analysis

Variables Compared	Mann-Whitney U Test Value	p-value
Knowledge Score	823.5	0.871
Personal Hygiene Score	884.0	0.902
Report Card Score	811.5	0.957

This test is used to compare the difference in average scores between two groups (students with positive and negative worm infections).

A p-value > 0.05 indicates no significant difference in the average scores between the two groups. There is no significant difference in report card scores between the two groups. There is no significant difference in knowledge scores between the two groups. There is no significant difference in *personal hygiene* scores between the two groups.

All variables have p-values well above 0.05. This reinforces the conclusion from the logistic regression that knowledge scores and report card scores do not differ significantly between students infected with worms and those who are not.

DISCUSSION

From Table 1, it can be seen that the comparison between male and female subjects is balanced. There are 48 male students and 47 female students. In terms of age, the respondents are pre-teens, aged 10-12 years. The majority of respondents are 11 years old (48, 50.5%).

Table 2 shows the research data based on the research variables, namely the level of knowledge about worms, personal hygiene, and academic achievement. The level of knowledge about worms was obtained from a questionnaire with 10 questions. A score of 1 was given for a correct answer, a score of 0 for an incorrect answer, and the scores were then added up. The interpretation was divided into three categories: good if the total score was 8 to 10, fair if the total score was 5 to 7, and poor if the total score was 0 to 4. For the level of personal hygiene, there were 20 questions. Each question had a correct answer for good personal hygiene. The score is the

total number of correct answers. The interpretation is divided into 3 categories: good personal hygiene if the score is 15-20, fair if 8-19, and poor if the score is 0-7. Academic achievement is measured by good, adequate, and poor interpretations. Good if the student's score is 81-100, adequate if the student's score is 61-80, and poor if the student's score is less than or equal to 60. Table 2 also presents the incidence of intestinal worms in students at SD Negeri II Selokaton Karanganyar.

In this study, most students had a good level of knowledge about intestinal worms (89.4%) and most had good *personal hygiene* (91.6%).

Of the feces examined, 16 samples or 16.8% tested positive for worm eggs. Of the 16 positive feces samples, there were 5 *Ascaris lumbricoides*, 10 *hookworms*, and 1 *Oxyuris vermicularis*. These three species are commonly found in worm infections in elementary school children^{3,9,10,13-15}.

Direct smear examination is a simple, quick stool test that can be used for initial diagnosis. Compared to the gold standard Kato Katz test, this examination has a sensitivity of 89.09%, specificity of 100%, positive predictive value (PPV) of 100%, and negative predictive value (NPV) of 33.33%¹⁶.

From the analysis results, there was no significant relationship between knowledge, personal hygiene, and academic achievement with the incidence of worm infection ($p > 0.05$) among students at Selokaton II Public Elementary School in Karanganyar. Although most students had good knowledge and *personal hygiene*, there were still cases of worm infection. This indicates that other factors not examined in this study may play a role in the transmission of intestinal worms.

Research on intestinal worms is very complex and influenced by many variables, so insignificant results may not always mean that there is no relationship, but it could be that the relationship is not detected by existing research methods or is overshadowed by other more dominant factors.

In this case, the research method of filling out a *personal hygiene* questionnaire allows for *self-report bias* because it is filled out by the research subjects themselves.

Factors that have not been studied include socioeconomic differences, poor sanitation, use of unsanitary toilets, access to clean water, footwear habits, compliance with deworming medication, nutritional status, and history of regular deworming medication use^{8-10,12,17-21}. In this context, hookworm infection typically enters through the skin when children do not wear footwear.

CONCLUSION

The conclusion of this study is that no significant relationship was found between knowledge, learning achievement, and personal hygiene and the incidence of intestinal worms among students at Selokaton II Public Elementary School in Karanganyar ($p > 0.05$). In future studies, it is recommended to look at various other risk factors, namely family socioeconomic status, environmental sanitation, toilet use, access to clean water, the habit of wearing footwear, compliance with deworming medication, nutritional status, and history of regular deworming medication use.

REFERENCES

1. Bestari, Rochmadina; Dewi, Listiana Masyita; Mahmuda INN. Tropical

Medicine: Basic and Clinic. Surakarta: Muhammadiyah University Press; 2020.

2. Bestari RS, . S, . S, . S. Degree of Eosinophilia in Patients with Soil-Transmitted Helminth (Sth) Infection. Biomedika. 2015;7(2):27–34.
3. Agrawal R, Pattnaik S, Kshatri JS, Kanungo S, Mandal N, Palo SK, et al. Prevalence and correlates of soil-transmitted helminths in schoolchildren aged 5 to 18 years in low- and middle-income countries: a systematic review and meta-analysis. Front Public Health. 2024;12(March):1–14.
4. Rahmah M, Bestari RS, T RT. Correlation Between Socioeconomic Level and Nutritional Status with The Incidence of Helminthiasis in Students of SDN 02 Selokaton Faculty of Medicine , Universitas Muhammadiyah Surakarta (UMS), Jalan Ahmad Yani , Sukoharjo , 57169 , Central Java , Indo.
5. Sulastris S, Ambarwati WN, Hudiyawati D, Rachmawati WP, Jannah AF. Education and Early Detection of Worm Infection in Pregnant Women in the Working Area of the Gatak Sukoharjo Community Health Center. Warta LPM. 2022;25(3):397–406.
6. Firoos M, Najmii A, Bestari RS, Aisyah R, Rahmah M. Correlation between parents' knowledge about worm infection and environmental sanitation towards the incidence of worm infection (helminthiasis) in students of SDN 02 Selokaton. :1–8.
7. Östan I, Kilimcioğlu AA, Girginkardeşler N, Özyurt BC, Limoncu ME, Ok ÜZ. Health inequities: Lower socio-economic conditions and higher incidences of intestinal parasites. BMC Public Health. 2007;7:1–8.

8. Ernida E, Navianti D, Damanik H. Knowledge, Attitudes, and Behaviors Regarding Handwashing with Soap Among Elementary School Students. *Journal of Environmental Sanitation*. 2021;1(1):1–7.
9. Kattula D, Sarkar R, Ajjampur SSR, Minz S, Levecke B, Mulyi J, et al. Prevalence & risk factors for soil transmitted helminth infection among school children in south India. *Indian Journal of Medical Research*. 2014;139(January):76–82.
10. Yurika E, Eldytananda D, M FE, A AD, F RD, Nugraheni G. Intestinal Worm Infection and Deworming Programs as well as Risky Behavior for Intestinal Worm Infection in Children. *Community Pharmacy Journal (Jfk)*. 2019;6(2):52–9.
11. Binuko RSD, Mahmuda INN, Bestari RS, Agustina T, Dewi LM, Fauziah NF, et al. Screening and Management of Worm Infection and Malnutrition in Students of Muhammadiyah Elementary School, Karanganyar. *Jurnal Pengabdian Masyarakat Medika*. 2022;19:70–9.
12. Bestari RS, Ayu NS, Aisyah R, Wijayanti A. Influence of Knowledge, Attitude, and Use of Footwear on Incidence. *Proceedings Book National Symposium and Workshop Continuing Medical Education XIV [Internet]*. 2020;1–8. Available from: <http://hdl.handle.net/11617/12227>
13. Gunaratna GPS, Dempsey S, Ho C, Britton PN. Diagnosis of Enterobius
14. World Health Organization. Fact sheets. 2023 [cited 2024 Dec 3]. Soil-transmitted helminth infections. Available from: <https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections>
15. Sari MP, Nathasaria T, Majawati ES, Pangaribuan HU. Soil-Transmitted Helminth Infections, Anemia, and Undernutrition Among School-Children in An Elementary School in North Jakarta, Indonesia. *Bandung Medical Journal*. 2020;52(4).
16. Sofia R. Comparison of the Accuracy of Direct Slide Examination with the Kato-Katz Method in Helminth Infection. *AVERROUS: Malikussaleh Journal of Medicine and Health*. 2018;3(1):99.
17. Irawan NA, Sari Y, Haryati S, Negara KSP. Description of Environmental Sanitation and Nutritional Status with Parasitic Infections in Students of Madrasah Ibtidaiyah Singosari, Boyolali. *Plexus Medical Journal*. 2024;3(1):16–26.
18. Mukti AJ, Sari OP, Susiawan LD. Analysis of Handwashing Behavior and Its Relationship with Worm Infection in Elementary School Children in Linggasari Village, Kembaran District, Banyumas Regency. *Mandala Of Health*. 2022;15(1):1.
19. Rahmawati Y, Dini Harlita T, Indriaty Yusran D, Medical Laboratory Technology J, East Kalimantan Ministry of Health P. Correlation Between Knowledge of Personal Hygiene and Helminthiasis Infection in Primary School Students. *Journal Health & Science: Gorontalo Journal Health and Science Community [Internet]*. 2024;34–42. Available from: <https://ejurnal.ung.ac.id/index.php/gojhes/index>
20. Adiguna ES, Utami WS, Sutejo IR, Hermansyah B, Armiyanti Y. Hygiene and Sanitation Factors Affecting

Contamination of Soil-Transmitted Helminths in Household Water Sources in Jember, Indonesia. *Althea Medical Journal*. 2022;9(3):125–30.

21. Indonesian Ministry of Health Regulation. Ministry of Health Regulation on Helminthiasis Control. Indonesian Ministry of Health Regulation 2017.