

Representation of Soil-Transmitted Helminth Eggs on Fingernails of Children in Orphanages in the City of Padang on October-December 2023

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ABSTRACT

Soil-transmitted helminth (STH) infection is one of the neglected tropical diseases in which preschool-age and school-age children had the highest number of the prevalence. The spread of STH infection can be caused by poor nail hygiene, especially in shared facilities such as orphanage.

This study was a descriptive study with primary data from Al-Falah Orphanage, Anak Mentawai Gurun Laweh Orphanage, and Yayasan Kanzul Ulum Pasia Nan Tigo on October to December 2023. The sampling technique in this study was purposive sampling with 123 total samples. All samples were examined by direct microscopic examination with direct sedimentation method.

The study found that from 123 samples, 1.6% samples were contaminated by *Ascaris lumbricoides* eggs and 0.8% samples were contaminated by hookworm eggs.

It can be concluded that STH eggs were identified on fingernails of children in orphanages in the city of Padang which contributed as one of STH infection transmission factor. Therefore, promotive and preventive actions might be needed to prevent STH infection in orphanage children.

Keywords: Nail hygiene, STH infection, orphanage children

INTRODUCTION

Soil-transmitted helminth (STH) infection or helminthiasis is a disease caused by nematodes which transmitted through contaminated soil to human digestive system. The species that commonly infect people such as hookworms (*Necator americanus* and *Ancylostoma duodenale*), whipworm (*Trichuris trichiura*), roundworm (*Ascaris lumbricoides*), and threadworm (*Strongyloides stercoralis*).¹ According to World Health Organization, it is estimated around 1.5 billion or 24% of population all over the countries have infected by STH. Those are consisted more than 260 million pre-school aged children and 654 million school-age children. The highest prevalence of this number is found in areas with tropical and sub-tropical climates including sub-Saharan Africa, China, South America and Asia.¹ Based on data from the Regulation of the Minister of Health of Indonesia number 15 of 2017 about deworming prevention, the prevalence of helminthiasis in Indonesia in general is still quite high, especially in the lower middle class and access to sanitation and hygiene which is bad, which varies between 2.5%-62%.²

The incidence of helminthiasis is most common among school-age children. Helminthic infections in school children have an adverse impact, among others: can cause anemia, weakness, drowsiness, decreased Intelligence quotient (IQ), decreased achievement and productivity, disruption of physical and mental development and malnutrition.³

Risk factors for helminthiasis in elementary school children include consuming food or drinks that are processed unhygienically, not wearing footwear or gloves when in contact with the ground, the habit of defecating in any place, the habit of not washing hands, not maintaining nail hygiene, the unavailability of latrines, and the lack of availability of clean water. Other factors are also influenced by socio-economic, level of education and knowledge.^{4,5}

Poor nail hygiene and fingernails that are not cut regularly are one of the factors for the spread of STH infection. One of the results of research conducted on school-age children in Ethiopia also mentioned the presence of STH eggs in the fingernails, poor hygiene and hygiene, and demographic factors contributed greatly to the incidence of STH infection.⁶ Some research results suggest the prevalence of fingernails contaminated with STH eggs in school-age children reaches 20% for *A. lumbricoides*, 13% for *T. trichiura*, and 4% for hookworm. School-age children are susceptible to STH infection because washing hands and cutting fingernails is still not a habit, including before eating.⁶ In a study conducted in 2016 in Pekanbaru, it was stated that subjects with dirty fingernails had a four times greater risk of being infected with STH worms compared to subjects who had clean fingernails.⁴

Children living in orphanages receive care and depend on caregivers in various ways, including in accustoming orphanage children to carry out clean and healthy living behaviors, including the habit of cutting and maintaining nail hygiene.⁷

Based on data from the Padang City Social Office, there are as many as 35 orphanages

spread throughout the city of Padang. Initial survey and observations done by researchers at several orphanages. Children with long and dirty fingernails were found in 3 out of 8 children (37.5%) in Al Falah Orphanage. The same thing was found in the Anak Mentawai Gurun Laweh Orphanage, which was in 4 out of 10 children (40%). Observations at Yayasan Kanzul Ulum Pasia Nan Tigo were also carried out because of its location close to the beach, which is a vulnerable location for transmission of STH infection.

In addition to the characteristic of the fingernails, researcher found that the children of the Al-Falah orphanage were freed to play on the ground around the yard and move on the ground barefoot. At the Anak Mentawai Gurun Laweh Orphanage, shared facilities such as bedrooms and bathrooms are considered humid with poor hygiene. This condition can be one of the risk factors for STH infection in orphanage children. Based on the background that has been described, researcher are interested in examining the picture of the presence of STH worm eggs in fingernails in orphanages.

LITERATURE REVIEW

STH Infections

Humans can contract helminthiasis from STH eggs transmitted through the feces of other infected people by accidental ingestion of infective eggs either from contaminated and imperfectly processed food, water sources that are not suitable for consumption, or from STH eggs that attached to hands and fingernails that come into direct contact with contaminated soil. In hookworm species and *S. stercoralis*, worm eggs can hatch in the soil and secrete larvae that can infect humans by its filariform larvae that penetrating the skin.^{7,8} The clinical symptoms are largely determined by the severity of the infection that occurs.⁹ In mild infections, helminthiasis often do not cause clinical manifestations. In cases with higher rate of infection, most common symptoms in early

stages are malaise, malabsorption, and anemia. In severe cases, abdominal pain, distention, constipation, diarrhea, even anorexia. In children, the risk of anemia often manifested by the general condition of paleness, growth disorders, and impaired cognitive development.¹⁰

Helminthiasis can be diagnosed by microscopic examination of feces for the presence of helminth eggs. The identification of *rhabditiform* and *filariform* larvae in feces can be done to stronglyloidiasis suspected patient. Another method can be done with the Kato-Katz method, which can measure the degree of infection.^{11,12,13}

Factors Influencing the Incidence of Soil-Transmitted Helminth Infection

The incidence of STH infection can be influenced by many factors such as environment sanitation, personal hygiene, age, and social, educational, and economic status. Environments with poor sanitation contribute to increasing the risk of STH infection by increasing the number of infective eggs in the soil because they are polluted by garbage, human feces, and other microorganisms that support the presence of helminth eggs, which are then very potentially ingested by humans.^{14,15} The level of personal hygiene and personal sanitation is closely related to STH infection. Personal sanitation behavior includes washing hands with soap before and after eating, as well as before and after defecation and urination, defecating in latrines, maintaining cleanliness and trimming fingernails regularly, and wearing shoes when doing activities outside the home.^{16,17} In one study showed that the possibility of STH infection was 6 times greater in children who had poor personal hygiene compared to children who had good personal hygiene.¹⁷ Age is one of the factors that influence the incidence of STH infection, especially in school-age children because there is no awareness of children to maintain personal hygiene and still lack of knowledge about their body health. WHO

determines that pre-school age children, school, human mothers, breastfeeding mothers, are vulnerable groups affected by STH infection.^{1,17} STH infection is still one of the neglected tropical diseases (NTDs) that are treated seriously by WHO because many occur especially in tropical areas with middle to lower economic populations. This condition is related to crowded living conditions, access to health services, and low levels of public education.^{17,18}

Nail Hygiene as A Form of Personal Hygiene Behavior

Fingernails are one part of the body that has the main function as a protector of fingertips that are full of nerve endings and are very sensitive to touch stimuli.¹⁹ Healthy fingernails play an important role functionally as well as cosmetically. The characteristics of healthy fingernails are smooth texture, shiny, also the same color and consistency of fingernails on all sides. In addition, the base of a healthy nail is pink, does not crack or break, and is clean of dirt.²⁰ Nail hygiene is maintained by cutting fingernails periodically at least once a week so that dirt is not easily stuck on the inside of the nail and avoid the habit of biting fingernails which greatly facilitates the transmission of STH eggs into the digestive system.²¹ Personal hygiene or personal sanitation is all the actions of a person who aims to maintain cleanliness and health.²⁰ Habits in maintaining personal hygiene are preventive efforts that can be done early to avoid infectious diseases and improve the health of themselves and the surrounding environment.^{22,23}

Maintaining nail hygiene is one form of maintaining personal hygiene.¹⁹ Fingernails left long for a period of time have been shown to harbor more dirt and microorganisms compared to shorter fingernails, and allow handwashing practices to be ineffective for maintaining hand hygiene.²⁴ Toenail hygiene can be maintained by wearing footwear such as sandals and shoes when doing activities

outdoors so as to reduce direct contact of fingernails and skin with the ground.²¹

Personal Hygiene in Orphanages

An orphanage is a social welfare institution that provides care assistance for children in need of alternative caregivers. The purpose of the establishment of the orphanage is to help and guide the children under care to get a decent life and be able to feel the role of parents by the caregivers.²⁵

Predisposing factors associated with the level of personal hygiene of children cared for in orphanages include attitudes, facilities, and knowledge. The orphanage has limited space with fairly dense residents and facilities that are shared. The activities of orphanage residents increase the risk of disease transmission because contact between orphanage residents periodically cannot be avoided.⁷ There is another factor, namely the limited number of caregivers in the orphanage makes supervision of the activities of each child in the orphanage not maximal so that it is very high the possibility of hygiene and health factors going unnoticed.^{7,26}

MATERIALS & METHODS

Participants and Methods

This research was conducted on children and adolescents age 5-19 years old at orphanages in Padang which are Al Falah

Orphanage, Anak Mentawai Gurun Laweh orphanage, and Yayasan Kanzul Ulum Pasia Nan Tigo. Each research subject cut their fingernails and put them in small storage to be examine with microscope at Laboratory of the Department of Parasitology Faculty of Medicine of Andalas University. The sample examination is carried out by direct centrifuge sedimentation method.

Type of Research

This research is a descriptive research using primary data from the results of examination of worm eggs on the fingernails of orphanage children as the research subjects that aimed to determine the presence of STH eggs in fingernails. The total samples that have been obtained and meet the inclusion and exclusion criteria amounted to 123 samples using purposive sampling technique.

Data analysis

The data analysis conducted in this research is a univariate analysis describing the frequency distribution of each research variable. Univariate analysis was carried out to determine the percentage of the presence of STH eggs in the fingernails of the research subjects. Data were analyzed using SPSS and also categorized by their orphanages, age, gender, and the characteristic of their fingernails.

RESULT

1.1 Frequency Distribution of Research Subjects Based on Age, Gender, and Distribution of Children in Each Orphanage

Variable	f	%
Age (years)		
5 - < 7	0	0
7 - < 9	22	17,9
9 - < 11	33	26,8
11 - < 13	31	25,2
13 - < 15	23	18,7
15 - < 17	11	8,9
17 - < 19	3	2,4
Gender		
Male	54	43,9
Female	69	56,1
Orphanage		
Anak Mentawai Gurun Laweh	20	16,3
Al Falah	87	70,7
Yayasan Kanzul Ulum Pasia Nan Tigo	16	13

Based on table 1.1 data above, the age range of the study subjects was 5 to 19 years of age, with the highest number being in the age range of 9-<11 years as many as 33 people (26.8%). From the gender variable, the number of male research subjects amounted to 54 people (43.9%) and female research subjects amounted to 69 people (56.1%). Based on the origin of the orphanage that was the subject of the study, there were 20 people (16.3%) from the Anak Mentawai Gurun Laweh Orphanage, 87 people (70.7%) from Al-Falah Orphanage, and 16 people (13%) from Yayasan Kanzul Ulum Pasia Nan Tigo.

1.2 Frequency Distribution of Hygiene Conditions and Fingernails Characteristics of Orphanage Children in The City of Padang

Fingernails Characteristic	f	%
Long and dirty	45	36,6
Long and clean	20	16,3
Short and dirty	36	29,3
Short and clean	22	17,9
Total	123	100

Based on table 1.2, the results of observations of hygiene conditions and nail characteristics in all study subjects found that there were 45 samples (36.6%) of long and dirty fingernails, 20 samples (16.3%) of long and clean fingernails, 36 samples (29.3%) of short and dirty fingernails, and 22 samples (17.9%) of short and clean fingernails.

1.3 Frequency Distribution of STH Eggs in Fingernails of Orphanage Children in The City of Padang

Presence of STH eggs	f	%
Positive	3	2,4
Hookworm	1	0,8
<i>Ascaris lumbricoides</i>	2	1,6
<i>Trichuris trichiura</i>	0	0
<i>Strongyloides stercoralis</i>	0	0
Mixed \geq 2 species	0	0
Negative	120	97,6
Total	123	100

Based on table 1.3, microscopic examination of fingernail samples with

direct sedimentation method was found, namely there were a total of 3 samples contaminated with STH eggs. A total of 2 samples (1.6%) were contaminated with eggs *A. lumbricoides* and 1 sample (0.8%) contaminated hookworm eggs. All positive samples were found in research subjects who were female. *A. lumbricoides* eggs was found in a 9-year-old from Al-Falah Orphanage with dirty short fingernails and from the a 14-year-old form Yayasan Kanzul Ulum with dirty long fingernails. Hookworm eggs were found in a 14-year-old from Yayasan Kanzul Ulum with dirty long fingernails. While as many as 120 nail samples were declared not contaminated with STH eggs.

DISCUSSION Hygiene Conditions and Fingernails Characteristics of Orphanage Children in the Padang Area

This study was conducted on 123 research subjects with an age range of 5-19 years and lived in orphanages in the Padang area. Of the total sample, 43.9% were boys and 56.1% were girls. The condition of the fingernails was observed from two aspects, namely the cleanliness and characteristics of the fingernails of the study subjects. The two aspects are grouped into 4 types, namely long and clean fingernails, short and clean fingernails, long and dirty fingernails, and short and dirty fingernails. From the results of the examination, it was found that the condition and characteristics were dominated by long and dirty fingernails (36.6%), followed by short and dirty fingernails (29.3%), short and clean fingernails (17.9%), and long and clean fingernails (16.3%). Research conducted on orphanages in Banten in 2020 by Jamilatun, et al. found that most of the nail samples examined were found to be long, dirty, and had dirt in them.²⁷

There are factors that can contribute to the condition of fingernails, which is one form of *personal hygiene measures*, in school-age children, including the level of knowledge about *personal hygiene*, habits in the

neighborhood, and parental or caregiver supervision. Research in Surabaya in 2021 by Amalia, et al. explained that there is a significant relationship between the level of knowledge of orphanage children and their level of hygiene.⁷ In the results of another study conducted in Lampung in 2018 by Prabowo, et al. stated that *personal* hygiene behavior is inseparable from the habits of the community or peers in the environment where a person lives and interacts, in this case in an orphanage environment.²⁶ The observations of the three research subjects showed similarities, namely that there were only a number of caregivers who supervised hundreds of orphanage children, so that the supervision of personal hygiene of each foster child was not optimal. This causes hygiene and health factors to go unnoticed.^{7,26}

The Presence of Worm Eggs Based on STH Worm Species in Fingernails of Orphanage Children in the City of Padang

The results of this study found 2.4% of samples contaminated with STH eggs with 0.8% of samples contaminated with hookworm eggs in the condition of long and dirty fingernails, and 1.6% of other samples contaminated with *A. lumbricoides* eggs with long and dirty fingernails, and short and dirty. The results of this study are similar to a 2014 study conducted by Wintoko on elementary school children in Lampung, which also showed only a small percentage of samples contaminated with STH eggs. *A. lumbricoides* eggs predominately found in positively contaminated nail samples, followed by hookworm eggs.²⁸ In another study conducted in Bali in 2019 by Pradinata, et al. in elementary school students related to behavior towards STH infection, it showed that children with unclean fingernails had a 34 times greater risk of STH infection than children who had clean fingernails.²⁹ Research by Kartini in Pekanbaru in 2016 found that dirty fingernails increase the risk of STH infection up to 4 times greater.³⁰

This shows that dirty fingernails are one of the risk factors for STH infection because it facilitates the transmission of STH eggs and larvae into the host's body. In contrast to the results of a study conducted in 2018 in Yogyakarta by Sofiana, et al. in elementary school children who showed that nail hygiene conditions did not have a significant correlation with the risk of STH infection, but had a significant correlation with the behavior of washing hands before eating, washing hands after defecation, and the habit of using footwear while on the move.³¹

According to the CDC in 2022, ascariasis is the type of STH infection with the highest incidence of 807 million-1,121 billion worldwide.³² The results of a study conducted on 600 school-age children in Jimma Town, Ethiopia by Tadege, et al. in 2022, showed that there were a small number of samples contaminated with worm eggs and dominated by *A. lumbricoides*. In the same study, the percentage of children infected with ascariasis was also the highest compared to other STH species because of all fecal samples that were positive for STH infection, most of them were caused by *A. lumbricoides*.⁶ Adult female *A. lumbricoides* worms can produce up to 200,000 eggs in one day.³³ This can contribute greatly to the high finding of eggs in fingernails and the prevalence of ascariasis. On the other hand, hookworm eggs can hatch in the soil into *filariform* larvae and penetrate the skin so that it can be one of the fewer factors found in this species in the form of eggs in the skin and fingernails.³⁴

In addition to STH eggs, microscopic examination conducted in this study found 1 nail sample with a long and dirty condition contaminated with *Oxyuris vermicularis* eggs (pinworms). The positive sample was found in a 10-year-old study subject from Al-Falah Padang Orphanage with male gender. *O. vermicularis* is a type of non-STH nematode that can transmit through *fecal-oral* routes or autoinfection, or retroinfection.³⁵ The distribution of this

species is very high especially in crowded and crowded places such as schools or orphanages.³⁶ Long, dirty fingernails are a potential source of *oxyuriasis* transmission because the species can survive in an optimal environment for growth and transmit without soil media. Research related to the prevalence of *O. vermicularis* infection in children conducted in Thailand in 2020 by Laoraksawong, et al. said children with long fingernails were 29.97 times more at risk of contracting an infection caused by *O. vermicularis* called oxyuriasis or enterobiasis.³⁷ The results of another study conducted in Solo in 2019 by Muliawati, et al. on elementary school children concluded that there was a significant relationship of *poor personal hygiene* to pinworm infection and the presence of *O. vermicularis* eggs was found by 44% of 150 students in grades 1 to 3 elementary school.³⁸

This study only aimed to look at the presence of STH eggs or larvae in the fingernails of study subjects which is one of the many factors of STH infection. A positive nail examination result containing STH eggs or larvae is not a criterion for the diagnosis of STH infection so fecal examination must be carried out to confirm the infection suffered by the study subject. In addition, some children in orphanages, especially adolescent girls, are not willing to be the subject of research because they want to keep long fingernails for aesthetics. The limited distance between the sampling site and the laboratory that is far enough may affect the condition of the sample and the level of accuracy of microscopic examination of the sample.

CONCLUSION

Based on observations and research that has been carried out on orphanage children in the city of Padang in October-December 2023, conclusions were obtained:

1. The most common nail condition in orphanage children is long and dirty fingernails.

2. STH eggs found in a small portion of fingernails samples by microscopic examination by direct sedimentation method, namely *A. lumbricoides* eggs followed by hookworms.

Declaration by Authors

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REFERENCES

1. World Health Organization. Soil-transmitted helminth infections. Accessed May 24, 2023. Available from: <https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections>
2. Peraturan Menteri Kesehatan Republik Indonesia No.15 Tahun 2017 Tentang Penanggulangan Cacingan. Available from: http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No._15_ttg_Penanggulangan_Cacingan_.pdf
3. Lynn MK, Morrissey JA, Conserve DF. Soil-Transmitted Helminths in the USA: a Review of Five Common Parasites and Future Directions for Avenues of Enhanced Epidemiologic Inquiry. *Curr Trop Med Reports*. 2021; 8(1):32-42. DOI:10.1007/S40475-020-00221-2
4. Kartini S. Kejadian Kecacingan pada Siswa Sekolah Dasar Negeri Kecamatan Rumbai Pesisir Pekanbaru. *J Kesehat Komunitas*. 2016;3(2):53-58. doi:10.25311/jkk.vol3.iss2.10
5. Suriani E, Irawati N, Lestari Y. Artikel Penelitian Analisis Faktor Penyebab Kejadian Kecacingan pada Anak Sekolah Dasar di Wilayah Kerja Puskesmas Lubuk Buaya Padang Tahun 2017. 2019;8(4):81-88.
6. Tadege B, Mekonnen Z, Dana D, et al. Assessment of the nail contamination with soil-transmitted helminths in schoolchildren in Jimma Town, Ethiopia. *PLoS One*. 2022; 17(6):e0268792. Published 2022 Jun 29. DOI:10.1371/journal.pone.0268792
7. Amalia AN. Hubungan Tingkat Kebersihan Diri Dan Faktor Predisposisi Pada Anak Di Panti Asuhan Al-Amal Surabaya. *Med*

- Technol Public Heal J.* 20215(1):19-27. doi:10.33086/mtphj.v5i1.875
9. Centre for Disease Control and Prevention. DPDx - Laboratory Identification of Parasites of Public Health Concern. Strongyloidiasis. Accessed September 22, 2023. <https://www.cdc.gov/dpdx/strongyloidiasis/index.html>
 10. Al-Tameemi KA, Kabakli RA. *Ascaris lumbricoides*: Epidemiology, diagnosis, treatment, and control. *Asian J Pharm Clin Res.* 2020 Apr 7; 13(4):8-11.
 11. Centre for Disease Control and Prevention. Trichuriasis. Accessed May 24, 2023. <https://www.cdc.gov/dpdx/trichuriasis/index.html#:~:text=Adult%20males%20of%20Trichuris%20trichiura,and%20appendix%20of%20the%20host.>
 12. Barda, BD, Keiser, J. & Albonico, M. Human trichuriasis: a diagnostic update. *Curr Trop Med Rep* 2. 2015: 201–208. <https://doi.org/10.1007/s40475-015-0063-x>
 13. Centre for Disease Control and Prevention. DPDx - Laboratory Identification of Parasites of Public Health Concern. Hookworm (Intestinal). Accessed May 24, 2023. <http://www.cdc.gov/parasites/hookworm/>
 14. Ghodeif AO, Jain H. Hookworm. [Updated 2023 Jun 15]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK546648/>
 15. P. S. Ramlal, T. A. Stenström, S. Munien, I. D. Amoah, C. A. Buckley, Sershen; Relationships between shared sanitation facilities and diarrhoeal and soil-transmitted helminth infections: an analytical review. *Journal of Water, Sanitation and Hygiene for Development* 1 June 2019; 9 (2): 198–209. DOI: <https://doi.org/10.2166/washdev.2019.180>
 16. Puteri P P, Nuryanto N, Candra A. Hubungan Kejadian Kecacingan Terhadap Anemia Dan Kemampuan Kognitif Pada Anak Sekolah Dasar Di Kelurahan Bandarharjo, Semarang. *J Nutr Coll.* 2019;8(2):101. doi:10.14710/jnc.v8i2.23821
 17. Andromeda A, Rafshanzany ML, Buntoro JD. Association Between Personal Hygiene and Nutritional Status in School-Age Children. *Mutiara Medika: Jurnal Kedokteran dan Kesehatan.* 2023 Jul 11;23(2):70-7.
 18. Agustaria G, Fazidah AS, Nurmaini N. The Relationship of Gender, School Sanitation and Personal Hygiene with Helminthiasis at Juhar Karo Regency in North Sumatra Province, Indonesia. *Open Access Maced J Med Sci.* 2019; 7(20):3497-3500. Published: 2019, Oct 14. DOI:10.3889/OAMJMS.2019.686
 19. Al Amin ASM, Wadhwa R. Helminthiasis. [Updated 2023 Jul 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK560525/>
 20. Arini R, Sulistyowati E, Al Imron NA, Apriliana SA, Marshanda FN, Sabillla TS, Ayu YD, Nurhidayat A. Sikap Perawatan Kuku Dengan Kesehatan Kuku Pada Remaja. *Journal of Educational Innovation and Public Health.* 2023 Jan 18;1(1):24-32.
 21. Reinecke JK, Hinshaw MA. Nail health in women. *International Journal of Women's Dermatology.* 2020 Mar 1; 6(2):73-9.
 22. Pane R, Andayani LS. Relationship between the Cleanliness of Fingernails and the Usage of Footwear with the Incidence of Helminths Infections on Elementary Student in Sibolga of 2019. *Britain International of Exact Sciences (BIOEx) Journal.* 2020 Jan 3; 2(1):45-52.
 23. PD election. Young Women's Behavior with Personal Hygiene During Menstruation at SMA Etidlandia Medan in 2018. *Gaster.* 2019 Mar 14; 17(1):62-76.
 24. Puspita SI, Ardiati FN, Adriyani R, Harris N. Factors of Personal Hygiene Habits and Scabies Symptoms at Islamic Boarding School. *PROMKES Journal.* 2021 Sep; 9(2):91.
 25. Wu AG, Lipner SR. A potential hidden reservoir: The role of nail hygiene in preventing transmission of COVID-19. *J Am Acad Dermatol.* 2020; 83(3):e245-e246. DOI:10.1016/J.Jaad.2020.05.119
 26. Safitri TA, Rahmawati FM. Analisis SWOT Panti Asuhan Aisyiyah Putri Yogyakarta. *CDJ [Internet].* 2023Mar.31 [cited 2023Sep.10];4(2). Available from: <http://journal.universitaspahlawan.ac.id/index.php/cdj/article/view/13534>
 27. Prabowo M, Mutiara H, Sukohar A. Hubungan Kebersihan Diri dan Pengetahuan Dengan Kejadian Penyakit Skabies di Salah

- Satu Panti Asuhan di Kecamatan Kemiling Kota Bandar Lampung. *Jurnal Majority*. 2018 Dec 11;7(3):132-6.
28. Jamilatun M, Aminah A, Shufiyani S. Pemeriksaan Kuku Dan Penyuluhan Memotong Kuku Yang Benar Pada Anak-Anak Di Panti Asuhan Assomadiyyah. *Jurnal Abdidas*. 2020 Jul 5;1(3):88-94.
29. Wintoko R. Relations aspects of personal hygiene and behavior aspects with worm eggs nail contamination risk at 4th, 5th and 6th grade of state Elementary School 2 Raja Basa Districts Bandar Lampung Academic Year 2012/2013. *Juke Unila*. 2014 Mar 1;4(07).
30. Pradinata KT, Sudarmaja IM, Ariwati NL. Perilaku siswa SDN 4 Antiga Kelod Karangasem terhadap infeksi soil transmitted helminth. *Intisari Sains Medis*. 2019 Dec 1;10(3).
31. Kartini S. Kejadian Kecacingan pada Siswa Sekolah Dasar Negeri Kecamatan Rumbai Pesisir Pekanbaru. *J Kesehatan Komunitas*. 2016;3(2):53-58. doi:10.25311/jkk.vol3.iss2.102
32. Sofiana L, Kelen MS. Factors related to soil transmitted helminth infection on primary school children. *Unnes Journal of Public Health*. 2018 Jan 31; 7(1):55-61.
33. Centre for Disease Control and Prevention. Soil-Transmitted Helminths. Accessed May 24, 2023. <https://www.cdc.gov/parasites/sth/index.htm>
34. Centre for Disease Control and Prevention. DPDx - Laboratory Identification of Parasites of Public Health Concern. Ascariasis. <https://www.cdc.gov/dpdx/ascariasis/index.html>
35. Clements AC, Alene KA. Global distribution of human hookworm species and differences in their morbidity effects: a systematic review. *The Lancet Microbe*. 2022 Jan 1.
36. Khazaal R, Al-Hadraawy SK, Hussein KR. Prevalence of *Enterobius vermicularis* among preschool age and school age children in Thi-Qar province southern Iraq. *International Journal of Pharmaceutical Research (09752366)*. 2020 Jan 2.
37. Al-Daoody AA, Qadir FM, Tahir AA, Mahmood NH, Majeed AF. Risk factors of *Enterobius vermicularis* infection with symptoms among children in Erbil Governorate. *Pak-Euro Journal of Medical and Life Sciences*. 2020 Jun 27; 3(2):50-8.
38. Laoraksawong P, Pansuwan P, Krongchon S, Pongpanitanont P, Janwan P. Prevalence of *Enterobius vermicularis* infections and associated risk factors among schoolchildren in Nakhon Si Thammarat, Thailand. *Tropical Medicine and Health*. 2020 Dec; 48(1):1-7.
39. The Association between Personal Hygiene and Egg Positive Rate of *Enterobius Vermicularis* among Primary School Children. *ICPH [Internet]*. 2019 Oct. 24 [cited 2024 Feb. 3]; 4(02):38. Available from: <https://theicph.com/index.php/icph/article/view/1020>

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