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RESEARCH ARTICLE

Soil-Transmitted Helminth Eggs Contamination on Fresh Vegetables in Medan Indonesia

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Abstract

Indonesian people habitually consume fresh vegetables as companions to other foods. We can find soil-transmitted helminths (STH) eggs in fresh vegetables that are not washed clean. This study determines whether there was STH egg contamination in fresh vegetables in several stalls selling fried chicken in Medan. This study was a descriptive study with a cross-sectional design. Research samples were four types of fresh vegetables: lemon basil (*Ocimum africanum*), lettuce (*Lactuca sativa*), cucumber (*Cucumis sativus*), and cabbage (*Brassica oleracea* var. *capitata*) collected from 88 fried chicken stalls in Medan in January 2019. All samples were examined by the sedimentation method to ensure STH egg contamination at the Parasitology Laboratory of the Faculty of Medicine Universitas Muhammadiyah Sumatera Utara. The types of fresh vegetables that were most contaminated by STH eggs were lemon basil leaves (*Ocimum africanum*), and the most abundant STH eggs found were *Ascaris lumbricoides* eggs. In conclusion, there is egg contamination in fresh vegetables in several stalls selling fried chicken in Medan.

Keywords: Fresh vegetables, soil-transmitted helminths eggs

Introduction

Soil-transmitted helminths (STH) are intestinal nematodes that require soil in their life cycle for the maturation process to change from the non-infective stage to the infective stage.[1] *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms are STH that often infect humans. Infection of STH is widespread in the tropics and subtropics region. The World Health Organization estimates that more than 1.5 billion people (24% of the world's population) are infected with STH.[2]

Indonesia is a tropical country with high humidity, so it's a suitable environment for STH breeding. The prevalence of helminth infections in Indonesia is still relatively high, especially among the poor living in densely populated environments with poor sanitation, restrooms, and inadequate clean water facilities. According to the Ministry of Health Republic of Indonesia, in several provinces, the prevalence of helminthiasis for all ages in Indonesia ranges from 40–60%.[3]

Sources of STH transmission can be water and soil used in vegetable cultivation. Using human feces as fertilizer for the vegetable plant is essential in spreading STH infection. In addition, defecating on the ground can cause soil and the plants that grow around it to be contaminated with STH eggs.[1,2]

Indonesian people habitually consume fresh vegetables as companions to other foods. Before consuming fresh vegetables, they must be washed carefully so that there are no STH eggs in the vegetables. Previous studies found no parasites were observed in standard-washed samples, but STH contamination was in the unwashed vegetables.[4]

This study determines whether there was STH egg contamination in fresh vegetables in several stalls selling fried chicken in Medan.

Methods

This study is a descriptive study with a cross-sectional design. Research samples were four types of fresh vegetables: lemon basil (*Ocimum africanum*), lettuce (*Lactuca sativa*), cucumber (*Cucumis sativus*), and cabbage (*Brassica oleracea* var. capitata) collected from 88 fried chicken stalls in Medan in January 2019. All participants provided written informed consent before their participation. The Health Research Ethics Committee, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara,

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has approved this research (approval number 276/KEPK/FKUMSU/2019).

The sedimentation method examined the fresh vegetables to ensure the presence of STH eggs contamination. The examination was carried out in the Parasitology Laboratory of the Faculty of Medicine Universitas Muhammadiyah Sumatera Utara. The examining procedure of STH eggs in fresh vegetables is as follows: the vegetables were cut into small pieces, then 60 grams of that vegetables were soaked in 600 mL of 0.2% NaOH solution in a beaker for thirty minutes, stirred, and then we removed the vegetables. The soaking water was filtered, put into a beaker glass, and left for one hour. Then we removed the water from the surface of the beaker glass. The water at the bottom of the beaker glass containing the sediment was taken 10 mL using a pipette and put into a centrifugation tube. We were then centrifuged at 1,500 revolutions per minute for five minutes. After that, we discarded the supernatant, and the precipitate was taken with a pipette, placed on a glass object covered with a cover glass, then examined using a microscope.

Results

From 88 fried chicken stalls whose fresh vegetables were taken as research samples, we found that seventeen (19.3%) stalls were contaminated with STH eggs in the vegetables (Table).

Discussion

Several researchers have published research about the contamination of STH eggs in fresh vegetables. Similar studies were conducted in several regions of Indonesia using vegetables sold in the traditional and modern markets and the food stalls that provided fresh vegetables.[5–8]

This study showed that there was STH egg contamination in fresh vegetables. The vegetables most contaminated with STH eggs were lemon basil, where we found ten *Ascaris lumbricoides* eggs, two *Trichuris trichiura* eggs, and one hookworm egg. The second type of vegetable containing STH eggs was lettuce, where we found two *Ascaris lumbricoides* eggs and one *Trichuris trichiura* egg. The next vegetable contaminated with STH eggs was cabbage, where we found one *Ascaris lumbricoides* egg. At the same time, we did not find cucumbers in STH eggs.

The results of this study were in line with the results of previous studies, which found contamination of STH eggs in vegetables. The previous research results found that STH eggs contaminated fresh vegetables in Bekasi.[5] Likewise, the research conducted in four traditional markets in Padang showed that 24.1% of fresh vegetable samples were contaminated with STH eggs.[6] Similarly, a study conducted in Lampung on the fresh vegetables in the food stalls and campus canteens found contamination of STH eggs.[7,8] The results of this study are also the results of research conducted at Lorok Pakjo village, Palembang, in 2021.[9]

In this study, it was found contamination of *Ascaris lumbricoides* eggs more than other types. The results of this study are the same as those of research conducted in several other areas.[8–11] This is because the *Ascaris lumbricoides* egg has three layers of skin (hyaline, vitelline, and albuminoids), so it has better environmental resistance than other STH eggs.[11] *Ascaris lumbricoides* eggs are also resistant to chemical disinfectants, and against temporary immersion in various chemical materials.[12] *Ascaris lumbricoides* can also be due to high egg production. *Ascaris lumbricoides* female worm can produce 200,000 eggs each day, which is present in the feces and can contaminate the environment.[13]

Table Distribution of 88 Fresh Vegetables with STH Eggs Contamination

Types of Fresh Vegetables	Negative Results n (%)	Positive Results		
		Ascaris lumbricoides Eggs n (%)	*Trichuris trichiura* Eggs n (%)	Hookworm Eggs n (%)
Lemon basil	75 (85.2)	10 (11.4)	2 (2.3)	1 (1.1)
Lettuce	85 (96.6)	2 (2.3)	1 (1.1)	0 (0)
Cabbage	87 (98.9)	1 (1.1)	0 (0)	0 (0)
Cucumber	88 (100)	0 (0)	0 (0)	0 (0)

This study found hookworm eggs to contaminate fresh vegetables the least. Hookworm infections often occur where human feces are used as fertilizer or where defecation onto soil happens.[14] After leaving the patient's intestine, hookworm eggs that fall on the ground within two days will grow into rabbit-form larvae that can live freely in the soil so that hookworm eggs are no longer found again in the soil.[15,16]

Contamination of STH eggs in fresh vegetables can occur due to the lack of management knowledge and preventive measures from the farmers to consumers. At the farmer level, factors that can affect the contamination of STH eggs in vegetables are using organic fertilizers derived from human feces as a medium for fertilizing vegetables. If the human feces contain STH eggs, they will contaminate the soil and move quickly to the leaves of vegetables in contact with the ground.[17,18] At the consumer level, STH eggs in vegetables bought from traditional and modern markets may be caused by improper vegetable washing techniques. Vegetables sold in the current markets look cleaner, and no soil or sand is stuck to them because they have been washed first. Vegetables soaked in large quantities in a bucket at once allow soil or sand to be released from the vegetable leaves, but the STH eggs can remain tucked between sheets of the vegetable leaves.[5,6] The correct vegetable washing technique is to wash the vegetables under running tap water, wash the leaves of vegetable sheets per sheet, then briefly dip them in warm water or rinse using cooking water so that the STH eggs that may be attached to the vegetable leaves can be removed along with the flow of water. The proper washing procedure before consuming the vegetable is essential to avoid the transmission of STH infection.[19]

This study found STH egg contamination most commonly found in lemon basil, followed by lettuce and cabbage. The morphology of fresh vegetables also played a role in STH egg contamination. Basil has small leaves and many branches on a stalk, making cleaning difficult. In addition, washing basil with water before storing can cause the leaves to rot quickly, so basil is usually washed immediately before serving. Lettuce and cabbage have serrated leaves that allow STH eggs to attach and hide in their leaves. Another possibility is that cabbage and basil have short stems, so the leaves are close to the soil surface and have very curved and uneven leaf surfaces so that worm eggs are easy to stick and difficult to clean.[9] The results of this study are the same as a study conducted in Makassar, where no contamination of STH eggs was found in cucumbers at food stalls.[20] Cucumbers have smooth skin, making them easier to wash or peel before eating.

Conclusion

There is egg contamination in fresh vegetables in several stalls selling fried chicken in Medan.

Conflict of Interest

The authors want to state that this study has no conflicts of interest.

References

1. Centre for Disease Control and Prevention. Parasite: soil-transmitted helminths [Internet]. Atlanta: Centre for Disease Control and Prevention; 2020 [cited 2021 April 22]. Available from: https://www.cdc.gov/parasites/sth/index.html.
2. World Health Organization. Soil-transmitted helminth infections [Internet]. Geneva: World Health Organization; 2020 [cited 2021 April 24]. Available from: https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections.
3. Lee J, Ryu JS. Current status of parasite infections in Indonesia: a literature review. Korean J Parasitol. 2019;57(4):329–39.
4. Rostami A, Ebrahimi M, Mehravar S, Fallah Omrani V, Fallahi S, Behniafar H. Contamination of commonly consumed raw vegetables with soil-transmitted helminth eggs in Mazandaran province, northern Iran. Int J Food Microbiol. 2016;225:54–8.
5. Anindita R, Arlinda RI, Inggraini M. Identifikasi telur soil transmitted helminth (STH) pada kubis (*Brassica oleracea*) dan kemangi (*Ocimum basilicum*) di penjual makanan Kota Bekasi. J Bioshell. 2022;11(1):25–31.
6. Ashika V, Nurhayati, Gayatri. Distribusi frekuensi soil transmitted helminth pada sayuran selada (*Lactuca sativa*) yang dijual di pasar tradisional dan pasar modern di Kota Padang. JKA. 2014;3(3):480–5.
7. Alsakina N, Adrial, Afriani N. Identifikasi

telur cacing soil transmitted helminths pada sayuran selada (*Lactuca sativa*) yang dijual oleh pedagang makanan di sepanjang Jalan Perintis Kemerdekaan Kota Padang. JKA. 2018;7(3):314–8.
8. Mutiara H. Identifikasi kontaminasi telur soil transmitted helminths pada makanan berbahan sayuran mentah yang dijajakan kantin sekitar kampus Universitas Lampung Bandar Lampung. JUKE. 2015;5(9):28–32.
9. Husaini F, Saragih CRR, Rahma H, Lubis IA. Perbedaan kejadian kontaminasi STH pada kubis dan selada di pasar tradisional dan modern Kota Medan. J Kedokt STM. 2022;5(2):141–51.
10. Faziqin LM, Dalilah, Handayani D, Anwar C, Susilawati. Contamination of soil transmitted helminths (STH) eggs in raw vegetables at street food stalls and restaurant in Lorok Pakjo village, Palembang. BSM. 2021;5(6):599–607.
11. Fane AT, Majawati ES, Liman HH. Identification of soil transmitted helminth contamination on the raw vegetables in warung pecel lele in Kebon Jeruk district, West Jakarta. IJOBB. 2021;5(1):9–16.
12. Aryadnyani NP, Chairlan, Inderiati D. Pengaruh suhu dan waktu pemanasan terhadap ketahanan telur *Ascaris lumbricoides*. Meditory. 2020;8(1):40–5.
13. Oh KS, Kim GT, Ahn KS, Shin SS. Effects of disinfectants on larval development of *Ascaris suum* eggs. Korean J Parasitol. 2016;54(1):103–7.
14. Centre for Disease Control and Prevention. Parasites: hookworm [Internet]. Atlanta: Centre for Disease Control and Prevention; 2020 [cited 2021 April 26]. Available from: https://www.cdc.gov/parasites/hookworm.
15. Baruadi F, Kadir L, Malaha A. Identification of worm soil transmitted helminths vegetables in the house eating Telaga region Gorontalo district. JHTS. 2021;5(3):19–27.
16. Satya Latta BDJ. Review on hook worm infections: ancylostomiasis. IJSRST. 2022; 9(5):331–44.
17. Lim MD, Broker SJ, Belizario VY Jr, Gay-Andrieu F, Gilleard J, Levecke B, et all. Diagnostic tools for soil-transmitted helminths control and elimination programs: a pathway for diagnostic product development. PLoS Negl Trop Dis. 2018;12(3):e0006213.
18. Andoh LA, Abaido RC, Obiri-Danso K, Drechsel P, Konradsen F, Klank LT. Helminths contamination of lettuce and associated risk factors at productions site, markets, and street food vendor points in urban and peri-urban Kumasi, Ghana. Res J Microbiol. 2009;4(1):13–22.
19. Amoah ID, Adegoke AA, Stenström TA. Soil-transmitted helminth infections associated with wastewater and sludge reuse: a review of current evidence. Trop Med Int Health. 2018;23(7):692–703.
20. Setiawan A, Indrawati A, Syarif J. Identifikasi telur soil transmitted helminths pada lalapan mentimun di warung makan Jalan Abdul Kadir Kota Makassar. Media Laboran. 2017;7(2):16–21.