THE DIFFERENCE OF SOIL TRANSMITTED HELMINTHS (STH) ON VEGETABLES IN TRADITIONAL AND MODERN MARKETS

Rahmadani Sitepu¹+ Universitas Islam Sumatera Utara
¹Email: drrsitepu@email.com
(¹ Corresponding author)

ABSTRACT

Soil Transmitted Helminths (STH) infections is still a problem in many areas of the world, there are more than 1.5 billion people, or 2.4% of the world population is infected with intestinal worms that are transmitted through the soil. STH distribution in Indonesia includes all islands in Indonesia, where the prevalence is highest in Papua and North Sumatra with a prevalence of between 50% to 80%. One source of infection was water and mud used in the cultivation of vegetables. Contamination worms may occur especially on vegetables that propagate in the soil or close to the soil. This research is performed in an analytic study with cross sectional design. Vegetables are included in the sample in this research was lettuce, leeks, cabbage, spinach, and mustard as many as 50 samples taken from traditional markets and modern markets in Medan city. From the results done, it is known that the highest positive results is in traditional markets as much as 10 vegetables or (40.0%) and the lowest positive results is in modern markets as much as 3 vegetables or (25.0%). Based on these results we can conclude that there are differences between traditional markets and modern markets as evidenced by the value of p in this comparison are p=0.035, So there are differences of Soil Transmitted helminths contamination in raw vegetables sold in traditional markets and modern markets.

1. INTRODUCTION

Soil Transmitted Helminths are a group of parasitic worms (Nematode class) which can cause infection in humans through contact with eggs or larvae of the parasite itself that develop in moist soil found in tropical and subtropical countries. Symptoms of the disease infected by this parasite are known to damage the physical and mental development of children, hinder the progress of education, and economic development (Bopda, et al., 2016). Children are the most vulnerable to be infected with this disease because of inadequate body resistance (Tefera, Belay, Mekonnen, Zeynudin, & Belachew, 2017). In 2010, there were 613 million school-age children infected (Pasaribu, Alam, Sembiring, Pasaribu, & Setiabudi, 2019).

Soil Transmitted Helminths (STH) infections are still a problem in many regions of the world (Tekalign, Bajiro, Ayana, Tiruneh, & Belay, 2019), especially in developing countries with poor environmental sanitation and personal hygiene. According to Dunn, Turner, Tun & Anderson (2016), the existence of this parasite has even become a special marker for poverty where access to sanitation and clean water is very limited, followed by low hygiene standards. Its existence is also often categorized in Neglected Tropical Disease (NTD) where efforts in handling, controlling, and eliminating it were inadequate until the early 2000s (Stolk, et al., 2016). There are more than 1.5 billion people or 2.4% of the world's population infected by helminthiasis transmitted through the soil. Although it is endemic from South America, its spread can be said to be very fast (Chammartin, et al., 2013). The highest incidence of this disease is found in sub-Saharan Africa, America, China and East Asia. Based on the results of a survey of the prevalence of helminthiasis in 10 provinces, the national worm infection rate was 30.95%. Based on data from the FKUI Parasitology department from 2002-2009 the incidence of worm disease varies in each region in Indonesia. The number of STH infections is very large in Southeast Asia including Indonesia; the geographical location of Indonesia with a tropical climate is suitable for parasitic development. Geographical Information System (GIS) states the distribution of STH in Indonesia covers all islands in Indonesia, where the highest prevalence is in Papua and North Sumatra with prevalence of 50% to 80%.

The most common STH infecting humans are Ascaris lumbricoides, Trichuris trichiura, Anclylostoma duodenale and Necator americanus. Ascaris lumbricoides is one of the infections that most often infect humans about 49.02%.
Amoah, Singh, Stenström, & Reddy (2017) stated that *Ascaris lumbricoides* has attacked at least 771.7–891.6 million people. *Ancylostoma duodenale* infects 1.2 billion worldwide; while *Trichuris trichiura* is estimated to reach 30% or as many as 900 million people are infected. STH distribution in Indonesia covers all islands in Indonesia, prevalence A. 60–90% lumbrocidare and 40% hookworms.

The prevalence of intestinal helminth infections in 10 provinces in 2004, North Sumatra was ranked third (60.4%) in terms of intestinal worms. The prevalence in North Sumatra is estimated namely, *Ascaris* 50–79.9%, *Trichuriasis* 80–100%, and *Hookworms* infection 50–79.9%. In Medan, the prevalence of *Ascariasis* was 29.2%, *Trichuriasis* was 6.3%. The STH contamination rate in traditional markets is 85.0%, with the proportion of Strongyloides 35.0%, rhabditiform larvae of Strongyloides 30%, Hookworm eggs 15%, and *Toxocara* 5%. In the modern market STH contamination rate is 90%, with the proportion of Strongyloides 35%, Hookworm eggs 20% and *Toxocara* eggs 5%.

Based on research which was done in traditional markets and modern markets in Medan, it was found high rates of STH contamination in lettuce vegetables. The STH contamination rate in traditional markets is 85.0%, with the proportion of Strongyloides 35.0%, rhabditiform larvae of Strongyloides 30%, hookworm eggs 15%, and toxocara 5%.

In the modern market STH contamination rate is 90%, with the proportion of Strongyloides (35%), free living Strongyloides (30%), hookworm eggs, 20%, and toxocara eggs 5%.

Based on previous studies there was obtained positive STH results on 32 of 44 lettuce vegetables from traditional markets in the city of Padang with a percentage of 73%. Three of the 5 lettuce vegetables from the modern market in the city of Padang were stated positive with a percentage of 40%. The most types of STH researchers found in this study were *Ascaris* sp eggs (79%), *Trichosonchylus orientalis* larvae (16%) and hookworm eggs (5%).

Overall, lettuce, cucumber, cabbage, leafs, and leeks from traditional markets and modern markets in Medan showed positive results of parasitic contamination, namely 57 positive samples (75.0%) and 19 positive samples (25.0%). This high prevalence is strongly supported by natural conditions suitable for worm life cycles such as hot and humid climates, personal hygiene and low environmental sanitation, especially in vegetable farming environments. The low level of personal sanitation affects the incidence of this disease, such as not washing hands before eating and after defecation, not maintaining cleanliness and cutting nails. Previous research from Nasrolahi, Mirshafiee, Kholdi, Salehian, & Nasrolahi (2017) showed that 62% of the spread of parasites began with low awareness of personal hygiene such as cutting nails.

One of the sources of transmission is water and mud which is used in the cultivation of vegetables. Worm contamination can occur mainly in vegetables that spread on the surface of the soil or elevation close to the ground. The habit of eating raw vegetables has been in Indonesia so it seems difficult to change. However, in terms of safety, raw vegetables are at risk of being contaminated with pesticides or worm eggs. Previous research by (Elahi, Kheirabadi, Ahmadi, Gholamalizade, & Dehkodi, 2018) proves that vegetables that are not washed before consumption have a potential contamination of 82.5%. In addition, farmers often use organic fertilizer in the form of humus or livestock manure (even human waste) to increase soil fertility. This habit can be said to be dangerous because without special treatment, the bacteria in the feces used can be above the AFNOR criteria for per kilogram of vegetables harvested. (Atidégla, Huat, Agbossou, Saint-Macary, & Kakai, 2016)

Areas with no sanitation and high humidity are very good for developing STH eggs into an infective form. On the other hand, the development of STH is very difficult to detect and test through a laboratory because the amount of moisture, solids, the number of samples and soil particles varies greatly (Collender, Kirby, Addiss, Freeman, & Remais, 2015). Infection is transmitted by eggs in human feces, which pollute the soil where there is a habit of vegetable farmers using feces as fertilizer which will cause contamination of vegetables by STH in fertilizers made from manure and attaching eggs to vegetables. Furthermore, Said (2012) states there are several process factors that cause contamination in plants, including when they are still planted, harvesting, irrigation, transfer of produce, and marketing. In line with these results, the results of research by Ipeze, Chima, and Chizoba (2017) indicates the likelihood of someone being exposed to STTH is higher when consuming raw, undercooked, or unwashed fruit. Therefore, if the processing and washing of vegetables is not good, worm eggs may still be attached to the vegetables and ingested when vegetables are consumed. Although so far there have not been reported cases of people who were poisoned or died because of consuming raw vegetables, but there's nothing wrong we pay more attention to the safety of food consumed.

Based on the results of the initial survey by asking the vegetable traders about the area of origin of the vegetables sold, a conclusion was found that the vegetables sold in the traditional market in Medan came from the plantation area, namely Berastagi. The condition of plantations that are far from water sources and where defecation, making farmers often defecate in the middle of the plantation, so that the soil is polluted by feces containing worm eggs. STH
will multiply well on loose and moist soil. Vegetables can be planted in various types of soil, but good growth will be obtained if planted in loose, moist soil and contains enough organic matter. However, high environmental humidity has a significant effect on the development of worm eggs. Study results from Yuwono, Pasulu, Husada, & Basuki (2019) found that children in Papua infected with STH mostly lived in areas with high humidity.

Nematode contamination of vegetables is not influenced by the type of vegetable itself. Research by Almohithef, Al-Yahya, Al-Hazmi, Dawabah, & Laf (2018) focused their research on six types of vegetables which were all contaminated with nematodes. Contamination of vegetables by intestinal nematode eggs is thought to originate from sprinkling water used by vegetable plantation farmers to water vegetables, because sprinkler water comes from ponds which are also used to defecate by surrounding communities. In fact, the problem of reduced healthy water in various countries causes the use of treated wastewater for crop production, including household wastewater (Balkhair, 2016). After the vegetables are harvested, the next day they are then transported to the city/market to be sold, so that they do not wither, the vegetables are doused with ditch water or river water which is located closest to the vegetable plantation. The gutter or river water used is feared to contain intestinal nematode eggs so that it can contaminate vegetables during the process of watering and sticking to vegetables. Therefore, if there are people infected with worms, worm eggs in the pond can flow into the river so that it can pollute river water. If the river water is used to wash and water vegetables after harvest, it is feared that intestinal nematode eggs can stick to the vegetables.7.

In Medan, there are many people who consume raw vegetables, especially vegetables at fast food restaurants, Japanese restaurants, Korean restaurants, seafood, fried chicken and catfish pecel. One of the vegetables that is widely consumed by Indonesian people, especially in Medan, is salada, where salada is a vegetable that is in direct contact with the soil. There is evidence by lettuce that is easily found in foreign foods such as salads, hot dogs, ramen, hamburgers, and sandwiches. Indonesian food also uses a lot of lettuce such as gado-gado, fried rice vegetables, and fresh vegetables catfish. Unlike other vegetables, lettuce is never cooked because after cooking the taste changes. This allows STH eggs to easily enter the body because the vegetables consumed are not washed clean. In fact, 89% of consumption lettuce turns out to be contaminated with various types of parasites that are harmful to the body (Rodrigues, Silva, Pereira, & Pinto, 2020). When cooking vegetables, people rarely wash vegetables thoroughly before cooking, this of course makes the STH that is in vegetables can enter the body when vegetables are eaten. People in Medan tend to buy more vegetables in traditional markets than in modern markets.

From the researchers’ observations, vegetable traders in traditional markets in the city of Medan often ignore the hygiene of the vegetables they sell. Most vegetables sold in traditional markets are dirty, muddy, landed and carelessly placed. Unlike the modern market, vegetable hygiene in the modern market is very good, vegetables in the modern market are clean, wrapped in plastic and neatly arranged. Based on the description above that worm eggs can be found in vegetables contaminated by STH, therefore researchers are interested in knowing the differences of STH in vegetables in modern markets and traditional markets in Medan in 2016.

**Problem**

What is the difference between soil transmitted helminths in vegetables in traditional and modern markets?

**Research Purposes**

**General Purpose**

Finding the differences in soil transmitted helminths in vegetables in traditional and modern markets.

**Spesial Purpose**

1. Finding soil transmitted helminths in vegetables in traditional markets.
2. Finding soil transmitted helminths in vegetables in the modern market.
3. Identify the types of worm eggs that contaminate vegetables in modern markets and traditional markets.

**2. METHODOLOGY**

The research that will be carried out is an analytic study with a cross sectional research design by observing vegetables that are contaminated with worm eggs. Cross sectional design is a research design where data collection or variables to be studied are dependent and independent variables, assessed simultaneously at one time in the study. The reason researchers used the cross sectional design is that it is easy to implement, simple, economical in terms of time, and results can be obtained quickly and at the same time many variables can be collected, both independent and dependent variables. This research was conducted in the modern market and Medan traditional market, in February 2017.
Population (universe) is the entire unit of analysis whose characteristics will be predicted. Populations that will be used in this study are all vegetable traders in modern markets and traditional markets in Medan.

Sampling is a part of the object to be examined and is considered to represent the entire population. Sampling in this study uses the Purposive Sampling method which means a way of deliberate sampling in accordance with the required sample requirements. By using purposive sampling, it is expected that the sample criteria taken will truly be in accordance with the research to be conducted.

The sampling technique is a way for researchers to collect samples to be carried out in research. The sampling technique was first carried out an initial survey, after getting the population to be the object of research. The sample used in this study used vegetables found in 5 modern markets, which are: Hypermart, Carefour, Forward Together, Suzuya, Berastagi supermarket and 5 traditional markets, namely: johor market, setiabudi market, simpang limun market, juanda market, jamin ginting market. Samples were selected by taking 5 types of vegetables which are mustard greens, cabbage, leeks, lettuce, and spinach. Furthermore, the samples will be examined using a microscope in the microbiology laboratory of FK UISU. The inspection is carried out by finding the worm eggs found in the vegetable.

Data collection procedure is done by:

a. Soak vegetables in a 0.2% NaOH solution of 1 liter in beaker glass for 30 minutes.

b. Vegetables are removed from the solution.

c. Soaking water is filtered and put into another glass beaker.

d. The water on the surface is discarded, while the one below is taken with a 10-15ml pipette volume.

e. Sedimentary water is taken using a Pasteur pipette and drops on a glass object.

f. The slide is covered with a cover glass, and then examined under a microscope at 40 times magnification.

This study is using Univariate and Bivariate Analysis. Univariate Analysis is an analysis that involves one variable or per variable. Where the variables in this study were vegetables infected with STH. This Univariate Analysis aims to explain or describe the characteristics of each variable under study. Univariate analysis functions to summarize the data set of measurement results in such a way that the data set turns into useful information.

Bivariate Analysis is an analysis that involves two variables. The purpose of this bivariate analysis is to find out the differences between STH-infected vegetables in traditional and modern markets. Analyze data using the Wilcoxon test. The Wilcoxon Test is a test used to determine whether there are differences between two dependent or paired or related dependent samples and is used as an alternative to the Paired Sample T Test if the data are not normally distributed. The Wilcoxon Test is used to analyze the results of paired observations from two data whether different or not.

3. IMPLEMENTATION AND DISCUSSION

Research Location Description

The location for this research is a traditional and modern market that sells lettuce, cabbage, leeks, spinach and mustard greens in the traditional market and modern market in the city of Medan. There are 5 traditional markets namely johor market, setiabudi market, lemonade intersection market, Juanda market, ginting guarantee market and 5 modern markets namely Carefour, Hypermart, going forward together, supermarket berastagi, Suzuya. Whereas the location of sample inspection was carried out in the microbiology laboratory of the Faculty of Medicine, UISU located on Sisingamangaraja Street no. 2A.

Characteristics of Research Samples Description of

The samples of this study were lettuce, cabbage, leeks, and spinach and mustard greens in the traditional and modern markets in the city of Medan. A total of 50 vegetable samples have been examined for this study, namely 25 vegetables from 5 traditional markets, each traditional market is taken 5 types of vegetables each and taken 25 vegetable samples from 5 modern markets, and each modern market is taken 5 types of vegetables each.

Univariate Analysis Results

Education is an urgent matter for any country to grow and develop into a civilized state. Tan (2014) argues that it is due to the importance of a competent and specialized human resource stimulated the need to educate citizens, this led to the establishment of schools, hence developing the traditional and modern schools. From the Islamic perspective, the first verse of the Quran to be revealed commands man to read, which is an act of education. Education
as an essential aspect of development, it has been part of the struggle in the teaching and spread of Islam since its

| Vegetable   | Frequency | Percentage (%) |
|-------------|-----------|----------------|
| Mustard Greens | 10        | 20,0           |
| Lettuce     | 10        | 20,0           |
| Leek        | 10        | 20,0           |
| Cabbage     | 10        | 20,0           |
| Spinach     | 10        | 20,0           |
| **Total**   | **50**    | **100,0**      |

Based on Table 1 above, it can be seen from 50 vegetable samples that there are number of mustard greens, lettuce, scallions, cabbage, spinach each amounting to 10 vegetables (20.0%).

| Market Type   | Frequency | Percentage (%) |
|---------------|-----------|----------------|
| Traditional market | 25        | 50,0           |
| Modern market  | 25        | 50,0           |
| **Total**     | **50**    | **100,0**      |

Based on Table 2 above, it was found that the number of vegetables in the traditional and modern markets each amounted to 25 vegetables (50.0%).

| STH     | Frequency | Percentage (%) |
|---------|-----------|----------------|
| Negative | 37        | 74,0           |
| Positive| 13        | 26,0           |
| **Total** | **50**    | **100,0**      |

From the results of the sample examination found the most STH results were negative as many as 37 vegetables (74.0%) and the least were positive as many as 13 vegetables (26.0%).

| Vegetable Type | Negative F | Negative % | Ascaris Eggs F | Ascaris Eggs % | Larva Hookworm F | Larva Hookworm % | **Total** F | **Total** % |
|----------------|------------|------------|----------------|---------------|------------------|------------------|-------------|-------------|
| Mustard Greens | 5          | 10         | 3              | 6             | 2                | 4                | 10          | 20          |
| Lettuce        | 5          | 10         | 5              | 10            | 0                | 0                | 10          | 20          |
| Leek           | 9          | 18         | 1              | 2             | 0                | 0                | 10          | 20          |
| Kol            | 9          | 18         | 1              | 2             | 0                | 0                | 10          | 20          |
| Spinach        | 9          | 18         | 1              | 2             | 0                | 0                | 10          | 20          |
| **Total**      | 37         | 18         | 11             | 20            | 2                | 4                | 50          | 100         |

The types of vegetables that were contaminated with parasites were lettuce and mustard vegetables as much as 5 vegetables (10%) and followed by vegetables that were least contaminated with parasites were leeks, cabbage, spinach as much as 1 vegetable (2%) as shown in Table 4.
Table 5 Distribution of Parasite Types by Market Type

| Market Type        | Type of Parasite          | Total |
|--------------------|---------------------------|-------|
|                    | Negative                  |       |
|                    | Ascaris Eggs F %          |       |
|                    | Larva Hookworm F %        |       |
| Traditional market | 15 60                     | 25 100|
| Modern market      | 22 88                     | 25 100|
| Total              | 37 74                     | 50 100|

From Table 5, it can be seen that the type of parasite that is most prevalent in traditional markets is 9 eggs (36%) and ascaris eggs the least species of parasite found in traditional markets and modern markets are hookworm larvae each of 1 larvae (4%).

Table 6 Distribution of STH by Market Type

| Market Type | STH Negatif F % | STH Positif F % | Total F % |
|-------------|-----------------|-----------------|-----------|
| Traditional | 15 60           | 10 40           | 25 100    |
| Modern      | 22 88           | 3 12            | 25 100    |
| Total       | 37 74           | 13 26           | 50 100    |

From the sample examination results found the most positive STH results in traditional markets as many as 10 vegetables or (40%) while in the modern market only 3 vegetables (12%), as listed in Table 6.

Univariate Analysis Results

To find out whether the data is normally distributed or not, a normality test is performed. After normality test was done using the Shapiro-Wilk method, the significance result was 0.001. If the significance value <0.05 then the data is not normally distributed. Then the data will be analyzed using the Wilcoxon test.

Table 7 Bivariate Analysis Results

| Market Type | STH Negative F % | STH Positive F % | P Value |
|-------------|------------------|------------------|---------|
| Traditional | 15 60,0          | 10 40,0          | 0,035   |
| Modern      | 22 88,0          | 3 12,0           |         |
| Total       | 37 74,0          | 13 26,0          |         |

After statistical tests using the Wilcoxon test showed that there were significant differences between STH in traditional markets and modern markets with a probability value (p) = 0.035. This can be seen in Table 7. If p value <0.05, Ho is rejected.

Univariate Results Discussion

Based on table 4.4 it was found that the types of vegetables that were contaminated with parasites were 5 lettuce and mustard vegetables (10%) and followed by the least contaminated vegetables were leek, cabbage, spinach with 1 vegetable (2%). This is in accordance with research conducted by Ravicandran (2015) showing the most contamination results in modern markets and traditional markets, namely lettuce as many as 9 vegetables (36%). Likewise, there is a research from (Asihka, Nurhayati, & Gayatri, 2014) where this research was carried out on examining lettuce. In lettuce sold in traditional markets with a proportion of 73% (32 samples) out of 44 research samples were positively contaminated and in the modern market 40% (2 samples) of 5 research samples positif terkontaminasi. For further review, the results of this study are also in line with Mohamed, Siddig, Elaagip, Edris, & Nasr (2016). Their study took a sample of 260 vegetables where the largest contamination was in lettuce with 36.4%.
Green vegetables such as lettuce have uneven surfaces making it easier to attach to parasitic eggs even though they have been washed with water. Vegetables with soft or slippery surfaces such as leeks and leek have a low proportion of contamination. This can be caused by vegetables obtained in dirty physical conditions and not given washing treatment before being sold to the market so that the possibility for contamination is quite large. The conditions in this study are slightly different from those conducted by Rahmati, Fallah, Maghsood, Shamsi-Ehsan, & Matini (2017) and Yusof, et al. (2017).

In Rahmati, Fallah, Maghsood, Shamsi-Ehsan & Matini research (2017), the most contaminated vegetable is leek. However, this difference occurs due to different sampling. In a study by Rahmati, Fallah, Maghsood, Shamsi-Ehsan, and Matini (2017), Leeks that are sampled are products that have not been cleaned before being sold. On the other hand, a research by Yusof, et al (2017) discovered gotu kola leaf as the most contaminated vegetable in the Pahang market, Malaysia. This finding is due to the culture of the Pahang community that uses gotu kola leaves daily for cooking purposes.

Factors that influence the presence of STH in vegetables such as the use of organic fertilizer derived from animal livestock as a medium for fertilizing vegetables (Ravichandran, 2015). On one hand, proportional use of fertilizer will increase soil and plant fertility (Nazemi, Raei, Amir, Chaman, 2012), on the other hand, the same as in humans, if the manure contains STH eggs, then the STH eggs that are easily contained in manure used as fertilizer will move to vegetables that are in direct contact with the soil. Based on observations, vegetables in the modern market are placed in refrigerated cabinets. In addition to direct contact with the land, Punsawad, Phasuk, Thongtup, Nagavirochana & Virjajejakul (2019) found that STH's presence in vegetables from the modern market was due to improper vegetable washing techniques. Vegetable washing must also be followed by hand washing both before and after. In addition to washing, disinfection also needs to be done because washing has not been able to clean the entire parasite that sticks (Salavati, Chalehchaleh, & Rezaei, 2017).

Although the above process has been carried out, the regulation of irrigation of plants also affects the attachment of this parasite. According to Benti & Gemechu (2014), the majority of agriculture currently uses wastewater as a savings strategy, which turns out to have an impact on the health of agricultural production.

Lettuce, cabbage, leeks and leek are plants that spread or close to the ground so that parasitic contamination is easy, and are supported by a vegetable structure that is layered and squiggled to allow worm eggs/larvae to settle in it. As for sampling, traditional traders sell their wares using tarps placed close to the ground so that contamination is greater while in the modern market vegetables are sold in a plasticized state and placed in a vegetable cooler in accordance with the type of vegetable itself. This concept is also in line with studies by Sibomana, Ziena, Schmidt, & Workneh (2017) yang menyatakan bahwa optimalisasi pengemasan pada produk sayuran berpengaruh positif terhadap penurunan kontaminasi bakteri dan parasit. Do not stop there; delivery of vegetable products must also come with hygiene standards to prevent the spread of STH (Abass, Owusu, & Gyasi, 2018).

From table 4.5 above, it can be concluded that the type of parasites that are mostly found in traditional markets are 9 eggs ascaris eggs (36%) and the least species of parasites found in traditional markets and modern markets are hookworm larvae each as much as 1 larvae (4%) . This is in line with research by Asihka, Nurhayati, and Gayatri (2014), where the most types of STH that researchers found in this study were Ascaris sp eggs (79%), Trichostrongylus orientalis larvae (16%) and hookworm eggs (5%). This is supported by the World Health Organization theory (2020) that the Soil Transmitted Helminths infection is the most common infection in the tropics especially in economically weak communities living in slums. This infection can occur if humans are swallowed by infectious eggs / larvae (A. lumbricoides and T. trichiura) or by penetrating the form of filariform larvae (hookworm larvae) that are on the ground. Previous studies have also shown similar findings. Fumilayo, Buru, Kayode & Adedokun (2017) conducting research on three different markets in Ondo State, Nigeria. Their results show that there are no striking differences from these three markets where ascaris is found as the most with 51%. Fumilayo et al. (2019) collected 150 vegetable samples and found 42% of the samples they tested positive for ascaris. Furthermore, the majority of these findings are due to skin contact containing larvae. According to Beyhan, Yilmaz, & Hokelek (2016) the finding of ascaris eggs as being most affected is due to the fact that ascaris eggs have three layers that are resistant and difficult to remove by ordinary washing methods. Even so with the use of several types of drugs commonly used as disinfectants, it has not been so effective in completely eliminating this parasite (Idris, Wintola, & Afolayan, 2018).

According to Soedarto (2011) the existence and spread of a parasite in an area depends on various things, namely the presence of a sensitive host, and the presence of an environment suitable for parasitic life. The socioeconomic factor of the host, especially humans, greatly influences the spread of parasites. Agricultural areas, animal husbandry,
habits of using feces for fertilizer, environmental cleanliness, poor personal hygiene, and poverty are factors that increase the spread of parasitic diseases.

From table 4.6 above, it can be concluded that the most negative STH results in the modern market are 22 vegetables (44%) and the most positive STH results in traditional markets are 10 vegetables (88.0%). This is in line with Ravichandran's research (2015) showed the highest positive results of parasitic contaminants in traditional markets as much as 75% while the highest negative results in the modern market were 8.1%. In line with these results, Chau et al (2014) argues that in addition to hygiene factors, the types of products sold in traditional markets are very diverse and less organized when compared to modern markets. This condition causes its spread very quickly. Patrobis et al. (2018) added, transactions in traditional markets occur in the dry season and rain which have direct implications on environmental sanitation and cleanliness. In such an environment, insects such as flies often gather in places with low sanitation quality, carry pathogens and attach them to objects such as vegetables (Oyeyemi, Agbaje, & Okelue, 2016). One important cause of parasitic infections is due to consumption of raw and dirty vegetables due to the above factors. All vegetables must be washed before adequate consumption and, where possible, decontamination must be included in washing water. Other potential contaminations such as harvesting procedures, environmental contamination during handling, transportation and storage, or direct contamination from individuals involved in the production and processing of products are also not investigated.

The habits of all traditional market entrepreneurs with existing modern markets practicing washing vegetables before they are sold show negative results for parasitic contamination. These results are in line with studies conducted by Deakpe, Manyi, & Utume (2018) which found that the modern market was in the two lowest possible ascending spheres from the 7 locations studied. This factor influences the presence of STH in vegetables such as the use of organic fertilizer derived from animal livestock as a medium for fertilizing vegetables. Just like in humans, if the manure contains STH eggs, then the STH eggs that are easily contained in manure used as fertilizer will move to vegetables that come in direct contact with the soil. Based on observations, vegetables in the modern market are placed in refrigerated cabinets. The presence of STH on vegetables from the modern market may be caused by improper vegetable washing techniques.

Discussion of Bivariate Results

From table 4.7 above it can be concluded that the most negative STH results in the modern market are 22 vegetables (88.0%) and the most positive STH results in traditional markets are 10 vegetables (44%). The difference in STH in traditional and modern markets through statistical tests using the Wilcoxon test shows that there is a difference between STH in traditional markets and modern markets with a probability value (p) = 0.035. If the value of p <0.05 then Ho is rejected while Ha is accepted. This is in line with Ravichandran's research (2015) showed the highest positive results of parasitic contaminants in traditional markets by 75% while the highest negative results in modern markets were 8.1% and there were significant differences in STH in modern markets and traditional markets with a significance value of p = 0.011. This is likely due to the lack of attention from vegetable entrepreneurs from traditional markets in the hygiene of vegetables they sell. Vegetable traders in traditional markets in Medan often ignore the hygiene of the vegetables they sell. Most vegetables sold in traditional markets are dirty, muddy, landed and carelessly placed. Unlike the modern market, vegetable hygiene in the modern market is very good, vegetables in the modern market are clean, wrapped in plastic and neatly arranged. The limitation of this study is the insufficient number of samples to compare STH contamination between vegetables in traditional and modern markets, in addition to the number of traditional markets and modern markets where sampling is lacking. Likewise with the cost and time, the limited cost and time for this study led to this research still has shortcomings.

4. CONCLUSION

Based on the results obtained from this study the differences in STH in vegetables in traditional markets and modern markets, the following conclusions can be drawn:

a. In the traditional market there were 10 STH positive results (10%), while negative STH was 15 vegetables (60%).
b. In the modern market there were 3 positive vegetables, while the negative yield was 22 vegetables (44%).
c. There is a difference between Soil Transmitted Helminths in vegetables in traditional and modern markets with a value of p = 0.035.

5. SUGGESTION

a. For the community the results of this study are expected to provide information and understanding relating to Soil Transmitted Helminthes (STH), so that pollution prevention can be done.
b. For traders to be able to increase the stage of vegetable hygiene so as to prevent worm egg infections.
c. For public health workers the results of this study are expected to be used as supporting data or planning material for preventing Soil Transmitted Helminthes (STH) pollution.
d. For further researchers to conduct more detailed interviews such as finding the source of vegetables and increasing the type and number of research samples so that more vegetables can be studied and can also complement the shortcomings and limitations of this study.

6. REFERENCES
Abass, K., Owusu, A. F., & Gyasi, R. M. (2018). Market vegetable hygiene practices and healthrisk perceptions of vegetable sellers in urban Ghana. International Journal of Environmental Health Research, 1, 1-16.
Almoithiehef, A. H., Al-Yahya, F. A., Al-Hazmi, A. S., Dawabah, A. A., & Laﬁ, H. A. (2018). Prevalence of plant-parasitic nematodes associated with certain greenhouse vegetable crops in Riyadh region, Saudi Arabia. Journal of the Saudi Society of Agricultural Sciences, 1-4.
Amoah, D., Singh, G., Stenström, T. A., & Reddy, P. (2017). Detection and quantification of soil-transmitted helminths in environmental samples: A review of current state-of-the-art and future perspectives. Acta Tropica, 169, 187-201.
Asihka, V., Nurhayati, & Gayatri. (2014). Distribution of helminth soil transmitted soil frequency in lettuce (Lactuca sativa) for sale in traditional and modern markets in Padang City. Andalas Journal of Health, 3(3), 480-485. doi:https://doi.org/10.25077/jka.v3i3.183
Atidégl, S. C., Huat, J., Agbossou, E. K., Saint-Macary, H., & Kakai, R. G. (2016). Vegetable contamination by the fecal bacteria of poultry manure: case study of gardening sites in southern benin. International Journal of Food Science, 1-8.
Balkhair, K. S. (2016). Microbial contamination of vegetable crop and soil profile in arid regions under controlled application of domestic wastewater. Saudi Journal of Biological Sciences, 23(1), 83-92.
Benti, G., & Gemechu, F. (2014). Parasitic contamination on vegetables irrigated with Awash river in selected farms, eastern showa, Ethiopia. Journal of Parasitology and Vector Biology, 5(7), 103-109.
Beyhan, Y. E., Yilmaz, H., & Hokelek, M. (2016). Effects of acetic acid on the viability of Ascaris lumbricoides eggs. Saudi Medical Journal, 37(3), 288-292.
Bopda, J., Nana-Dejengue, H., Tenaguem, J., Kamtchum-Tatouene, J., Gounoue-Kamkumo, R., Assob-Nguedia, C., & Assob-Nguedia, C. (2016). Prevalence and intensity of human soil transmitted helmint infections in the Aknonlinga health district (Centre Region, Cameroon): Are adult hosts contributing in the persistence of the transmission? Parasite Epidemiology and Control, 1(2), 199-204.
Chammartin, F., GCScholte, R., HGuimarães, L., Tanner, M., Utzinger, J., & Vounatsou, P. (2013). Soil-transmitted helminth infection in South America: a systematic review and geostatistical meta-analysis. The Lancet Infectious Diseases, 13(6), 5017-518.
Chau, H. L., Thong, H. T., Chao, N. V., Hung, P. H., Hai, V. V., An, L. V., . . . Akamatsu, M. (2014). Microbial and parasitic contamination on fresh vegetables sold in traditional markets in hue city, vietnam. Journal of Food and Nutrition Research, 2(12), 959-964.
Collender, P. A., Kirby, A. E., Addiss, D. G., Freeman, M. C., & Remais, J. V. (2015). Methods for Quantification of Soil-Transmitted Helminths in Environmental Media: Current Techniques and Recent Advances. Trends in Parasitology, 31(12), 625-639.
Deakpe, Manyi, & Utume. (2018). Pathogenic parasites and bacteria associated with the housefly(Musca domestica) in Makurdi: a fly-infested area in central Nigeria. Nigerian Journal of Parasitology, 39(1), 111-115.
Dunn, J. C., Turner, H. C., Tun, A., & Anderson, R. M. (2016). Epidemiological surveys of, and researchon, soil-transmitted helminths in SoutheastAsia: a systematic review. Parasites & Vectors, 9(31), 1-13.
Elahi, R., Kheirabadi, Y. P., Ahmadi, N., Gholamalizade, M., & Dehkodi, H. A. (2018). The effect of washing procedures on contamination of raw vegetables with nematodes larvae. Asian Journal of Pharmaceutics, 12(2), 498-502.
Fumilayo, A. J., Buru, A. S., Kayode, A. I., & Adedokun, A. R. (2017). Isolation of intestinal parasites in vegetables sold in major markets in akure, ondo state, nigeria. International Journal of Health Sciences and Research, 7(6), 78-83.
Fumilayo, A. J., Mosummola, O. J., Kayode, A. I., Adedokun, A. R., Zagi, H. T., & Buru, A. S. (2019). Intestinal parasites isolated in vegetables sold in most important markets within ilorin metropolis. Journal of Tropical Diseases and Public Health, 8(1), 1-8.
Idris, O. A., Wintola, O. A., & Afolayan, A. J. (2018). Helminthiases; prevalence, transmission, host-parasite interactions, resistance to common synthetic drugs and treatment. Heliyon, 5, 1-29.

Ikpeze, Chima, & Chizohia, S. (2017). Soil-transmitted helminth parasites contaminating edible raw vegetables and fruits sold at nkwo-edo market nnewi nigeria. The Bioscientist, 5(1), 65-72.

Mohamed, M. A., Siddig, E. E., Elaagip, A. H., Edris, A. M., & Nasr, A. A. (2016). Parasitic contamination of fresh vegetables sold at central markets in Khartoum state, Sudan. Annals of Clinical Microbiology and Antimicrobials, 15(17), 1-7.

Nasrolahei, M., Mirslafiee, S., Khodí, S., Salehian, M., & Nasrolahei, M. (2017). Bacterial assessment of food handlers in sari city, mazandaran province, north of iran. Journal of Infection and Public Health, 10(2), 171-176.

Nazemi, S., Ra'i, M., Amiri, M., & Chaman, R. (2012). Parasitic contamination of raw vegetables in shahrud, semnan. Zahedian Journal of Research in Medical Sciences, 14(8), 84-86.

Oyeyemi, O., Agbaje, M., & Okelue, U. (2016). Food-borne human parasitic pathogens associated with household cockroaches and houseflies in Nigeria. Parasite Epidemiology and Control, 1, 10-13.

Pasaribu, A. P., Alam, A., Sembiring, K., Pasaribu, S., & Setiabudi, D. (2019). Prevalence and risk factors of soil-transmitted helminthiasis among school. BMC Public Health, 19, 1-8.

Patrobas, M., Okubanjo, O., Lawal, I., Kudi, C., Balami, A., & Dunka, H. (2018). Occurrence of parasite eggs and oocysts in commonly consumed selected markets in Zaria, Kaduna State Nigeria. Sokoto Journal of Veterinary Sciences, 16(1), 79-85.

Punsawad, C., Phasuk, N., Thongtup, K., Nagavirochana, S., & Viriyavejakul, P. (2019). Prevalence of parasitic contamination of raw vegetables in Nakhon Si Thammarat province, southern Thailand. BMC Public Health, 19(54), 1-7.

Rahmati, K., Fallah, M., Maghsood, A. H., Shamsi-Ehsan, T., & Matini, M. (2017). The Prevalence of Parasitic Contamination of Vegetables Consumed in Malayer City, West of Iran, in 2014. Avicenna Journal of Clinical Microbial Infection, 4(2), 1-5.

Ravichandran, N. A. (2015). Comparison of soil transmitted helminth pollution in vegetables in traditional markets and modern markets in western part of Medan city. Medan: Universitas Sumatera Utara.

Rodrigues, A. C., Silva, M. D., Pereira, R. Â., & Pinto, L. C. (2020). Prevalence of contamination by intestinal parasites in vegetables (Lactuca sativa L. and Coriandrum sativum L.) sold in markets in Belém, northern Brazil. Journal of Science of Food and Agriculture, 100(7), 1-10.

Said, D. E. (2012). Detection of parasites in commonly consumed raw vegetables. Alexandria Journal of Medicine, 48, 345-352.

Salavati, Z., Chalehchaleh, A., & Rezaei, F. (2017). Parasitic Infections in Raw Vegetables of Kermanshah, Western Iran. Journal of Food Quality & Hazards Control, 4, 37-41.

Sibomana, M. S., Ziena, L. W., Schmidt, S., & Workneh, T. S. (2017). Influence of transportation conditions and postharvest disinfection treatments on microbiologicalquality of fresh market tomatoes (cv. nemo-netta)in a south african supply chain. Journal of Food Protection, 80(2), 345-354.

Stolk, W. A., Kulik, M. C., Rutte, E. A., Jacobson, J., Richardus, J. H., Vlas, S. J., & Houweling, T. A. (2016). Between-country inequalities in the neglected tropical disease burden in 1990 and 2010, with projections for 2020. PLOS NEGLECTED TROPICAL DISEASES, 10(5), 1-13.

Tefera, E., Belay, T., Mekonnen, S. K., Zeynudin, A., & Belachew, T. (2017). Prevalence and intensity of soil transmitted helminths among school children of Mendera Elementary School, Jimma, Southwest Ethiopia. PanAfrican Medical Journal, 27(88), 1-12.

Tekalign, E., Bajiro, M., Ayana, M., Tiruneh, A., & Belay, T. (2019). Prevalence and Intensity of Soil-Transmitted Helminth Infection among Rural Community of Southwest Ethiopia: A Community-Based Study. Hindawi Biomed Research International, 1-7.

World Health Organization. (2020, March 2). Soil-transmitted helminth infections. Retrieved from World Health Organization: https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections

Yusof, A. M., Mohammad, M., Abdullahi, M. A., Mohamed, Z., Zakaria, R., & Wahab, R. A. (2017). Occurrence of intestinal parasitic contamination in select consumed local raw vegetables and fruits in kuantan, pahang. Tropical Life Science Research, 28(1), 23-32.

Yuwono, N., Pasulu, S. S., Husada, D., & Basuki, S. (2019). Prevalence of soil transmitted helminthiasis among elementary children in sorong district, west papua. Indonesian Journal of Tropical and Infectious Disease, 7(4), 86-91.