



UNIVERSITAS INDONESIA

**THE IMPACT OF HEALTH EDUCATION ON THE LEVEL OF
KNOWLEDGE REGARDING THE SIGN AND SYMPTOMS OF
SOIL TRANSMITTED HELMINTHS INFECTION IN PACET,
CIANJUR**

RESEARCH REPORT

A final project report presented to Universitas Indonesia as a prerequisite to obtain Bachelor of
Medicine

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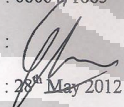
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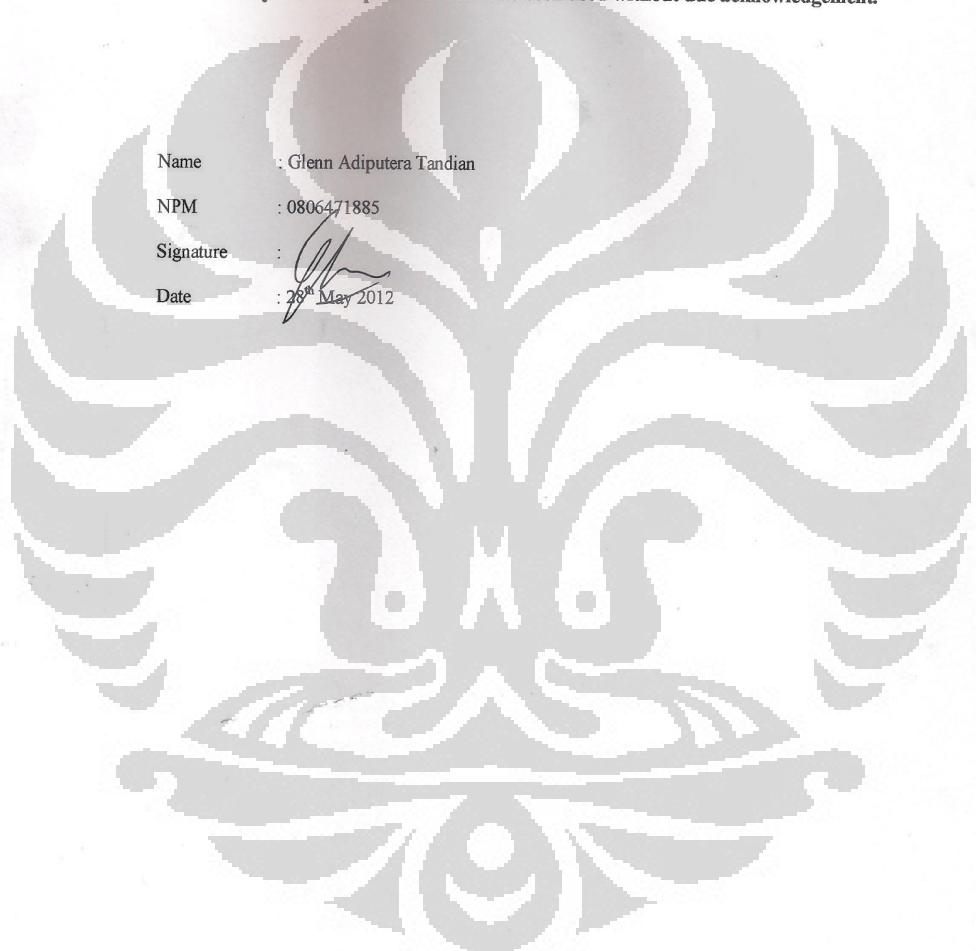
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The author realized that there are still a lot of weaknesses to this research report. Therefore, the author would like to apologize should there be any mistake or misunderstanding arising from this research report. Finally, the author hopes that this research report would bring benefits to the improvement of medical knowledge worldwide.

Jakarta, 22 December 2012

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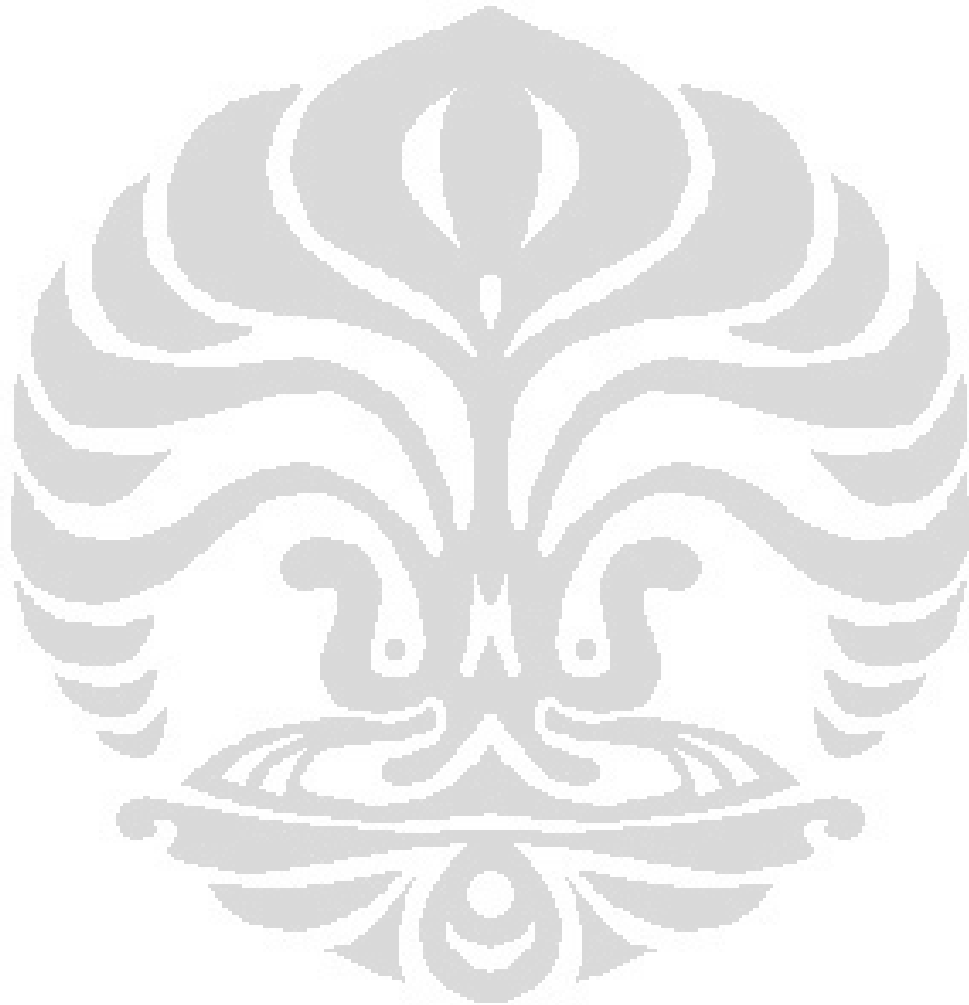
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ABSTRACT

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Title : The Impact of Health Education on the Level of Knowledge Regarding the Sign and Symptoms of Soil Transmitted Helminths Infection in Pacet, Cianjur

Soil Transmitted Helminths (STH) Infection is one of the neglected diseases in Indonesia. Even though the WHO's strategy is to give medication regularly, Indonesia's condition makes it difficult to implement their strategy. Therefore, we have to take preventive measures, and one of them is by giving health educations. This research was conducted to investigate the impact of health education in increasing the knowledge level of STH sign and symptoms among Madrasah Aliyah students in Pacet, Cianjur. This pre-post study with intervention of health education was conducted on September 10th, 2011 in Madrasah Aliyah X (49 students) using questionnaire about STH sign and symptoms. The data was analyzed using Wilcoxon test. The result shows from 48 students most of them were female (53.1%), 1st grader (49%), has been infected before (59.2%), and most of their surroundings has been infected (75.5%). Prior to the health education, the median of the knowledge level of STH sign and symptoms was 40 (20-60). The delta score of the knowledge level shows that it has no association with the respondent's demographic characteristic ($p > 0.05$). Post education, the median score was 100 (100-100). A significant increase in the knowledge level of STH sign and symptoms before and after health education can be seen as showed by the Wilcoxon test ($p < 0.001$). As a conclusion, the knowledge level of STH infection sign and symptoms did have association with some part of respondent's demographic characteristic and also influenced by health education.

Keywords: knowledge level, soil transmitted helminthes, sign and symptoms, madrasah students.



ABSTRAK

Nama : Glenn Adiputera Tandian
Program studi : General Medicine
Judul : Dampak Penyuluhan Kesehatan terhadap Tingkat Pengetahuan mengenai Gejala Infeksi Cacing yang Disebarkan melalui Tanah di Pacet.

Infeksi cacing yang disebarkan melalui tanah (Soil Transmitted Helminth – STH), adalah salah satu penyakit menular yang kurang diperhatikan di Indonesia, khususnya di daerah Pacet, Cianjur. Strategi WHO untuk mengatasi masalah ini adalah memberikan pengobatan secara berkala, namun kondisi di Indonesia yang mempunyai jumlah penduduk yang besar serta kondisi geografis yang menyulitkan aksesibilitas pelayanan, membuat strategi ini sulit untuk dilaksanakan. Untuk itu diperlukan langkah pencegahan antara lain dengan memberikan penyuluhan kesehatan. Riset ini dilaksanakan untuk mengetahui dampak penyuluhan kesehatan dalam rangka meningkatkan tingkat pengetahuan mengenai gejala-gejala infeksi STH pada siswa Madrasah Aliyah di Pacet, Cianjur. Penelitian pra-pasca dengan intervensi penyuluhan kesehatan ini dilaksanakan pada tanggal 10 September 2011 di Madrasah Aliyah X (48 siswa dari 3 kelas) menggunakan kuesioner mengenai gejala-gejala infeksi STH. Data dianalisis menggunakan tes *Wilcoxon*. Hasilnya menunjukkan bahwa dari 48 siswa, sebagian besar adalah perempuan (53,1%), kelas X (49%), pernah terinfeksi (75,5%). Sebelum penyuluhan, hasil tes menunjukkan nilai skor median 40 (20-60). Pasca penyuluhan, nilai skor median 100 (100-100). Perubahan hasil tersebut tidak menunjukkan ada hubungan antara nilai skor dengan karakteristik demografi responden ($p > 0,05$), kecuali pada siswa yang pernah terinfeksi STH. Tes *Wilcoxon* menunjukkan adanya peningkatan yang bermakna pada tingkat pengetahuan sebelum dan sesudah penyuluhan kesehatan ($p < 0,001$). Kesimpulannya, pengetahuan mengenai gejala-gejala infeksi STH menunjukkan hubungan dengan sebagian karakteristik demografi responden dan dipengaruhi oleh penyuluhan kesehatan.

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CHAPTER I

INTRODUCTION

1.1 Background

Soil Transmitted Helminths (STH) infection, as the name implies, is a condition where there are intestinal worms infecting humans that are transmitted through contaminated soil ("helminth" means parasitic worm). They are the most common infections worldwide affecting the most deprived communities.¹

The causal agent of soil-transmitted helminthiasis is any of the following worms: *Ascarislumbricoides*, *Trichuristrichiura* and the hookworms. Recent estimates suggest that *A. lumbricoides* infects over 1 billion people, *T. trichiura* 795 million, and hookworms (*Ancylostomaduodenale* and *Necatoramericanus*) 740 million. The greatest numbers of soil-transmitted helminth infections occur in sub-Saharan Africa, the Americas, China and East Asia. Infection is caused by ingestion of eggs from contaminated soil (*A. lumbricoides* and *T. trichiura*) or by active penetration of the skin by larvae in the soil (hookworms). The high-level of STH infection also recorded in Indonesia, especially in children.¹

Soil-transmitted helminths infection can cause a wide range of symptoms. Starting from intestinal manifestations (such as diarrhoea and abdominal pain), general malaise and weakness, that may affect working and learning capacities and impair physical growth. Hookworms cause chronic intestinal blood loss that results in anaemia.

The strategy for STH control is to treat once or twice per year preschool and school-age children; women of childbearing age (including pregnant women in the 2nd and 3rd trimesters and lactating women) and adults at high risk in certain occupations (e.g. tea-pickers, miners, etc.). The new WHO coordinated strategy on the use of anthelmintic drugs will make realistic the control of soil-transmitted helminths, now that safe and effective anthelmintic drugs are

available for no more than a few US\$ cents per dose. This means that deworming school-aged children is probably the most economically efficient public health activity that can be implemented in any low-income country where soil-transmitted helminths are endemic.¹In reality, the strategy from WHO has not been fully implemented in Indonesia, because there are problems in drug supply and distribution. Therefore we need to use another way to take care of the infections. One of the most feasible and cost-friendly way is by preventing the infection itself. In order to prevent the infections requires a change of lifestyle and more attention to hygiene. While people in the cities might get the information easily, people in endemic areas usually needs to be given a special education, therefore we conducted this research on the impact of the education to the people in the endemic areas, especially those in high school equivalent grades.

1.2. Main Problem

WHO's strategy has not been fully implemented in Indonesia due to the problems in drug supply and distribution, therefore additional countermeasures are required, one which can be done without putting a lot of burden to either government nor the people in the endemic area.

1.3. Research Questions

- 1.3.1. Is there any association between the knowledge level of the sign and symptoms of STH infection and the socio-demography of the Madrasah Aliyah students in Pacet, Cianjur?
- 1.3.2. Does giving health education about STH to Madrasah Aliyah students effective in increasing their knowledge on the sign and symptoms of STH Infection?

1.4. Hypothesis

- 1.4.1. There is an association between the knowledge level of the sign and symptoms of STH Infection and the socio-demography of the Madrasah Aliyah students.

- 1.4.2. Giving health education about STH is effective to increase their knowledge on the sign and symptoms of STH Infections.

1.5. General Objective

- 1.5.1. To explore the relation between the knowledge level of the sign and symptoms and the socio demography of the Madrasah Aliyah students.
- 1.5.2. To identify the effectiveness of health education on the level of knowledge, attitude and behavior of STH among Madrasah Aliyah students in Pacet, Cianjur.

1.6. Specific Objective

- 1.6.1. To study the level of knowledge before and after the health education on STH infections.
- 1.6.2. To study the socio-demographic characteristics of the Madrasah Aliyah students in Pacet, Cianjur
- 1.6.3. To study the level of knowledge in association with the characteristics of socio-demographic factor.

1.7. Research Benefits

1.7.1. Benefit for University

- 1.7.1.1. To participate in the Tri Darma Perguruan Tinggi, which is as institution for education, research, and community service.
- 1.7.1.2 To realize the mission of FMUI to become a world class research university.

1.7.2. Benefit for Society

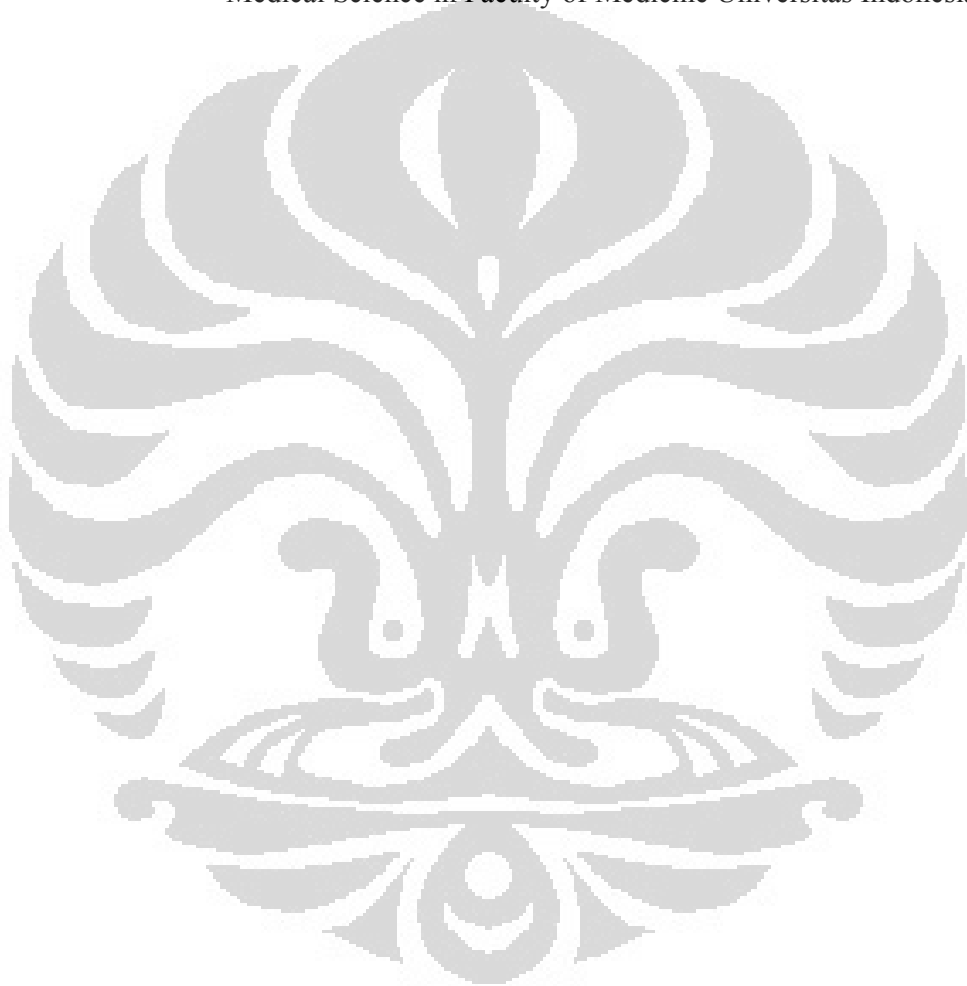
- 1.7.2.1. To provide the society more knowledge about factors contributing to soil transmitted helminthes.
- 1.7.2.2. To provide the society knowledge how to treat STH-infected patient.

1.7.3. Benefit for Researchers

1.7.3.1. To learn how to interact with the community

1.7.3.2. To learn how to make a medical research.

1.7.3.3. To meet the requirement needed to graduate as a Bachelor of Medical Science in Faculty of Medicine Universitas Indonesia



CHAPTER II

LITERATURE REVIEW

2.1. Soil Transmitted Helminths Infection

Soil-transmitted helminths refer to the intestinal worms infecting humans that are transmitted through contaminated soil: *A. lumbricoides*, *T. trichiura* (Whipworm), and hookworm (*A. duodenale* and *N. americanus*). A large part of the world's population is infected with one or more of these STH.²

Soil-transmitted helminth infection is found mainly in areas with warm and moist climates where sanitation and hygiene are poor, including in temperate zones during warmer months. These STHs are considered Neglected Tropical Diseases (NTDs) because they inflict tremendous disability and suffering yet can be controlled or eliminated.²

2.2. Species

2.2.1. *A. lumbricoides*

An estimated 807-1,221 million people in the world are infected with *A. lumbricoides*.² *Ascaris* lives in the intestine and *Ascaris* eggs are passed in the feces of infected persons. If the infected person defecates outside (near bushes, in a garden, or field) or if the feces of an infected person are used as fertilizer, eggs are deposited on soil. They can then mature into a form that is infective. Ascariasis is caused by ingesting eggs. This can happen when hands or fingers that have contaminated dirt on them are put in the mouth or by consuming vegetables or fruits that have not been carefully cooked, washed or peeled.³

People infected with *Ascaris* often show no symptoms. If symptoms do occur they can be light and include abdominal discomfort. Heavy infections can cause intestinal blockage and impair growth in children. Other symptoms such as cough are due to migration of the worms through the body. Ascariasis is treatable with medication prescribed by your health care provider.²



Figure 2.1 *A. lumbricoides* Adult and Egg Form.⁴

A. lumbricoides are large worms, both ends tapering. Female worms are slightly larger (200-400 mm X 3-6 mm) than the male ones (150-300 mm X 2-4 mm). Males characteristic is specified by the curved posterior end. They vary in size, depend on age and worm load. An adult female worm lay about 200.000 eggs daily and may reach a total of 25 million during its lifetime per worm.³

The size of the eggs are 45-70 μm X 35-50 μm . It has thick transparent shell with outer albumin coat. Due to the rapid egg production, about fifteen percent of the eggs are infertile. In the beginning, when these unfertile eggs are passed, they are without the outer coat.

In the faeces, the unsegmented, fertilized ova, take 10–15 days in moist soil or water, at 20–30°C, to develop to the infective stage. If the infective eggs are ingested, when they are in the duodenum, at a temperature level of 37°C, with high concentration of CO₂ and low oxidation-reduction potential and the pH is around 7.0, the larvae will hatch. They enter the lymphatics or veins by penetrating the mucosa, and are carried in through the liver and heart, and reach the lungs in 3 days. In the lungs, the larvae moult twice (between 5–6 days and 10 days) and then they penetrate the alveolae. From the alveolae the larvae then ascend the trachea, reaching the ileum via the esophagus. In the ileum the larvae develop into adult males and females in about 65 days and live there for about 1–2 years. The eggs that are laid by the adult female will pass into the feces. This whole cycle will take around 2–3 months.³

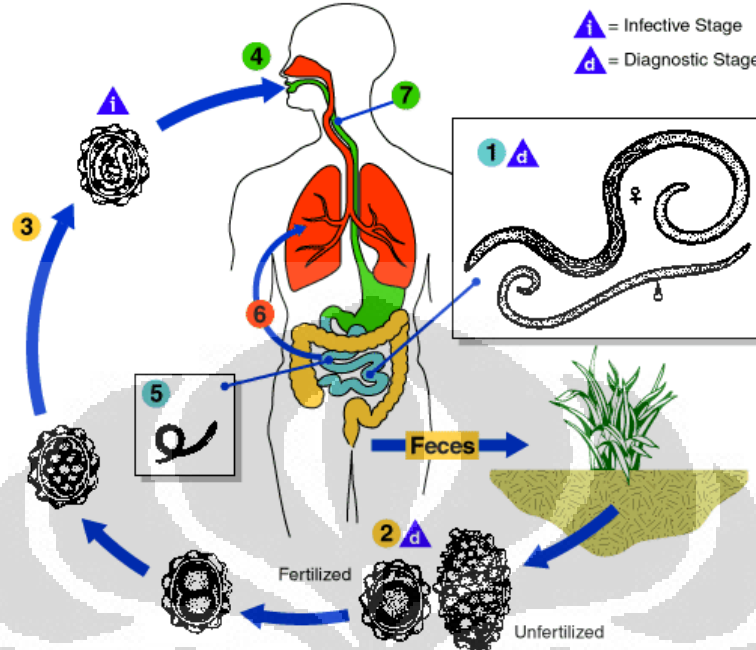


Figure 2.2 *A. lumbricoides* Life Cycle⁵

The adult worms or the larvae can both cause the signs and symptoms. The larvae in the lung usually caused the clinical manifestation, from with pneumonitis with cough, accompanied with dyspnoea and substernal pain, fever and eosinophilia, and occasionally with bloodstained sputum (sometimes contain larvae). In the X-ray examination, the larvae could be seen as dense infiltrate, known as Loeffler's syndrome. The heavy phase of infection caused by the adult worms in the intestinal lumen. The symptoms are nausea, vomiting and colic (digestive disorders) and, restless sleep and tooth grinding in children.³

Children quite often suffer form a serious complication of *Ascaris infectionis* intestinal obstruction, with symptoms namely loss of appetite, nausea and vomiting until recurrent abdominal pain. The worms may cause peritonitis and they may or may wander into the appendix and possibly cause appendicitis. The adult worms sometimes stay in ectopic sites, usually in the abdominal cavity, and worms may pass out through various orifices mouth, nose, lachrymal duct, urethra, and vagina.³

In places with poor protein intake, ascariis removed the amount of host food material, with concomitant anorexia and malabsorption, this probably potentiates kwashiorkor. Nutrition in many developing countries need to consider the widespread of parasitism. It is estimated 26 worms consume about one-tenth of the total daily intake of protein of a child and and cause to vitamin A and C deficiency. When this occurred in children aged 2–10, it effects on the physical growth as well as their cognitive ability.⁶

Diagnosis of ascariasis infection is to find the eggs through fecal examination. Infertile eggs may not be recognized, but fertile eggs are usually plentiful in the faeces. Fecal examination or direct faecal smears, required about 2 mg of faeces. Other technique is the Kato–Katz thick-smear technique. For ascariasis, the number of adults present can be indicated by the number of eggs present in the faeces. Heavy infection that need regular re-treatment, according WHO is when the examination indicate the presence of 50 000 eggs/gram faeces.³

On X-rays after a barium meal examination or on a CT scan, the existencies of adult worms sometimes can be seen as clear spaces. Ultrasound is useful to detect adult worms in the biliary or pancreatic ducts, they show up as long, narrow, moving images, especially if the two inner parallel lines can be seen. Other method that can help is endoscopy. The adult stage of the parasite, other than those examination, might also be detected in stool or sometimes through vomiting.³

Albendazole is 100% is the treatment of choice, a single oral standard dosage of 400 mg is effective for all individuals except the under 5s. It is contra indicated for pregnant woman. The good thing is that it work well for all geohelminths. Other treatment is Mebendazole, a single oral dose of 400 mg effective for all geohelminths, but best for Ascaris (100%).⁶ To remove blockage of the intestine caused by a large number of worms, endoscopy is needed or occasionally surgery.³

When a large area could increase its sanitation standards, it will result in a

quick reduction of *Ascaris* infection, in a one year time. While at personal level, it is important to gain a behavior change to thorough washing and correct cooking of vegetables and overseeing the children's playground. In areas where pica is common, it is important to prevent infection and reinfection among young children. Important measures for public health intervention are maintaining the people's health, such as hand washing, nail cutting, hygienic defecation, and the environment's health.^{3,6}

2.2.2. *Trichuris trichiura*

T. trichiura is a gastrointestinal nematode in the family *Trichuridae*, genus *Trichuris*. *T. trichiura* adult parasites are characterized by a long thin anterior end that lies in a burrow in the host mucosa, and thicker end that extends into the intestinal lumen. The worms are white in colour and roughly 30 to 50mm in length. The male worm, which is smaller than the female, has a coiled posterior end when viewed in vitro. The female worm sheds between 3,000 and 20,000 eggs per day. The distinguishing feature of *T. trichiura* is the stichosome, which is a glandular structure encircling the slender oesophagus of the thin anterior half of the worm. Adult worms are long lived, typically living for up to 5 years in their host. At the second stage of *T. trichiura*'s life cycle, the larva measures roughly 260µm x 15µm in length. The eggs of *T. trichiura* are barrel shaped with a characteristic plug at either end. They are usually brown in human stool samples and typically measure from 50-55 µm by 22-24 µm.³

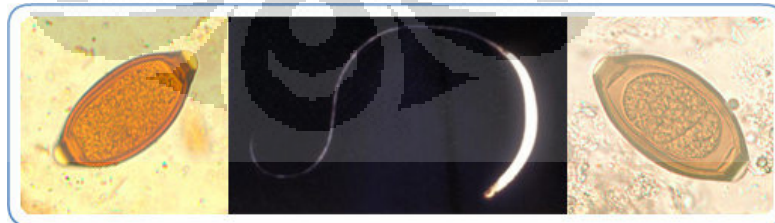


Figure 2.3 *T. trichiura* Adult and Egg form.⁷

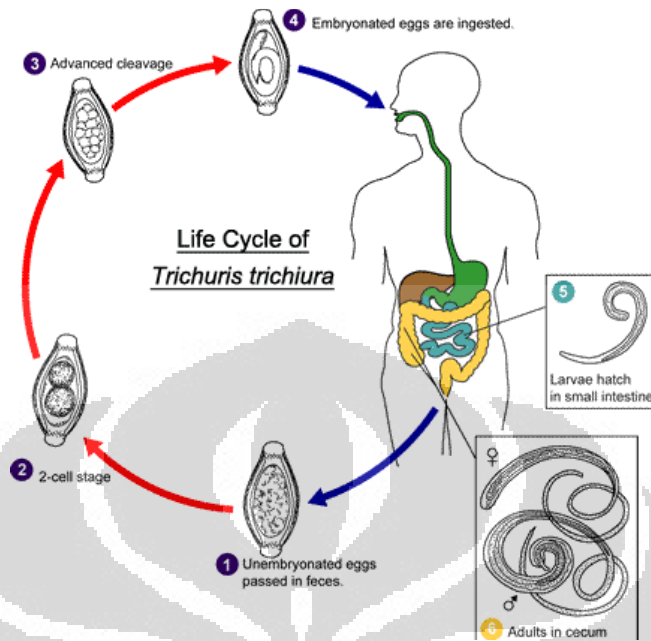


Figure 2.4 Life Cycle of *T.Trichiura*.⁸

Whipworm's life cycle starts when the female lays eggs in the large intestine of an infected human. The eggs are carried out in the faeces landing on soil. If landed on warm moist soil, after 2–3 weeks the eggs have embryonated and are infective ready to be ingested. The eggs get inside you, if you eat contaminated unwashed and uncooked vegetables or rice Larvae hatch in the small intestine and invade the intestinal villi and start growing. After a while they move to the large intestine where they penetrate the mucosa and develop into adults. Only the head, the anterior of the worm is threaded into the intestinal wall. The posterior end is hanging loose, ready to mate, if another whipworm of the opposite sex passes by. The life cycle completes, when females and males mate and eggs are produced at the rate of 2,000–10,000 eggs /day. The cycle from egg to adult takes a few months.⁶

The whip-like anterior portion of the worm attaches itself to the mucosa of the caecum and upper colon. The severity of the disease is dependent on the intensity of the infection in the gastrointestinal tract, and the variables associated with the host, such as age, general health, and iron reserves. In

supersensitive persons, infection can lead to non-specific responses such as nervousness, anorexia and urticaria. In light infections, most cases are asymptomatic. In moderate infections of 20 adult worms or less, the worms are confined to the caecum and the ascending colon.³ Symptoms include epigastric and lower abdominal pain, diarrhoea (rarely bloody), vomiting, flatulence and distention, headache, weight loss, and increased blood and iron loss. In heavy infections of 200 adults worms or more (Trichuris dysentery syndrome), the worms are in the distal colon and rectum; therefore, symptoms include bloody diarrhoea with profuse mucous, abdominal pain and tenesmus, weight loss leading to cachexia, severe anaemia, rectal prolapse, moderate eosinophilia, and the "clubbing" of fingers. Chronic infection leads to impaired childhood growth, poor physical fitness and nutritional status. *T. trichiura* is also believed to suck blood from the colon and it is estimated that about 0.005 ml of blood is lost per day per worm. In heavy infections, as much as 4 to 5 ml can be lost per day per worm. *T. trichiura* is usually found in association with other helminths that flourish under similar conditions. Combination infections with other worm type organisms such as *Ascaris lumbricoides*, *Necator americanus*, and *Ancylostoma duodenale* can lead to growth stunting, intellectual retardation, and cognitive educational defects.⁹

T. trichiura is most commonly found in warm, moist, tropical and sub-tropical countries. Prevalence in children can be over 90%. An estimated 604 to 795 million persons harbour *T. trichiura*. Typically the most intense infections are in children aged 5 to 15 years, with a decline in intensity and frequency in adulthood. This is thought due to poor hygiene and more consumption of soil. Children are also more heavily infected. Furthermore, it is believed that partial protective immunity develops with age and children are not protected initially.⁹

Most patients are asymptomatic. Clinical symptoms are limited to patients with heavy infection, who tend to be small children or others with significant exposure. Note that there is no pulmonary migration and, thus, no pulmonary or extra-gastrointestinal symptoms.

These are the sign and symptoms:

- Nocturnal loose stools
- Dysentery can occur in patients with greater than 200 worms.
- Rectal prolapse
- Failure to thrive
- Symptoms of anemia (in massive infection only)
- Vague abdominal discomfort
- Stunted growth
- Mild abdominal tenderness
- Finger clubbing

Laboratory studies often reveals eosinophilia from ongoing tissue invasion (in contrast to all intestinal helminths except *Strongyloides stercoralis*). Anemia is shown rarely. Endoscopy often shows adult worms attached to the bowel mucosa. The most effective screening tests would be obtaining stool and smeared by for ova and parasites.⁹

The drug of choice for trichuriasis is mebendazole. A single dose of 500 mg can results in a cure rate of 40-75%. Albendazole is an alternative drug. However, its efficacy for trichuriasis is slightly lower than for mebendazole.⁹ Mebendazole causes worm death by selectively and irreversibly blocking glucose uptake and other nutrients in the susceptible adult intestine where helminths dwell. Dosage is 100 mg in form of tablet for both adult and pedriatic, taken orally twice a day for 3 days.⁶

If it not treated well, it may lead to rectal prolapse or anemia and vitamin deficiency. Although, prognosis is excellent with proper treatment, however, without education and changes in behavior/waste management re-infection is very common.⁹

As for most of soil-transmitted helminthes, prevention and control measures includes:

- Availability of water for use for personal hygiene.
- Sanitation and education to promote using latrines.
- Education on hand washing and washing of food.
- Avoiding the use of uncomposted human feces as fertilizer.
- Mass chemotherapy: Modern anthelmintics such as mebendazole or albendazole administered in a single dose are safe, relatively inexpensive, and effective for several months. The association of albendazole to ivermectine or to diethylcarbamazine in community-wide drug distribution to eliminate lymphatic filariasis in many areas also will reduce the number of eggs released in the environment and, consequently, decrease the intensity and prevalence of *T. trichiura* infection.^{2,3,6}

2.2.3. Hookworm (*Necator americanus* and *Ancylostoma duodenale*)

An estimated 576-740 million people in the world are infected with hookworm. Hookworm was once widespread in the United States, particularly in the southeastern region, but improvements in living conditions have greatly reduced hookworm infections. Hookworms live in the small intestine. Hookworm eggs are passed in the feces of an infected person. If the infected person defecates outside (near bushes, in a garden, or field) or if the feces of an infected person are used as fertilizer, eggs are deposited on soil. They can then mature and hatch, releasing larvae. The larvae mature into a form that can penetrate the skin of humans. Hookworm infection is mainly acquired by walking barefoot on contaminated soil. One kind of hookworm can also be transmitted through the ingestion of larvae.²

Most people infected with hookworms have no symptoms. Some have gastrointestinal symptoms, especially persons who are infected for the first time. The most serious effects of hookworm infection are blood loss leading to anemia, in addition to protein loss. Hookworm infections are treatable with medication prescribed by your health care provider.¹⁰

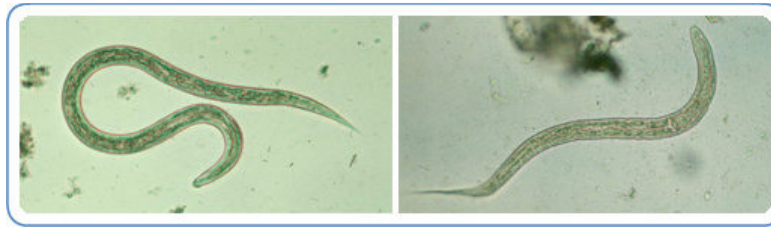


Figure 2.5 Hookworm Larva¹¹

The adult female worm is about 1 cm in length, and the male is smaller about 0.8 cm. The adult *N. americanus* are slightly curved, cylindrical, tapering anteriorly, greyish-yellow; it has an S shape appearance, with head bent back dorsally. *N. americanus* has buccal capsule which is actually the mouth with cutting plates and at the bottom of the cavity there is a pair of short triangular lancets. With this structure it can attach to the intestinal mucosa and cutting off food. The buccal capsule also equipped anticoagulant glands. Adult *A. duodenale* has a C shape appearance, with it's head in the same line as it's body. The two pairs of curve teeth is the characteristics of *A. duodenale*. The similarity of *N. americanus* and *A. duodenale* is that both male has bursa copulatrix as a reproductive organ while the female has vulva in the middle of its body.¹

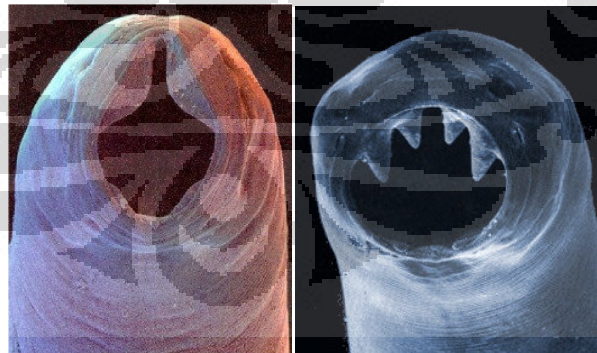


Figure 2.6 (L) *Necator americanus* (R) *Ancylostoma duodenale*

Source of Image: Nematode.net¹²

It is difficult to differentiate the eggs of both hookworms, both measure about

60x40 microns, ovoid, thin-shelled, and has blunt-rounded ends. Each contains a few cells. The first stage larvae that come out from the egg, called rhabditiform, has body length about 250 microns, and as it has body length of $\pm 600\mu\text{m}$, it becomes filariform (third stage larvae).¹

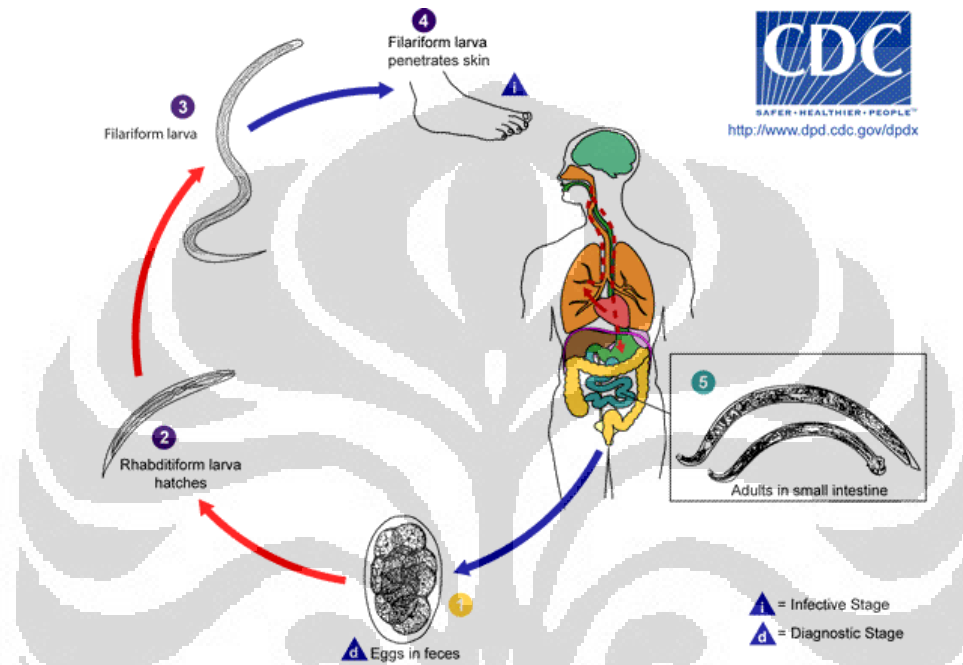


Figure 2.7 Hookworm Life Cycles¹³

The egg that is shed through feces and will hatch in 1-1.5 days. When the egg reach the soil, then an embryonated egg will develop and hatch into rhabditiform (first stage) larvae. Within 3 days the first stage larvae develops into third stage larvae (filariform). In this stage, it can penetrate into human skin. The skin between toes and fingers are the preferable point of entry. The larvae then enter venules, following the venous circulation into the heart and finally to the lung. In the lung, the larvae grow, they will reach the alveoli, the bronchi and the trachea. When they are swallowed, then they can reach the small intestine about 7 days after infection. The route of *A. duodenale* infection can be through ingestion of the larvae.²

Early symptoms of hookworm infection are proportional to the intensity of exposure. *Necator* produces a local irritation, termed ground itch, at the site of skin invasion. An intensely pruritic, erythematous, or vesicular rash usually appears on the feet or hands. This should be distinguished from a creeping eruption due to skin migration of the cat or dog hookworm *Ancylostomabraziliense*. Severe infection with either *A. duodenale* or *N. americanus* may produce pneumonitis (Loefflerlike syndrome) that manifests as cough, fever, and malaise. As worms mature in the jejunum, patients may experience diarrhea, vague abdominal pain, colic, and/or nausea. These symptoms are more common with initial exposures than with subsequent exposures. Patients with severe iron deficiency anemia may present with lassitude, headache, palpitations, dyspnea, and edema. Signs of iron deficiency anemia are often insensitive. In severe cases, patients may exhibit pallor, spooning nails, tachycardia, and peripheral edema. Poor skin texture, edema, and susceptibility to cutaneous infection suggest possible malnutrition.¹⁰

Direct microscopic stool examination for ova and parasites usually reveals oval, 60- μm X 40- μm eggs with thin colorless shells that can be seen 2 months after exposure. Concentration techniques may be helpful for diagnosis of minimal infections expected during control programs. Because the intensity and prevalence of hookworm infection decrease with public health intervention, newer stool-concentration techniques such as FLOTAC have some merit over older methods such as ether concentration or the Kato-Katz thick smear.¹⁰

Anemia is confirmed by CBC count and peripheral blood smear results demonstrating typical signs of iron deficiency anemia. Upon initial infection, eosinophilia is usually present during migratory phase before stool findings are positive. Eosinophilia is persistent, due to attachment of the adult worms to the intestinal mucosa. Peak eosinophil counts at 1,350-3,828 cells/ μL 5-9 weeks after experimental human exposure to 45-50 infective larvae. Eosinophilia can be a clue to hookworm or *Strongyloides* infestation in chronically infected patients. Chest radiography may show diffuse alveolar infiltrates during the migration of the worms through the lung in severe infection.¹⁰

Albendazole or mebendazole is the drug of choice for hookworm infection. These drugs provide a short-term cure in 90-95% of children, with up to a 99% reduction in egg counts. Quarterly retreatment of Zanzibari preschool children resulted in improved anemia and malnutrition after one year. Concomitant iron supplementation in a recent study in Kenya did not improve final hemoglobin concentrations in children or adults. Rapid hookworm reinfection is common in endemic areas and is made particularly problematic by the high prevalence and worm burden in adults who are untreated and who continue to contaminate soil. Iron replacement and nutritional supplementation (protein and vitamins) should be part of the management strategy and may have greater efficacy than anthelmintics in reducing morbidity in selected populations, such as pregnant women and patients who are not infected with HIV.¹⁰

2.3. Knowledge

Knowledge is, based on Oxford dictionary, facts, information, and skills acquired through experience or education or the theoretical or practical understanding of a subject.^{11,12} Knowledge is derived from serial activities, namely censoring process, for example seeing and hearing.¹¹

There are sequential processes required for a person to adopt new behaviors. If based on knowledge, then followed by increase of awareness and positive attitude, then the behavior adopted will stay long.

There are six levels of knowledge:

1. **Knowing:** Is the lowest stage of knowledge level. By definition, knowing is the ability of one person to recognize or to recall some information about a topic that one has known.
2. **Understanding:** With some knowledge, a person will have the ability to correctly explain an object and come up with correct interpretation. Having been understood, one may have the ability to give explanation, example, and make conclusion.

3. Applying: The next level is when a person able to apply one topic correctly.
4. Analysis: When a person has the ability in dissolving an object into a number detail information, and still relate them in a big structure, then he or she has obtain the capability to analyze.
5. Synthesis: A person has the capability to synthesize an object when he or she has the ability in analyzing and connecting each components and reformulating it.
6. Evaluation: The highest level of knowledge that one can obtain is whenever one able in observing and comparing a similar object, in obtaining a complete and thorough impression of the thing being judged.

2.3.1. Factors Influencing Knowledge

1. Age: Older people may have more knowledge, but knowledge level not always determined by age. It is the curiosity of an individual that is important. Usually the young people are more likely to be more curious than older.
2. Education Level: As the objective of education is to deliver knowledge, then knowledge level of one with higher educational level should be higher than the one with lower educational level.
3. Source of Information: Knowledge level of one person with same level of education may be different, as it depend on the source of information. Different source may have different quality and quality of information.
4. Experience: One way to get knowledge is to experience it. People say learning by doing. Experience can be self-experience or other people's experience.

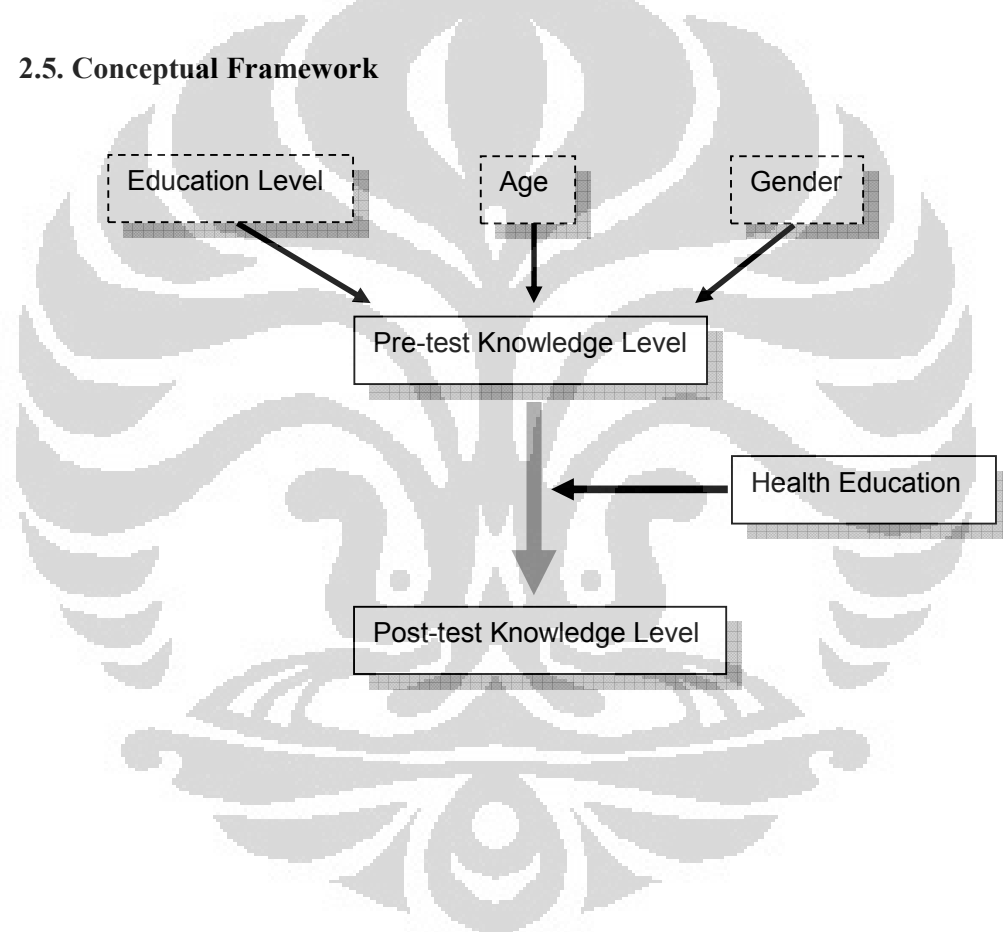
2.4. General Data of Madrasah Aliyah X, Pacet, Cianjur

Madrasah Aliyah X is located in Kampung Mardika, Desa Batu Lawang, Cisereuh, Kecamatan Pacet, Kabupaten Cianjur, West Java. It is located in the area of PT X Agriculture, in the middle of agricultural lands. The plantation

produces paprika, broccoli, and lettuce to be distributed all over Java.

There are 49 students with 24 male students and 25 female students. There are some classes, library, and mosque. The students are living around the plantation area and their parents mostly are the worker who works for the farm. The water source is from the mountain that firstly is collected in the tank and then distributed to each house. The farm sells broccoli, lettuce, spinach which then distributed to the restaurants and hotels around West Java.

2.5. Conceptual Framework



CHAPTER III

RESEARCH METHOD

3.1. Research Design

This research will take the design of cross sectional study. Researcher will study the students' post-test and pre-test answers with intervention of health education

3.2. Time and Place

This research was held in Madrasah Aliyah X, Pacet, Cianjur. The data was collected on 10th of September 2011.

3.3. Population and Sample

The targeted population for this research will be the residents in Pacet, Cianjur in general, while the accessible population will be all Madrasah students with inclusion and exclusion criteria.

3.4. Inclusion, Exclusion, Dropout Criteria

3.4.1 Inclusion Criteria

1. Students who were healthy and could answer the questions in the questionnaire.
2. Students who attended the health education.

3.4.2 Exclusion Criteria

1. Students who refused to fill the questionnaire.

3.4.3 Drop-out Criteria

1. Students who do not cooperate during data collection.

3.5. Survey Method

3.5.1. Sample Recruitment

The target population of this research is all of the *Madrasah Aliyah* students in Pacet, Cianjur, while the sample is the whole population (total sampling), therefore there are no inclusion or exclusion criteria.

3.5.2. Data Collection

Data will be collected with form of questionnaire. First the subject requested to fill the pre-test questionnaire that contains knowledge, attitude, and behavior regarding STH infection to know the current level of knowledge, attitude, and behavior of the subject. After receiving the health education, the subject will be given the same questionnaire as the post test to measure the knowledge, attitude, and behavior after the health education. Later, statistics will be processed using SPSS 11.5

3.5.3. Variables to be measured

3.5.3.1. Dependent variables

1. The knowledge level

3.5.3.2. Independent variables

1. Student's education level
2. Age
3. Sex
4. Personal experiences of STH infection
5. Environment STH infection experiences
6. Health education

3.5.4. Operational Definition

- Students are Madrasah Aliyah students from both sexes who were in attending the health education and both questionnaire.
- Grade is the respondent's education level at the time the research is being held. Data was collected by filling the questionnaire and were further classified as class X, XI and XII.
- Infected history is the previous infected history of the respondent, whether he/she has been infected by STH or not.
- Surrounding infected history is the infected history of the respondent's surrounding people, such as family, neighbor, or friends who has or has not been infected to STH.
- Pre-test score: The knowledge level measured before health education. Obtained from the answers picked in the questionnaire form.

- Post test score: The knowledge level measured after health education. Obtained from the answers picked in the questionnaire form.
- Delta score: The score difference between pre-test and post-test

3.6. Research Ethic

The subjects in this research had been given complete and detailed information about the purpose of the study and how it had been conducted before they agreed to be involved. Students have the right to refuse to participate in the study. Personal information gathered in this research will be kept confidential.

3.7. Data Analysis

Data taken by researcher refined and reformed into tables using Microsoft Excel 2010 and analyzed using SPSS 11.5 program afterwards. After inputting all of the data, researcher will run a normality test on the data. If the data is normally distributed, the researcher then will use parametric statistic and run a statistic test with Wilcoxon test. The level of correlation will be valued from the significance value (Sig.). If the sig value <0.05 , then the correlation has a meaning.

CHAPTER IV

RESULTS

4.1. Demographic Data

There are 49 Aliyah students who participate during health education. The data which had been collected shows that 49 pre and post questionnaires completely filled. Thus, all the data obtained from the participants are acceptable.

Table 4.1 Frequency Distribution of Students' Demographic Characteristics

Variable (n=49)	Category	N	%
Gender	Male	24	49
	Female	25	51
Grade	Class X	24	49
	Class XI	11	22.4
	Class XII	14	28.6
Infected History	Yes	28	57.1
	No	21	42.9
Surrounding Infected History	Yes	38	77.6
	No	11	22.4

Table 4.1 gives us information that female population (51%) is slightly higher than the male (49%). And more than half of the students got a history of STH Infection (57.1%), and they are aware that people around them experienced STH Infection (77.6%).

4.2. Pre & Post-Test Results

After obtaining the filled questionnaire, the data are scored and then tabulated using Microsoft Excel software in the form of table. The results are then grouped with the same sample to get the average ratio for each category and tested for its significance. The result is shown on the tables below.

Table 4.2 Pre and Post-test average of the STH Infection Sign and Symptoms**Knowledge by the Categories**

Category	Variable	n	Pre-Test			Post-Test	
			Average	Standard Deviation	p	Average	Standard Deviation
Gender	Male	24	37.4	32.6	0.536	95.7	10.4
	Female	25	51.5	26.6		96.1	8.04
Grade	Class X	24	36.7	37.6	0.151	97.5	6.8
	Class XI	11	56.4	33.2		90.9	13.8
	Class XII	14	50.0	21.9		97.1	7.3
Infected History	Yes	28	44.9	33.7	0.028	96.6	9.4
	No	21	45.0	25.0		95.0	8.9
Surrounding Infected History	Yes	38	44.9	29.2	0.659	97.8	6.3
	No	11	45.0	34.3		90.0	13.5

We can see from the table that the pre-test scores is still below the standard by some margin, while the post-test shows a nearly perfect scores in every categories. The statistics from Table 4.2 also shows us that gender ($p=0.536$), grade ($p=0.151$), and previous environmental experience of STH infection ($p=0.659$) are insignificant to the knowledge level of the participants. Only the personal previous STH infection ($p 0.028$) is significant enough to the knowledge level.

Table 4.3 Delta Score in Correlation with Demographic Factors

Category	Variable	N	Delta Score	Standard Deviation	P
Gender	Male	24	58.3	33.5	0.311
	Female	25	44.6	25.5	
Grade	Class X	24	60.8	32.0	0.044
	Class XI	11	34.6	27.0	
	Class XII	14	47.1	23.00	
Infected History	Yes	28	51.7	34.00	0.015
	No	21	50.0	23.80	
Surrounding Infected History	Yes	38	52.9	30.3	0.559
	No	11	45.0	29.7	

From the Table 4.3, we can see that there are significances in grade and personal experience of STH infection to the score difference of the pre and post-test given. While gender and previous environmental infection to STH infection are regarded insignificant to the score difference.

Table 4.4 The Impact of Health Education on the Knowledge Level of STH Sign and Symptoms

Variable	Median Delta Score (Maximum –Minimum)	p
Pre-test	40 (20-60)	0.000
Post-test	100 (100-100)	* Wilcoxon Test

Since the data from Table 4.4 which based on Wilcoxon test shows $p < 0.001$, it concludes that the difference related to the knowledge level before health education and after health education is significant. This indicates that there was an association between health education and knowledge level regarding the sign and symptoms of STH. Furthermore, the information shows the increase of the knowledge level from the starting point at the median of 52 (poor) to the high level at 100. The minimum and maximum levels are also elevated greatly in the post test.

CHAPTER V

DISCUSSION

The research was performed with the Madrasah Aliyah students in Pacet, Cianjur, because the area is mainly occupied by vegetable plantation. The students in this area make a lot of contacts with soil while helping their parents at the plantation and or doing their daily activities. This area has high risk of being endemic to STH infections.

Another reason why this area is a perfect research location was WHO strategy of giving anthelmintic drugs once or twice a year did not reach them, despite of the fairly close range to the capital city of Jakarta.

5.1. The Association between the Knowledge Level on STH Infections Sign and Symptoms and the Socio-Demographical Factors

As the results shown in Table 4.2, there are no significant difference between knowledge level and the characteristic demography namely gender, grade, past experience and environment experiences, but the personal experience exhibit significance in knowledge level.

Gender is previously assumed to be a significant factor to the STH infection sign and symptoms knowledge level, because girls are thought to spend more time reading books, but it is proven as not significant because they are raised in the same area, studied together in the same school, and the STH infection doesn't affect more into a gender than another. Neither does grade, because there are no curriculum specifically teaching in depth about the sign and symptoms of the STH infection, because Madrasah is a liberal arts only school and they didn't teach biology.

Personal past experiences of having the STH infection is the only socio-demographic factors affecting the knowledge level of the STH infection sign and symptoms. Notoadmojo stated¹⁵ experience also has a strong part in forming the knowledge. The experience of being ill infected by STH gives a strong impression that lives in their memory. But from the results, we can see that in particular area of the sign and symptoms, other's experience pays not a significant part in it. This might be caused by the uneducated and ignorant society. They take STH infections lightly so they didn't try to understand the disease.

5.2. The Association between the Knowledge Level Increase on STH Infections Sign and Symptoms Post-Intervention and the Socio-Demographical Factors

Table 4.3 shows us that the significant roles playing part in the increase of knowledge post-health education are the grades and the personal STH infection experience. As the previous discussion suggested, people with lower pre-test scores actually knows about the sign and symptoms, but either they forgot and or they didn't realize that it's actually a symptom of the STH infection they had before. The health education here functions as a refresher, enlighten their memories, and to some of them, make them realize that they actually experienced that before. Of course, these populations will have a stronger understanding after the health education, resulting in higher scores in the post-test.

5.3. The Impact of Health Education on the Knowledge Level of STH Infection's Sign and Symptoms

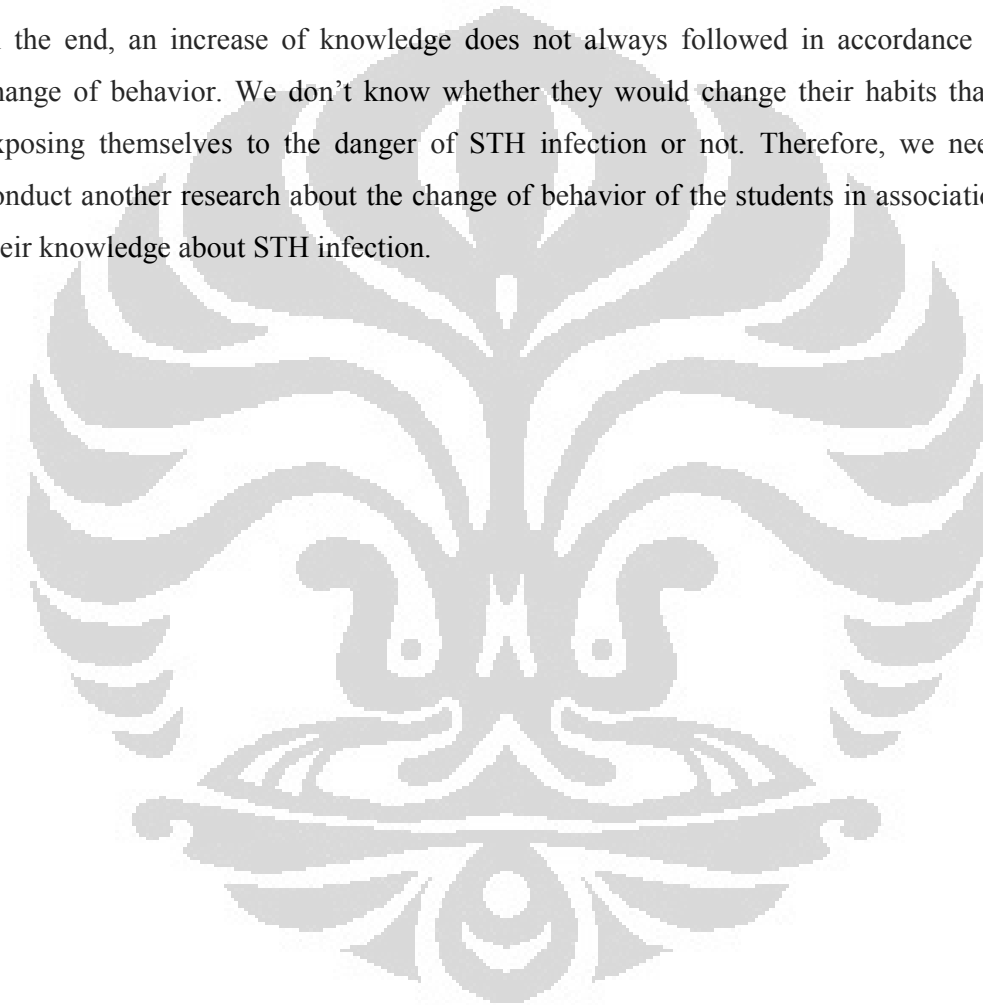
Table 4.4 exhibited and overwhelming change of knowledge level in sign and symptoms area after the health education has been given. From the pre-test median of 40 (20-60), to the post-test median of 100 (100-100). Even though there is still one extreme case of medium level, the subject still had a 40 points rise from his/her pre-test score (20). This data is enough to prove that giving a health education is the most effective intervention to increase the knowledge level on the population in the area. Although, it has not been proven to the population with the lower level of education and the population has not been re-tested after a period of time since the intervention.

Giving health education is significantly effective in increasing knowledge level of the sign and symptoms of STH infection, as proven by the p value of lower than 0.01 ($p < 0.05$), this statement also supported by research made by Puspita.¹⁷

In giving health education, the qualification of the lecturer also plays a big part in the increase of knowledge. Therefore we need to standardize the quality of the education giver. From this case, we have to admit that the lecturer is a very capable individual, have mastered the material and have good skills to relay the message to the layman crowd. Therefore we should not blindly send peoples to give health education, but we need people who have got experience in giving health education and sufficient education about the STH infection to give out the health education.

This research does prove that health education could increase the knowledge level regarding STH infection, but if the education is only done once, the students will easily forget about them. Amri stated¹⁶, health education should be given every month for at least 3 months in a row. We could also add some posters and leaflet regarding the STH infection, or we could train the teachers so they could also remind the students about STH infection.

In the end, an increase of knowledge does not always followed in accordance by a change of behavior. We don't know whether they would change their habits that are exposing themselves to the danger of STH infection or not. Therefore, we need to conduct another research about the change of behavior of the students in association to their knowledge about STH infection.



CHAPTER VI

CONCLUSION AND SUGGESTIONS

5.4 Conclusion

1. There is no association between the knowledge level on STH Infection sign and symptoms with gender, grade, environmental experience but associated with the personal experience of STH infection.
2. Health education is effective in increasing the knowledge level to the increase of the knowledge level on STH infection sign and symptoms.

5.5 Suggestion

- Health education should be given every month for at least 3 months in a row
- The health education should be given to all students without observing the gender grade and the environmental experience, but they need to take notice in their personal experience.
- Further research is needed to know whether the health education can result in the change of behavior of the students regarding the STH intervention.

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APPENDICES

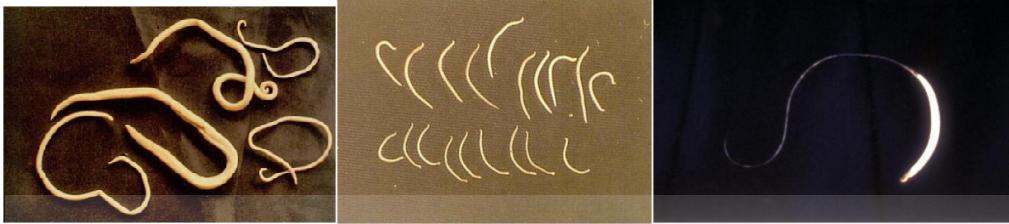
Appendix 1 – QUESTIONNAIRE

Behavior questionnaire healthy living

1. Do you wash your hands before eating?
 - a. Yes, with soap
 - b. Yes, without soap
 - c. No
2. Do you wash your hands after taking a dump?
 - a. Yes, with soap
 - b. Yes, without soap
 - c. No
3. Do you wear shoes or sandals while being outside of home?
 - a. Yes
 - b. No
4. Are the flooring of your house made of soil?
 - a. Yes
 - b. No
5. Do you often buy foods?
 - a. Never
 - b. Sometimes
 - c. Often
6. How is the condition of your fingernails? [observation]
 - a. Long and dirty
 - b. Long and clean
 - c. Short and dirty
 - d. Short and clean
7. Do you ever felt itchy on your anus?
 - a. Yes, often
 - b. Yes, rarely
 - c. NO
8. Where do you obtain water for your daily activities (bath, brushing teeth)?
 - a. Well
 - b. River
 - c. Water company
 - d. Others.....
9. Where do you usually take your dump (pick one where you did most of the time)?
 - a. River
 - b. Private toilet
 - c. Public toilet
 - d. Plantation
 - e. Fish pond
 - f. House yard
10. Have you ever take anti-helminthes drugs?
 - a. Yes, last time wasmonth/years ago
 - b. No

Knowledge Questionnaire

1. Put the proper name according to the picture of the adult worm



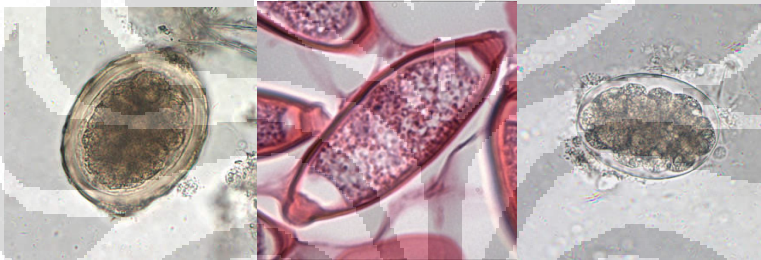
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- a. *Trichuris trichiura* (Whipworm)
- b. *Ascaris lumbricoides* (Cacing gelang)
- c. *Necator americanus* (Hookworm)

2. Put the proper name according to the picture of the worm's egg

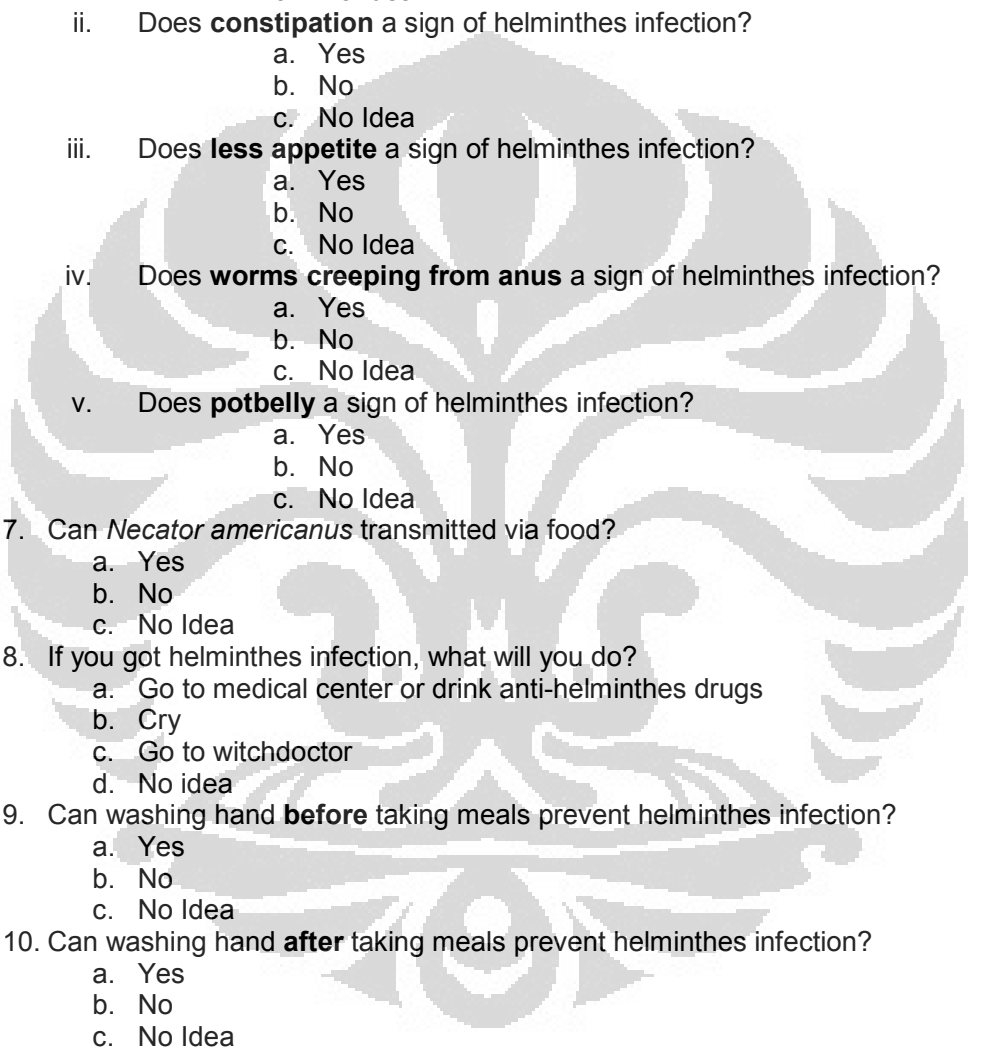


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- a. *Trichuris trichiura* (Cacing cambuk)
 - b. *Ascaris lumbricoides* (Cacing gelang)
 - c. *Necator americanus* (Cacing tambang)
3. *Trichuris trichiura* is transmitted via:
- a. Food
 - b. Through the skin underneath the nails
 - c. Airborne
4. Can *Necator americanus* infect the body via the hands?
- a. Yes
 - b. No
 - c. No Idea
5. Adult Whipworm attach to which part of human body?
- a. Duodenum
 - b. Caecum
 - c. Anus

- 
6. Signs of helminthes infection:
- i. Does **lethargic** a sign of helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea
 - ii. Does **stomachache** a sign of helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea
 - ii. Does **constipation** a sign of helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea
 - iii. Does **less appetite** a sign of helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea
 - iv. Does **worms creeping from anus** a sign of helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea
 - v. Does **potbelly** a sign of helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea
7. Can *Necator americanus* transmitted via food?
 - a. Yes
 - b. No
 - c. No Idea
8. If you got helminthes infection, what will you do?
 - a. Go to medical center or drink anti-helminthes drugs
 - b. Cry
 - c. Go to witchdoctor
 - d. No idea
9. Can washing hand **before** taking meals prevent helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea
10. Can washing hand **after** taking meals prevent helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea
11. Can wearing shoes/sandals outside your home prevent helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea
12. Can clipping your nails prevent helminthes infection?
 - a. Yes
 - b. No
 - c. No Idea

INDONESIAN LANGUAGE VERSION

1. Apakah Anda mengetahui penyakit cacingan?
 - a. Ya
 - b. Tidak

2. Darimana Anda mengetahui informasi mengenai cacingan? (boleh pilih lebih dari satu)
 - a. Televisi
 - b. Koran
 - c. Buku
 - d. Majalah
 - e. Orang Tua
 - f. Guru
 - g. Teman
 - h. Lainnya (sebutkan):.....

3. Dari sumber informasi diatas, sumber informasi yang paling berkesan adalah:

4. Apakah Anda pernah cacingan?
 - a. Ya, Kapan?
 - Lebih dari 2 tahun yang lalu
 - 1 tahun yang lalu
 - 6 bulan yang lalu
 - 3 bulan yang lalu
 - 1 bulan yang lalu
 - Dalam satu minggu ini
 - b. Tidak

5. Apakah ada orang di sekitar anda yang pernah mengalami cacingan?
 - a. Ya, sebutkan:
 - ibu
 - ayah
 - kakak
 - adik
 - tetangga
 - teman
 - lainnya.....
 - b. Tidak

6. Kegiatan apa yang Anda lakukan selain sekolah?
 - a. Berkebun
 - b. Bermain di sawah/kebun
 - c. Mencari ikan di sungai/empang
 - d. Bermain di halaman
 - e. Lainnya, sebutkan.....

I. Kuesioner Perilaku

A. Perilaku membersihkan diri

1. Apakah seharusnya anda mencuci tangan sebelum makan?
 - a. Ya pakai sabun
 - b. Ya tidak pakai sabun
 - c. Kadang-kadang kedua di atas
 - d. Tidak
2. Apakah seharusnya anda mencuci tangan setelah Buang Air Besar (BAB)/berak?
 - a. Ya pakai sabun
 - b. Ya tidak pakai sabun
 - c. Kadang-kadang kedua di atas
 - d. Tidak
3. Bagaimana seharusnya keadaan kuku anda?
 - a. Panjang dan kotor
 - b. Panjang dan bersih
 - c. Pendek dan kotor
 - d. Pendek dan bersih
4. Untuk keperluan sehari-hari (mandi, sikat gigi, minum, makan, buang air) darimana seharusnya anda mendapatkan air?
 - a. Sumur
 - b. Kali/sungai
 - c. Keran / PAM
 - d. Lainnya (sebutkan).....
5. Dimana seharusnya anda Buang Air Besar (BAB)/berak?
 - a. Kali/Sungai
 - b. Jamban/Kakus sendiri
 - c. Jamban/Kakus umum
 - d. Kebun
 - e. Empang
 - f. Pekarangan rumah

B. Perilaku melindungi diri

1. Jika anda berkebun/mengolah tanah, apakah anda seharusnya menggunakan sarung tangan dan alas kaki?
 - a. Menggunakan sarung tangan dan alas kaki
 - b. Menggunakan sarung tangan saja
 - c. Menggunakan alas kaki saja
 - d. Tidak menggunakan keduanya
2. Apakah anda memakai alas kaki (sepatu, sandal) bila berada di luar ruangan?
 - a. Ya
 - b. Kadang-kadang
 - c. Tidak
3. Apakah lantai rumah anda masih dari tanah?

- a. Ya
 - b. Kadang-kadang
 - c. Tidak
4. Apakah anda jajan di warung?
- a. Tidak pernah
 - b. Jarang
 - c. Sering
5. Apakah anda pernah minum obat cacing?
- a. Ya, terakhir minum obatbulan/tahun yang lalu
 - b. Tidak pernah

II. KUISONER PENGETAHUAN

A. Pengetahuan tentang cacing

1. Pasangkan gambar cacing berikut (1-3) dengan masing-masing nama cacing (a-c) yang sesuai!



1. ()



2. ()



3. ()

- a. *Trichuris trichiura* (Cacing cambuk)
- b. *Ascaris lumbricoides* (Cacing gelang)
- c. *Necator americanus* (Cacing tambang)
- d. Tidak tahu

2. Pasangkan gambar telur cacing berikut (1-3) dengan masing-masing nama cacing (a-c) yang sesuai!



1. ()



2. ()



3. ()

- a. *Trichuris trichiura* (Cacing cambuk)
- b. *Ascaris lumbricoides* (Cacing gelang)

- c. *Necator americanus* (Cacing tambang)
- d. Tidak tahu

3. Penularan *Trichuris trichiura* melalui...
- a. Makanan
 - b. Menembus kulit
 - c. Tanah
 - d. Tidak tahu

4. Penularan cacing tambang melalui...
- a. Makanan
 - b. Menembus kulit
 - c. Tanah
 - d. Tidak tahu

5. Cacing cambuk hidup di...
- a. Usus halus
 - b. Usus besar
 - c. Dubur
 - d. Tidak tahu

B. Pengetahuan Gejala Cacingan

1. Apakah **sering mencret** merupakan gejala cacingan?
- a. Ya
 - b. Tidak
 - c. Tidak tahu

2. Apakah **wajah pucat dan lemas** merupakan gejala cacingan?
- a. Ya
 - b. Tidak
 - c. Tidak tahu

3. Apakah **nafsu makan berkurang** merupakan tanda cacingan?
- a. Ya
 - b. Tidak
 - c. Tidak tahu

4. Apakah **keluar cacing dari mulut dan dubur/pantat** merupakan tanda cacingan?
- a. Ya
 - b. Tidak
 - c. Tidak tahu

5. Apakah **perut buncit** merupakan tanda dari cacingan?
- a. Ya
 - b. Tidak
 - c. Tidak tahu

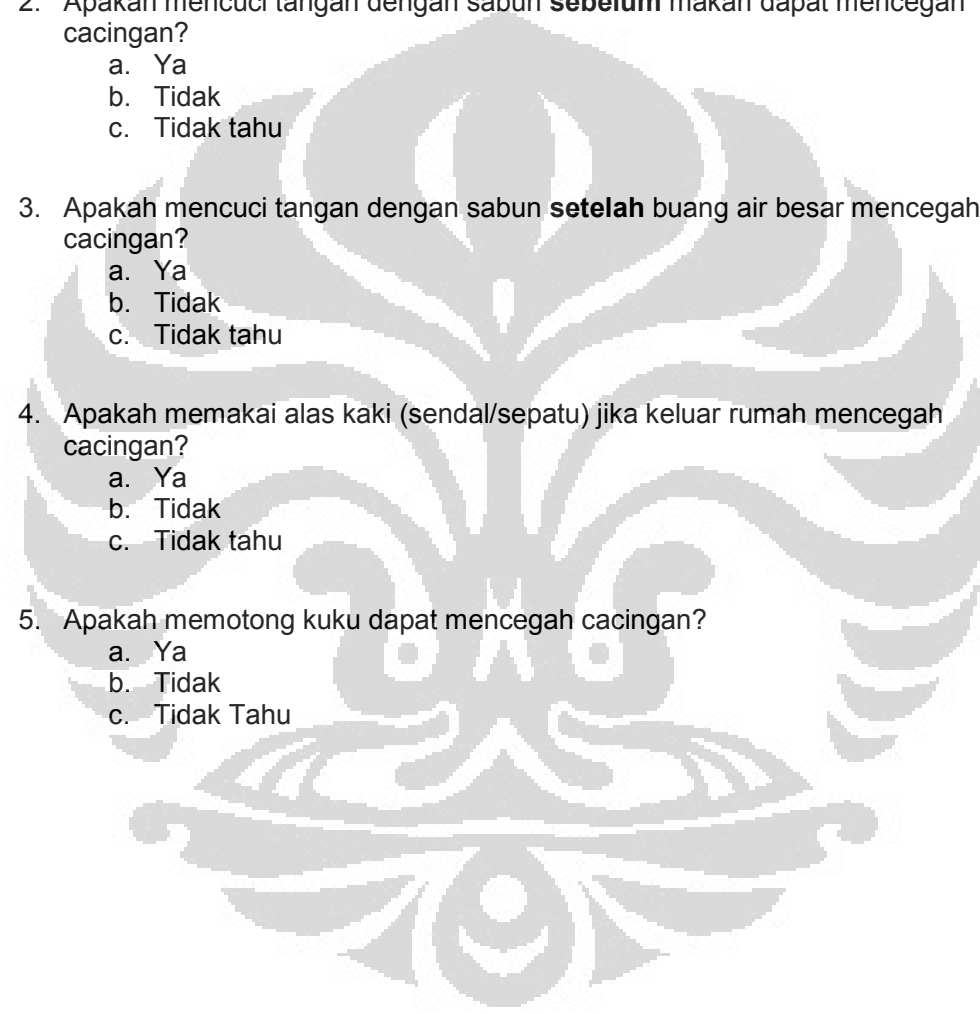
C. Pengetahuan Pencegahan Cacingan

1. Jika anda terkena penyakit cacingan, apa yang akan anda lakukan?
 - a. Ke rumah sakit
 - b. Minum obat cacing
 - c. Kedukun/orang pintar
 - d. Tidak tahu

 2. Apakah mencuci tangan dengan sabun **sebelum** makan dapat mencegah cacingan?
 - a. Ya
 - b. Tidak
 - c. Tidak tahu

 3. Apakah mencuci tangan dengan sabun **setelah** buang air besar mencegah cacingan?
 - a. Ya
 - b. Tidak
 - c. Tidak tahu

 4. Apakah memakai alas kaki (sendal/sepatu) jika keluar rumah mencegah cacingan?
 - a. Ya
 - b. Tidak
 - c. Tidak tahu

 5. Apakah memotong kuku dapat mencegah cacingan?
 - a. Ya
 - b. Tidak
 - c. Tidak Tahu
- 

Appendix 2 – SPSS ANALYSIS

1. Frequency Distribution of Students' Demographic Characteristics

Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid male	23	46.9	46.9	46.9
Valid female	26	53.1	53.1	100.0
Total	49	100.0	100.0	

Grade

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 10.00	24	49.0	49.0	49.0
Valid 11.00	11	22.4	22.4	71.4
Valid 12.00	14	28.6	28.6	100.0
Total	49	100.0	100.0	

Personal Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	29	59.2	59.2	59.2
Valid No	20	40.8	40.8	100.0
Total	49	100.0	100.0	

Environment Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	37	75.5	75.5	75.5
Valid No	12	24.5	24.5	100.0
Total	49	100.0	100.0	

Age

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age	49	100.0%	0	0.0%	49	100.0%

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Age	.245	49	.000	.887	49	.000

a. Lilliefors Significance Correction

Descriptives			Statistic	Std. Error
Age	Mean		16.4082	.14846
	95% Confidence Interval for Mean	Lower Bound	16.1097	
		Upper Bound	16.7067	
	5% Trimmed Mean		16.4433	
	Median		16.0000	
	Variance		1.080	
	Std. Deviation		1.03920	
	Minimum		14.00	
	Maximum		18.00	
	Range		4.00	
	Interquartile Range		1.00	
	Skewness		-.093	.340
	Kurtosis		-.228	.668

Delta Score

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Delta Score	49	100.0%	0	0.0%	49	100.0%

Descriptives			Statistic	Std. Error
Delta Score	Mean		51.0204	4.28814
	95% Confidence Interval for Mean	Lower Bound	42.3985	
		Upper Bound	59.6423	
	5% Trimmed Mean		51.1338	
	Median		60.0000	
	Variance		901.020	
	Std. Deviation		30.01700	
	Minimum		.00	
	Maximum		100.00	
	Range		100.00	
	Interquartile Range		60.00	
	Skewness		-.102	.340
	Kurtosis		-.942	.668

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Delta Score	.169	49	.001	.930	49	.006

a. Lilliefors Significance Correction

2. Pre-Test and Delta Score of STH Sign and Symptoms and Its Association with Demographic Characteristics

2.1. Pre-Test and Delta Score of STH Sign and Symptoms and Its Association with Gender

Descriptives

Gender		Statistic	Std. Error	
pre	male	Mean	37.3913	6.80669
		95% Confidence Interval for Mean	Lower Bound	23.2751
			Upper Bound	51.5075
		5% Trimmed Mean	35.9903	
		Median	40.0000	
		Variance	1065.613	
		Std. Deviation	32.64372	
		Minimum	.00	
		Maximum	100.00	
		Range	100.00	
		Interquartile Range	40.00	
		Skewness	.778	.481
		Kurtosis	-.288	.935
		Mean	51.5385	5.22398
		95% Confidence Interval for Mean	Lower Bound	40.7795
		Upper Bound	62.2974	
	5% Trimmed Mean	51.4530		
	Median	50.0000		
	Variance	709.538		
	Std. Deviation	26.63716		
	Minimum	.00		
	Maximum	100.00		
	Range	100.00		
	Interquartile Range	45.00		
	Skewness	.096	.456	
	Kurtosis	-.722	.887	
	Mean	58.2609	6.99102	
	95% Confidence Interval for Mean	Lower Bound	43.7624	
		Upper Bound	72.7594	
	5% Trimmed Mean	59.1787		
	Median	60.0000		
	Variance	1124.111		
	Std. Deviation	33.52776		
	Minimum	.00		
	Maximum	100.00		
	Range	100.00		
	Interquartile Range	40.00		
	Skewness	-.421	.481	
	Kurtosis	-.845	.935	
	Mean	44.6154	4.99941	
	95% Confidence Interval for Mean	Lower Bound	34.3189	
		Upper Bound	54.9119	
	5% Trimmed Mean	45.1282		
	Median	40.0000		
	male			
	female			
Delta Score	male			
	female			
	male			
	female			
	male			
	female			
	male			
	female			
	male			
	female			

Variance	649.846	
Std. Deviation	25.49208	
Minimum	.00	
Maximum	80.00	
Range	80.00	
Interquartile Range	40.00	
Skewness	-.093	.456
Kurtosis	-1.141	.887

Case Processing Summary

Gender	Cases						
	Valid		Missing		Total		
	N	Percent	N	Percent	N	Percent	
pre	Male	23	100.0%	0	0.0%	23	100.0%
	Female	26	100.0%	0	0.0%	26	100.0%
Delta Score	Male	23	100.0%	0	0.0%	23	100.0%
	Female	26	100.0%	0	0.0%	26	100.0%

Tests of Normality

	Gender	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
pre	Male	.207	23	.012	.874	23	.008
	Female	.168	26	.058	.942	26	.148
Delta Score	Male	.173	23	.073	.905	23	.032
	Female	.188	26	.018	.903	26	.019

a. Lilliefors Significance Correction

2.2. Pre-Test and Delta Score of STH Sign and Symptoms and Its Association with Education Level

Descriptives

Grade		Statistic	Std. Error	
pre	Mean	36.6667	6.44561	
	95% Confidence Interval for Mean	Lower Bound	23.3329	
		Upper Bound	50.0004	
	5% Trimmed Mean	35.1852		
	Median	40.0000		
	Variance	997.101		
	10.00	Std. Deviation	31.57691	
		Minimum	.00	
		Maximum	100.00	
		Range	100.00	
		Interquartile Range	55.00	
		Skewness	.588	.472
		Kurtosis	-.519	.918
	11.00	Mean	56.3636	10.02476
95% Confidence Interval for Mean		Lower Bound	34.0271	

		Upper Bound	78.7002	
		5% Trimmed Mean	55.9596	
		Median	60.0000	
		Variance	1105.455	
		Std. Deviation	33.24838	
		Minimum	20.00	
		Maximum	100.00	
		Range	80.00	
		Interquartile Range	60.00	
		Skewness	.030	.661
		Kurtosis	-1.878	1.279
		Mean	50.0000	5.83660
		95% Confidence Interval for Mean	Lower Bound 37.3908 Upper Bound 62.6092	
		5% Trimmed Mean	48.8889	
		Median	40.0000	
		Variance	476.923	
12.00		Std. Deviation	21.83857	
		Minimum	20.00	
		Maximum	100.00	
		Range	80.00	
		Interquartile Range	20.00	
		Skewness	.827	.597
		Kurtosis	.883	1.154
		Mean	60.8333	6.53632
		95% Confidence Interval for Mean	Lower Bound 47.3119 Upper Bound 74.3547	
		5% Trimmed Mean	62.0370	
		Median	60.0000	
		Variance	1025.362	
10.00		Std. Deviation	32.02128	
		Minimum	.00	
		Maximum	100.00	
		Range	100.00	
		Interquartile Range	40.00	
		Skewness	-.490	.472
		Kurtosis	-.810	.918
		Mean	34.5455	8.13116
		95% Confidence Interval for Mean	Lower Bound 16.4281 Upper Bound 52.6628	
11.00		5% Trimmed Mean	33.9394	
Delta Score				

Median	20.0000	
Variance	727.273	
Std. Deviation	26.96799	
Minimum	.00	
Maximum	80.00	
Range	80.00	
Interquartile Range	40.00	
Skewness	.304	.661
Kurtosis	-1.201	1.279
Mean	47.1429	6.15090
95% Confidence Interval for Mean	Lower Bound	33.8546
	Upper Bound	60.4311
5% Trimmed Mean	47.9365	
Median	50.0000	
Variance	529.670	
12.00 Std. Deviation	23.01457	
Minimum	.00	
Maximum	80.00	
Range	80.00	
Interquartile Range	25.00	
Skewness	-.476	.597
Kurtosis	-.132	1.154

Case Processing Summary

Grade	Cases						
	Valid		Missing		Total		
	N	Percent	N	Percent	N	Percent	
pre	10.00	24	100.0%	0	0.0%	24	100.0%
	11.00	11	100.0%	0	0.0%	11	100.0%
	12.00	14	100.0%	0	0.0%	14	100.0%
Delta Score	10.00	24	100.0%	0	0.0%	24	100.0%
	11.00	11	100.0%	0	0.0%	11	100.0%
	12.00	14	100.0%	0	0.0%	14	100.0%

Tests of Normality

Grade	Kolmogorov-Smirnov ^a				Shapiro-Wilk			
	Statistic	df	Sig.	Statistic	df	Sig.		
pre	10.00	.166	24	.085	.901	24	.022	
	11.00	.227	11	.120	.838	11	.030	
	12.00	.248	14	.020	.892	14	.087	
Delta Score	10.00	.184	24	.036	.908	24	.031	
	11.00	.251	11	.052	.899	11	.180	
	12.00	.212	14	.089	.924	14	.252	

a. Lilliefors Significance Correction

2.3. Pre-Test and Delta Score of STH Sign and Symptoms and Its Association with Personal History of STH Infection

		Descriptives		Statistic	Std. Error
pre	PersExp	Mean		44.8276	6.25053
		95% Confidence Interval for Mean	Lower Bound	32.0240	
			Upper Bound	57.6312	
	5% Trimmed Mean		44.2529		
	Median		40.0000		
	Variance		1133.005		
	Yes	Std. Deviation		33.66014	
	Minimum		.00		
	Maximum		100.00		
	Range		100.00		
	Interquartile Range		60.00		
	Skewness		.363	.434	
	Kurtosis		-1.179	.845	
	Mean		45.0000	5.59605	
		95% Confidence Interval for Mean	Lower Bound	33.2873	
			Upper Bound	56.7127	
		5% Trimmed Mean		44.4444	
		Median		40.0000	
		Variance		626.316	
	Delta Score	None	Std. Deviation		25.02630
Minimum				.00	
Maximum			100.00		
Range			100.00		
Interquartile Range			20.00		
Skewness			.190	.512	
Kurtosis			.391	.992	
Mean			51.7241	6.31811	
		95% Confidence Interval for Mean	Lower Bound	38.7821	
			Upper Bound	64.6662	
		5% Trimmed Mean		51.9157	
		Median		60.0000	
		Variance		1157.635	
Yes		Std. Deviation		34.02404	
	Minimum		.00		
	Maximum		100.00		
	Range		100.00		
	Interquartile Range		60.00		
	Skewness		-.135	.434	
	Kurtosis		-1.336	.845	
	Mean		50.0000	5.33114	
	95% Confidence Interval for Mean	Lower Bound	38.8418		
		Upper Bound	61.1582		

5% Trimmed Mean	50.0000	
Median	60.0000	
Variance	568.421	
Std. Deviation	23.84158	
Minimum	.00	
Maximum	100.00	
Range	100.00	
Interquartile Range	20.00	
Skewness	-.104	.512
Kurtosis	.190	.992

Case Processing Summary

PersExp		Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
pre	Yes	29	100.0%	0	0.0%	29	100.0%
	None	20	100.0%	0	0.0%	20	100.0%
Delta Score	Yes	29	100.0%	0	0.0%	29	100.0%
	None	20	100.0%	0	0.0%	20	100.0%

Tests of Normality

PersExp		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
pre	Yes	.218	29	.001	.894	29	.007
	None	.229	20	.007	.923	20	.115
Delta-Score	Yes	.176	29	.022	.903	29	.012
	None	.213	20	.018	.938	20	.221

a. Lilliefors Significance Correction

2.4. Pre-Test and Delta Score of STH Sign and Symptoms and Its Association with Environment History of STH Infection

Case Processing Summary

EnvExp		Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
pre	Yes	37	100.0%	0	0.0%	37	100.0%
	No	12	100.0%	0	0.0%	12	100.0%
Delta Score	Yes	37	100.0%	0	0.0%	37	100.0%
	No	12	100.0%	0	0.0%	12	100.0%

Descriptives

EnvExp		Statistic	Std. Error		
pre	Mean	44.8649	4.80274		
	95% Confidence Interval for Mean	Lower Bound	35.1245		
		Upper Bound	54.6053		
	5% Trimmed Mean	44.2943			
	Median	40.0000			
	Variance	853.453			
	Yes	Std. Deviation	29.21393		
	Minimum	.00			
	Maximum	100.00			
	Range	100.00			
	Interquartile Range	40.00			
	Skewness	.287	.388		
	Kurtosis	-.773	.759		
	No	Mean	45.0000	9.88571	
		95% Confidence Interval for Mean	Lower Bound	23.2417	
			Upper Bound	66.7583	
5% Trimmed Mean		44.4444			
Median		40.0000			
Variance		1172.727			
Std. Deviation		34.24511			
Minimum		.00			
Maximum		100.00			
Range		100.00			
Interquartile Range	55.00				
Skewness	.448	.637			
Kurtosis	-.729	1.232			
Delta Score	Mean	52.9730	4.97539		
	95% Confidence Interval for Mean	Lower Bound	42.8824		
		Upper Bound	63.0635		
	5% Trimmed Mean	53.3033			
	Median	60.0000			
	Variance	915.916			
	Yes	Std. Deviation	30.26410		
	Minimum	.00			
	Maximum	100.00			
	Range	100.00			
Interquartile Range	60.00				
Skewness	-.174	.388			
Kurtosis	-1.035	.759			
No	Mean	45.0000	8.57233		
	95% Confidence Interval for Mean	Lower Bound	26.1324		
		Upper Bound	63.8676		
	5% Trimmed Mean	44.4444			
	Median	40.0000			

Variance	881.818	
Std. Deviation	29.69542	
Minimum	.00	
Maximum	100.00	
Range	100.00	
Interquartile Range	35.00	
Skewness	.087	.637
Kurtosis	-.103	1.232

Tests of Normality

EnvExp		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
pre	Yes	.161	37	.017	.931	37	.024
	No	.225	12	.096	.911	12	.222
Delta Score	Yes	.186	37	.002	.920	37	.011
	No	.183	12	.200	.945	12	.570

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

2. The Effectiveness of Health Education on the Knowledge Level of Hygienic Behavior Related to STH Infection

Descriptives		Statistic	Std. Error	
pre	Mean	44.8980	4.30672	
	95% Confidence Interval for Mean	Lower Bound	36.2387	
		Upper Bound	53.5572	
	5% Trimmed Mean	44.3311		
	Median	40.0000		
	Variance	908.844		
	Std. Deviation	30.14703		
	Minimum	.00		
	Maximum	100.00		
	Range	100.00		
	Interquartile Range	40.00		
	Skewness	.324	.340	
	Kurtosis	-.789	.668	
	Mean	95.9184	1.30144	
post	95% Confidence Interval for Mean	Lower Bound	93.3017	
		Upper Bound	98.5351	
	5% Trimmed Mean	97.0295		
	Median	100.0000		
	Variance	82.993		
	Std. Deviation	9.11006		
	Minimum	60.00		
	Maximum	100.00		
	Range	40.00		
	Interquartile Range	.00		
	Skewness	-2.180	.340	
	Kurtosis	4.307	.668	

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
pre	.177	49	.001	.924	49	.004
post	.489	49	.000	.492	49	.000

a. Lilliefors Significance Correction

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
pre	49	44.8980	30.14703	.00	100.00	20.0000	40.0000	60.0000
post	49	95.9184	9.11006	60.00	100.00	100.0000	100.0000	100.0000

Ranks

		N	Mean Rank	Sum of Ranks
post - pre	Negative Ranks	0 ^a	.00	.00
	Positive Ranks	44 ^b	22.50	990.00
	Ties	5 ^c		
	Total	49		

a. post < pre

b. post > pre

c. post = pre

Test Statistics^a

	post - pre
Z	-5.812 ^b
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.