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Analysis of the Quality of Examination of Cleaning Workers' Feature Samples Using the Saturated NaCl and ZnSO₄ 33% Method

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ABSTRACT

Worm infections are caused by one of the soil-borne intestinal nematodes called Soil Transmitted Helminths (STH). One of the agents of soil pollution is garbage. Cleaners are among the workers who have a high risk of contracting helminthiasis. The purpose of fecal examination is for early detection of helminth egg infection, especially intestinal nematodes of the Soil Transmitted Helminths (STH) group. The method used is flotation with saturated NaCl solution and 33% ZnSO₄. This study is an observational study aimed at comparing the quality of the two reagents that can be used in the examination of Soil Transmitted Helminths (STH) eggs. The study used 30 samples of feces of janitors and 3 repetitions of each sample were carried out with 2 methods to determine the quality of the results. The results of Soil Transmitted Helminths (STH) eggs with saturated NaCl reagent with a mean of 8.86, while ZnSO₄ 33% with a mean of 20, the difference from the 2 methods is 11.43. In this study using the data normality test and the Mann-Whitney U test, the results obtained Asymp. Sig. (2-tailed) 0.034. The value of Asymp. Sig. (2-tailed) <0.05 concluded that there was a significant difference between the quality of the examination of Saturated NaCl and 33% ZnSO₄. The conclusion of this study is that the most effective is the use of ZnSO₄ 33% for the flotation method with an average result of 20.

Keywords: Soil Transmitted Helminths, Saturated NaCl, ZnSO₄ 33%

INTRODUCTION

According to the World Health Organization (WHO, 2016) Helminthiasis or helminthiasis infection is the entry of worm parasites into the human body and causes symptoms, which ultimately leads to helminthiasis disease. Health problems associated with helminthiasis are increasingly common in developing countries such as Indonesia. The largest worms in the human body are intestinal nematodes that live in the digestive tract of humans and animals. Intestinal nematodes are more commonly referred to as stomach worms in Indonesia. These worms are categorized as Soil Transmitted Helminths and non-Soil Transmitted Helminths (Rusdji, 2017).

The global infection rate of Soil

Transmitted Helminths is approximately 1.5 billion. Of these, 300 million people suffer from high severity helminthiasis, claiming the lives of around 150,000 people each year (WHO, 2017). According to the Ministry of Health of the Republic of Indonesia (2017), the frequency is still quite high in Indonesia, ranging from 2.5% to 62% of cases, especially in underprivileged communities that have poor sanitation. Based on the results of worm studies in 2008-2010, the prevalence of worm infections in East Java Province was 7.95% (Halleyantoro, et al., 2019). The Surabaya City Health Office reported that infectious and parasitic diseases were the fourth highest from January to December 2018 in Surabaya City (Surabaya City Health Office, 2019). In 2017, there was an

increase in the prevalence of helminthiasis among children in Kampung Pasar Keputran, Surabaya City, where 36% of children living there were affected by helminthiasis (Uci Hardianti & Jiwintarum, 2019).

Human helminthiasis can be transmitted in various ways, including direct transmission through worm eggs attached to hands or nails contaminated with soil, human feces, or food contaminated with worm eggs. Garbage is one of the factors of helminthiasis infection. Sanitation workers are a group of people who often work in unsanitary conditions and come into direct contact with garbage, which is the cause of transmission of helminthiasis infection (Maulida, 2021).

To determine a person's helminthiasis status, it is necessary to conduct a parasitology laboratory examination by counting the number of parasite eggs in the patient's stool sample. Different examination procedures and techniques can be selected to provide the best results in determining the etiology of helminthiasis (Khatimah et al., 2021).

ZnSO₄ 33% and saturated NaCl are 2 types of reagents used for the flotation method. ZnSO₄ 33% has a specific gravity of 1.20 while NaCl has a specific gravity of 1.19 for NaCl. The results of examining worm eggs using the flotation method using a saturated NaCl solution showed that there were fewer types of Soil Transmitted Helminths worm eggs compared to examining worm eggs using the flotation method with a 33% ZnSO₄ solution (Ervina, 2021).

The difference in specific gravity between eggs and saturated NaCl solution causes worm eggs to float to the surface. The advantage of saturated NaCl solution is that it can identify mild helminthiasis with fecal samples containing few eggs, and parasites in fecal samples remain alive (Rohmayani et al., 2023).

RESEARCH METHOD

The research was conducted on January 9 - May 14, 2024 at the Parasitology Laboratory, Faculty of Health Sciences, Universitas Muhammadiyah Surabaya. Sampling was conducted at the Depo temporary shelter (TPS), Dukuh Sutorejo, Mulyorejo, Surabaya. The tools used are beaker glass, measuring cup, measuring flask, stirring rod, stick, gauze, dark color bottle, analytical balance, centrifuge and microscope. As for the materials needed are distilled water, NaCl powder, lugol, ZnSO₄ powder, warm water and feces samples. This type of research is observational research. The sample obtained was 30 samples of feces of janitors at the Depot who met the exclusion and inclusion criteria. The inclusion criteria in this study include Personnel responsible for cleanliness are willing to sign an informed consent form at the time of data collection to participate as respondents, cleaning members who work for more than 3 months with the last education level at the elementary / junior high school level, cleaners who during their activities do not carry out activities.

With the last education level at the elementary / junior high school level, janitors who during their activities do not use PPE (Footwear and gloves), do not clean their nails regularly and after their activities only wash their hands with running water without using soap.

Examination of fecal samples is carried out by macroscopic and microscopic examination. Macroscopic examination by observing odor, Ph, color, consistency, presence or absence of mucus and blood. Microscopic examination by using the flotation method with saturated NaCl solution and 33% ZnSO₄.

The flotation method using saturated NaCl is done by filling the venoject tube with a fecal sample of about 5 grams, add saturated NaCl while stirring continuously until homogeneous (do not spill), try not to have bubbles so as not to interfere with the reading of the inspection results, then put a cover glass on it and leave it for 10-15

minutes, after 15 minutes, put 1-2 drops of lugol on the cover glass, then the cover glass is placed on the glass object to be examined, then examine with a magnification of 10x or 40x using a microscope. Saturated NaCl examination was carried out as many as 3x repetitions to ensure that the results were appropriate (confirmation test).

The flotation method using 33% ZnSO₄ is done by filling the venoject tube with a stool sample of about 5 grams, mix the stool with enough warm water, then homogenize, use gauze in different tubes to filter out existing fibers, then centrifuge at 2500 rpm for 5 minutes, after sedimentation remove the water, add warm water once again, then centrifuge once again, repeat the process until the mixture becomes clear (do this three times). Then put a cover glass on it and leave it for 10-15 minutes, after 15 minutes the cover glass is placed on a glass object for inspection, then examine it at 10x or 40x magnification using a microscope. Examination of 33% ZnSO₄ is done as many as 3x repetition to ensure that the results are appropriate (confirmation test).

The data obtained was then analyzed with the SPSS Version 25 application using the Mann-Whitney U Non-Parametric Statistical Test.

RESULT AND DISCUSSION

The results of the analysis of fecal samples by flotation method with saturated NaCl solution and 33% ZnSO₄, there were 30 samples with three repetitions in each method. The results obtained were 6 negative samples with a percentage of 20% in the saturated NaCl and 33% ZnSO₄ flotation test, while the negative samples were 24 samples with a percentage of 80%.

Table 1. Results of stool examination using saturated NaCl and 33% ZnSO₄

Hasil pemeriks aan	Metode Flotasi			
	NaCl Jenuh		ZnSO ₄ 33%	
	Posit if	Nega tif	Posit if	Nega tif
	6	24	6	24

Persentase (%)	20%	80%	20%	80%
Rerata	8,86		20	
Selisih	11,43			
Uji Normalitas Data	NaCl Jenuh ZnSO ₄ 33%	Shapiro-wilk Sig. 0,000	P < 0,05	
Uji Beda parametrik Whitney U	Non Mann-Sig. (2-tailed)	0,034	P < 0,05	

Findings were calculated using statistics with explanations of 0 (negative) and 1 (positive). The Mann-Whitney U test was then run, and the results showed that the Asymp. sign. (2-tailed) was 0.034 ($P < 0.05$). Asymptotic Sig (2-tailed) < 0.05 indicates a significant difference. So the results obtained Hypothesis 1 is accepted because there is a difference in Quality between the 2 Flotation Methods using Saturated Nacl and 33% Znso₄ in the examination of janitorial feces samples.

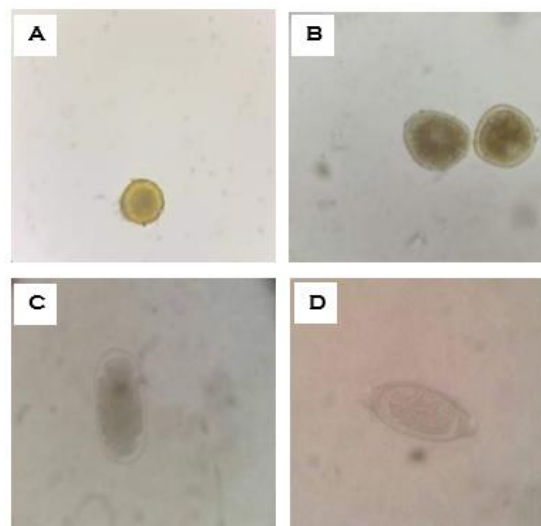


Figure 1. Stool examination by saturated NaCl flotation method found some samples positive for intestinal nematode worm eggs Soil Transmitted Helminths, A) Worm eggs *Ascaris lumbricoides fertil corticated*, B) Worm eggs *Toxocara sp.*, C) Worm eggs *Hookworm*, D) Worm eggs

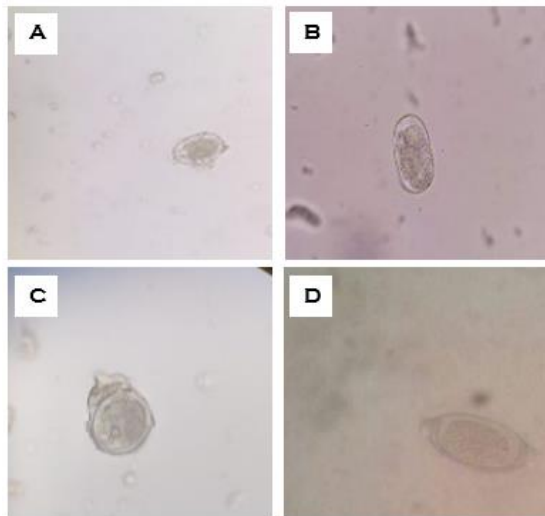
Trichuris trichiura

Figure 2. Examination of feces by 33% ZnSO₄ flotation method found some samples positive for intestinal nematode worm eggs Soil Transmitted Helminths, A). Worm eggs *Ascaris lumbricoides* fertil corticated, B) Worm eggs *Hookworm*, C) Worm eggs *Toxocara* sp, D) Worm eggs *Trichuris trichiura*

According to research by Astuti, D. S. P. (2018) the flotation method is the most widely used approach in parasite identification both in the scope of clinical and epidemiological surveys. Saturated salt or sugar solution is used in the flotation procedure as a tool to help eggs float to the surface, making it easier to identify worm eggs in fecal samples. This technique is widely applied when analyzing feces containing few eggs. Therefore, this method is often used in hospitals and during epidemiological surveys as an accurate diagnosis. Saturated NaCl is a commonly used technique in the field and in educational institutions because it is simpler to implement and requires fewer reagents than the flotation method using 33% ZnSO₄ solution.

According to research by Setiawan et al. (2018) Saturated NaCl solution with a specific gravity of 1.1979 and 33% ZnSO₄ solution with a specific gravity of 1.2251 were used in the flotation procedure of this study. The end result is different because

the solutions used have different specific gravity. Thus, it can be said that compared to the ZnSO₄ flotation method, the sensitivity of the NaCl flotation method is lower.

The results showed that the flotation method with saturated NaCl solution produced a clearer view of worm eggs and a cleaner examination field, while the results of the flotation method with 33% ZnSO₄ solution found more types of worm eggs, but the examination field was slightly dirty so that it could interfere with the examination.

The advantages of the Saturated NaCl flotation procedure are that it can identify mild helminthiasis with fecal samples containing few eggs, and the parasites in the fecal samples remain alive, and the examination background is clean, making it easier to identify the type of eggs. The long flotation method in the saturated NaCl flotation method is a disadvantage because it can produce false negative results. This occurs if the flotation time is too long, causing the worm eggs to sink back to the bottom of the tube and leaving no visible worm eggs for examination.

The advantages of the 33% ZnSO₄ flotation method are that more types of worm eggs are found, very effective for detecting cysts and larvae in fresh specimens. This technique works with fresh and stored material and can identify parasites in moderate disease. The disadvantages of the 33% ZnSO₄ flotation method are that the background is dirty, so it can cover the worm eggs resulting in false negative results, it is not suitable for detecting eggs with an operculum that has a specific gravity of more than 1.2, cyst shape distortion occurs, when the specimen has been exposed to ZnSO₄ for too long, the parasite settles after 30 minutes unless the material has been stored with formalin beforehand. Therefore, the examination needs to be carried out within a short period of time in order to detect about 20% of patients who secrete *Taenia* sp. segments.

The quality of specificity for

identifying the presence of Soil Transmitted Helminths (STH) eggs is influenced by the variation in the use of solutions in this test. Both types of reagents, especially the 33% ZnSO₄ reagent, are of higher quality and effective for the flotation process than saturated NaCl. This is due to the fact that, compared to saturated NaCl, the 33% ZnSO₄ solution gave better results, ranging from a greater variety of worm eggs and eggs of better quality and shape.

CONCLUSION AND RECOMMENDATION

The results of the examination of saturated NaCl and ZnSO₄ 33% obtained 6 positive samples or 20% of the total sample samples, while as many as 24 negative samples or 80% of the total samples. This examination found eggs of *Ascaris lumbricoides*, *Trichuris trichiura*, *Toxocara* sp, and *Trichuris trichiura*. The results of statistical analysis Asymp. Sig. (2-tailed) is 0.034. Asymptotic Sig (2-tailed) < 0.05 indicates a significant difference in data from the two types of reagents. Especially the 33% ZnSO₄ reagent, has a higher quality and is effective for the flotation process than saturated NaCl. This conclusion was drawn from the fact that the 33% ZnSO₄ solution gave better results and a greater variety of worm eggs, as well as better dosage quality and egg shape than saturated NaCl.

Asvice for the community, it is hoped that this study can be used as information material, especially for cleaning workers who are very vulnerable to helminthiasis. This includes ensuring that workers wear complete personal protective equipment, wash their hands frequently, and maintain good hygiene. Other researchers are expected to test the quality analysis of the examination by modifying the examination method to obtain the results of Soil Transmitted Helminths (STH) eggs so that fecal examination can be used as a gold standard in the diagnosis of helminthiasis infection.

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