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COMPARISON OF SOIL-TRANSMITTED HELMINTH EGG INFESTATION IN FECES OF INTELLECTUAL DISABILITY (ID) CHILDREN WITH NON-ID CHILDREN

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ABSTRACT

Background: The worm infestation is considered as one of the causes of cognitive function disruption. It also can aggravate the condition in children with intellectual disability (ID). This greatly affects health conditions, such as abdominal pain, bloating, diarrhoea, constipation and other digestive disorders. Indigestion may increase aggressive behaviour, mood change and malnutrition so that it leads to chronic malnutrition which is the cause of major morbidity and premature death in the ID population. This study aimed to compare soil-transmitted helminth egg infestation in stool samples between ID children and non-ID children.

Methodology: This present study was a descriptive study with a cross sectional design. Stool samples was collected from 30 students from Special Need School and 60 students from Elementary School in the Cirebon City. The floating method was used to identify the egg of soil-transmitted helminth. The stool samples were examined in the Laboratory of the Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon, Indonesia

Results: The laboratory test found positively Soil-transmitted Helminth eggs in 9 of 30 stool sample of ID students. Among them, it was found 5 stool samples with *Ascaris lumbricoides*, 2 stool samples of *Trichuris trichiura*, and 2 stool samples of *Necator americanus*. Regarding their levels, 4 students (44.4%) had mild intellectual disability and 5 students (55.6%) had moderate intellectual disability. However, there was not found any Soil-transmitted Helminth eggs in stool samples of non-ID children.

Conclusion: Soil-transmitted helminth eggs was found only in stool samples of ID children. The hygiene and sanitation in the school should be guaranteed to prevent the transmission of Soil-transmitted Helminth.

Key words: Soil-Transmitted Helminth, Intellectual Disability (ID), Feces

INTRODUCTION

Intellectual disability (ID) is a decline in intellectual function that is comprehensively meaningful and directly causes disruption of social adaptation, and manifests during the developmental period with a value of Intelligence Quotient (IQ) less than 70 and found at age less than 18 years old [1,4]. Based on data in 2013 from Indonesia Basic Health Research, the Indonesia population with disabilities is 8.3 percent of the total population. Disabled people in Indonesia are 6,008,661 people. That number is around 402,817 people with mental retardation or intellectual disability [3].

Children with ID consume less nutritious food, this can be caused by difficulty in swallowing and along with digestive problems, so that it can cause chronic malnutrition and be susceptible to infections such as parasitic infections [6,7,8]. Common parasites found in gastrointestinal tract infections are *Ascaris*

lumbricodes, Trichuris trichiura, Ancylostoma duodenale and *Necator americanus* which will affect the nervous system and digestive system. They also correlate with the immune system [9].

Parasitic infections can cause abdominal pain, bloating, diarrhea, constipation and other digestive disorders [6]. Indigestion can also increase aggressive behavior, mood swings and malnutrition so that it leads to chronic malnutrition which is the cause of major morbidity and premature death in the population intellectual disability (ID) [10,11,12,13]. Based on the above explanation, it is necessary to identify the soil-transmitted helminth eggs in ID children compared to non-ID children.

METHODS

Ethical Clearance Agreement No. 57/EC/FK/XI/2018 is obtained from the Ethics Committee of the Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon, Indonesia. This research is a descriptive study with a cross sectional design using total sampling. The samples are 30 stool samples from Special Need School students and 60 stool samples from Elementary School students in Cirebon. The stool sample is examined at the Laboratory of the Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon, Indonesia. Inclusion criteria of ID group are children who have intellectual disability. The classification of intellectual disability is described in table 1. Inclusion criteria of non-ID group are children without intellectual disability. Range age of both ID group and non-ID group are aged 6-12 years. Exclusion criteria of this study are parents or children refuse to take or collect the feces sample.

Table 1. Classification of Intellectual Disability According to the DSM-V and ICD 10[19]

Level of ID	DSM-V		ICD-10	
	Classification	IQ Level	Classification	IQ Level
Mild	317	50-55 to 70	F70	50-69
Moderate	318.0	35-40 to 50-55	F71	35-49
Severe	318.1	20-25 to 35-40	F72	20-34
Profound	318.2	<20-25	F73	<20

Parents who are willing to be the representative of the respondents in this study have signed an informed consent. Then, they are given an explanation of how to collect stool and provided a kit consisting of hand scoons, mask, spoon and stool pot.

In this study uses qualitative method that is flotation method to identify the egg of soil-transmitted helminth. The way it works is based on the specific gravity of the solution used, so that the eggs float on the surface and also to separate the large particles contained in the stool. The flotation method uses a saturated NaCl solution based on the specific gravity of the egg so that the egg will float and be easily observed. After the stool sample is collected, the flotation method is then conducted by means of each stool sample is inserted into a test tube and mixed with a saturated NaCl solution and then stirred. Then, the tube is pressed NaCl until full, then the glass cover is stored at the top of the tube and is waited for up to 15 minutes. Then the glass cover is taken and placed on the glass object. After that it is identified using a microscope with a magnification of 100x and 400x.

RESULTS

After the stool samples are collected, the baseline character of the respondent of this research are described in the table 1.

Table 2. Baseline Character

Parameter	Group	ID Children (n=30)		Non-ID Children (n=60)	
		Number	%	Number	%
Sex	Female	12	40%	24	40%
	Male	18	60%	36	60%
Grade	1	10	33%	20	33%
	2	2	7%	4	7%
	3	4	13%	8	13%
	4	3	10%	6	10%
	5	9	30%	18	30%
	6	2	7%	4	7%
Age (Range)		6-12		6-12	

The results of the analysis in Table 1 show that, based on the sex of the children, ID children consist of more male, namely 18 male children (60%), compared to women who only consist of 12 female children (40%). Sex in normal children also consists of more male, namely 36 male children (60%), compared to women who only consist of 24 children (40%).

Based on the class, ID children are ranked from the highest number of respondents, namely grade 1 with 10 children (33%), grade 5 with 9 children (30%), grade 3 with 4 children (13%), grade 4 with 3 children (10%), grade 2 with 2 children (7%) and grade 6 with 2 children (7%). In addition, non-ID children are sorted from the most, namely grade 1 with 20 children (33%), grade 5 with 18 children (30%), grade 3 with 8 children (13%), grade 4 with 6 children (10%), grade 2 with 4 children (7%) and grade 6 with 4 children (7%). Based on the age of the child, the range of both ID and non-ID children are 6-12.

The results shows that the number of students who are positive consist of 9 students (30%) in ID children and 0 students (0%) in non-ID children. Negative student numbers are 21 students (70%) in ID children and 60 students (100%) in non-ID children.

Table 3. Comparison between the Results of Faecal Examination in the ID Children with Non-ID Children.

Results of Stool Examination	Frequency (n)		Percentage (%)	
	(+)	(-)	(+)	(-)
ID Children	9	21	30	70
Non-ID Children	0	60	0	100

The results shows that the number of students who are positive consist of 9 students (30%) in ID children and 0 students (0%) in non-ID children. Negative student numbers are 21 students (70%) in ID children and 60 students (100%) in non-ID children.

The results of the identification of the number of worm species in the ID children are depicted in the figure below.

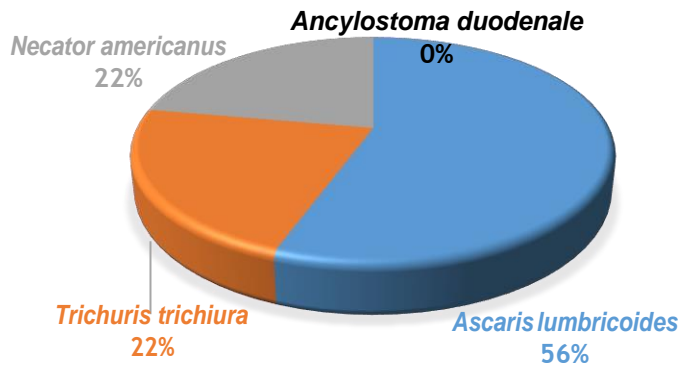


Fig. 1. The percentage of *Ascaris lumbricoides* eggs, *Trichuris trichiura* eggs, *Necator americanus* eggs and *Ancylostoma duodenale* eggs identified in stool samples.

The results showed that 5 *Ascaris lumbricoides*, 2 *Trichuris trichiura*, 2 *Necator americanus* and 0 *Ancylostoma duodenale* are identified.

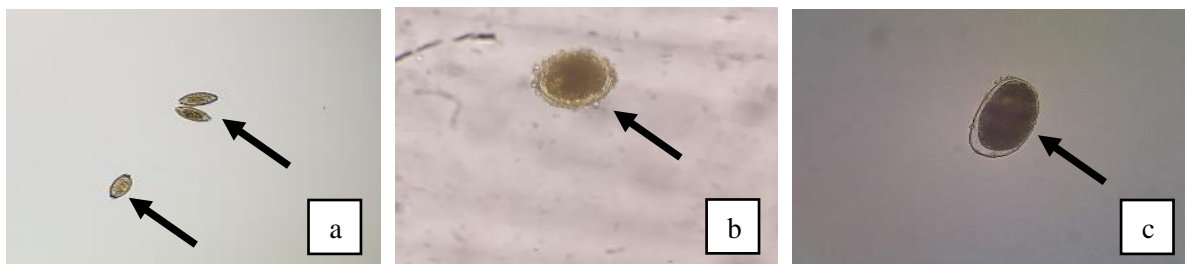


Fig. 2. Morphology of soil-transmitted helminth eggs identified in stool samples (a) *Trichuris trichiura* eggs (b) *Ascaris lumbricoides* egg (c) *Necator americanus* egg. ^(Personal Document)

The results of the study reveal that figure 2 identifies several types of soil-transmitted helminth eggs with different morphologies.

Table 4. Frequency Distribution of Results of Stool Examination (+) in ID Children Based on their Levels

Examination Results	Number (n)	Percentage (%)
Mild	4	44,4%
Moderate	5	55,6%
Total	9	100%

Although there are four levels of intellectual disability, in this study only two levels can be found, 4 students (44.4%) have mild intellectual disability and 5 students (55.6%) have moderate intellectual disability.

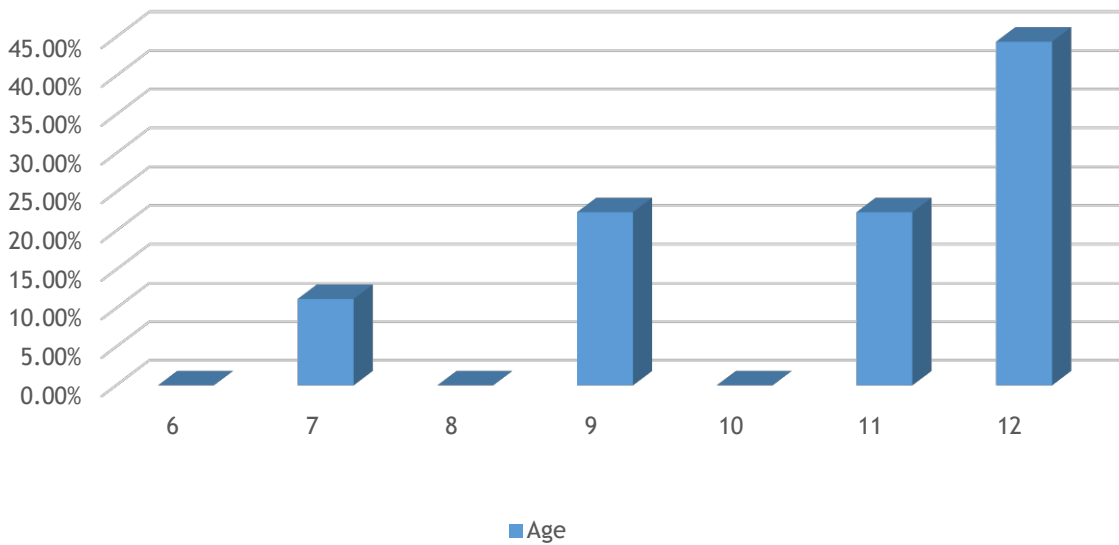


Fig. 3. The percentage of ID children identified egg of soil-transmitted helminth based on their age.

ID children identified egg soil-transmitted helminth consist of 4 children aged 12 years old, 2 children aged 9 years old, 2 children aged 11 years old and 1 child aged 7 years old.

Table 5. Identified Distribution of ID Children Soil-Transmitted Eggs Helminth Based on Class.

Grade	Results of Stool Examination (+)	
	Number (n)	Percentage (%)
1	4	44,4%
2	0	0%
3	0	0%
4	1	11,2%
5	4	44,4%
6	0	0%
Total	9	100%

Distribution of ID children which identified soil-transmitted helminth eggs based on class shows that there are grade 4 with 1 children, grade 5 with 4 children and grade 1 with 4 children.

Table 6. Frequency Distribution of Results of Stool Examination ID Children by Sex

Examination Result (+)	Number (n)	Percentage (%)
Female	4	44,4%
Male	5	55,6%
Total	9	100%

The distribution of ID children identified by soil-transmitted helminth eggs based on sex reveals that it is higher in men than in women.

DISCUSSION

This study shows that the number of students who are positive consist of 9 students (30%) in ID children and 0 students (0%) in non-ID children. I means soil-transmitted helminth egg infestation in ID children

is higher compared with non-ID children. This can be caused by bone maturation which is a little bit late so that it affects the maturity of eosinophil cells as cells that fight soil-transmitted helminth. In addition, personal hygiene also greatly influences soil-transmitted helminth infestation in ID children [2,17]. Personal hygiene includes hand washing, nail cutting, and footwear use that greatly affects the occurrence of soil-transmitted helminth infestation [14]. These results are in accordance with direct interviews with parents of ID children.

This study shows 44,4% students have mild intellectual disability and 55,6% students have moderate intellectual disability. It can be concluded that soil-transmitted helminth infestation in ID children with moderate levels is higher than mild levels. This can be caused because personal hygiene in children with mild intellectual disability is higher than moderate intellectual disability.

ID children have not been able to apply hand washing using soap before and after meals, after holding dirty objects or after defecating. These things greatly influence the occurrence of soil-transmitted helminth infestation in ID children.

ID children consume less nutritious food compared with healthy children, this can be caused by difficulties in swallowing and along with digestive problems, so that it can affect chronic malnutrition and be susceptible to infections such as parasitic infections. Malnutrition is also a cause of primary morbidity and premature death in the ID population [16].

ID children have discomfort when studying, this can be caused by parasitic infections that can cause abdominal pain, bloating, diarrhea, constipation and other digestive disorders [6]. Indigestion also can increase aggressive behavior, mood swings and malnutrition so that it can lead to chronic malnutrition which is the cause of major morbidity and premature death in the ID population [9,12,13,15].

Soil-transmitted helminth infestation also can affect the imbalance of cytokines can cause hyperactivity of microglia cells in the brain so that they become toxic for the brain cells [5,18]. This will disrupt the gut-brain axis system where digestive tract disorders can affect the nervous system. When unbalanced cytokines in the digestive system is as a result of soil-transmitted helminth infestation, it will stimulate the nervous system so that the nervous system secretes neurotransmitters which will cause anxiety, emotional enhancement, memory and cognitive impairment. These things can worsen the condition of ID children in conducting their activities and in learning activities.

CONCLUSION

Eggs of soil-transmitted helminth in feces of ID children are identified and in feces of non-ID children are not identified. Soil-transmitted helminth infestation can be prevented by always washing hands with soap. Further research can be taken from respondent's nails and also can use other method to identify.

CONFLICT OF INTEREST DECLARATION

The authors declare that there is no conflict of interest regarding the publication of this paper.

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