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THE IMPACT OF INTESTINAL HELMINTHIASIS ON THE Z-SCORE OF SCHOOL CHILDREN IN THE RIVERBANK AREA

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ABSTRACT:

Background: Intestinal helminthiasis is a human intestinal worm parasite infection by oral-fecal transmission. The prevalence of helminthiasis across Indonesia in children aged 1-15 years old remains high. It can cause nutritional deficiencies, decreased immunity, and stunted growth and development. The nutritional status parameter in children is the Body Mass Index (BMI) for Age Z-score (BAZ) related to stunting determination. This study aimed to determine the impact of intestinal helminthiasis infection on the z-score of primary school children in riverbank areas. **Methods:** This study was an analytical survey with a cross-sectional design. The sample obtained by total sampling of the population was 237 students 7 -14 years old, in two primary schools in the East and West Martapura riverbank area. Intestinal helminthiasis was obtained from quantitative helminth egg's microscopic examination in no preservative feces specimens by the Kato-Katz method as Eggs Per Gram (EPG). BAZ Z-score was determined by calculating the student's weight in kilograms divided by height square in meters as BMI then compared to the BAZ-score table. **Results and Discussions:** The results showed that 23 respondents (9.7%) found intestinal helminth eggs of *Ascaris lumbricoides*, *Trichuris trichiura*, and *Hymenolepis nana* in their feces with 11.5-115 EPG and 214 respondents (90.3%) were negative (0 EPG). The nutritional status by BAZ-score shows 123 (51.9%), students are in the thinness category, 75 (31.6%) students are normal, 28 (11.8) students are overweight and 11 (4.5%) students are obese. The Spearman correlation test showed there was a significant negative correlation between intestinal helminthiasis and Z-score in primary school children with a p-value of 0.006 (<0.05). **Conclusions:** Intestinal helminthiasis infection has an impact on the Z-score of primary school children in riverbank areas. Further research is recommended to conduct helminthiasis factors and other parameters of nutritional status.

Keywords: Intestinal Helminthiasis, Z-score, School Children, Riverbank Areas.

1. Introduction

Intestinal helminthiasis is one of the diseases with a high prevalence in the world. Intestinal helminth infection is a chronic infection that often occurs in tropical and subtropical areas (Neto et al., 2023; WHO, 2017). More than 1.5 billion people, or 24% of the world's population are infected with helminth. Infections often occur in tropical and subtropical areas, with the largest numbers occurring in sub-Saharan Africa, America, China, and East Asia. More than 267 million preschool-age children and more than 568 million school-age children live in areas where this parasite is transmitted intensively and requires treatment and preventive interventions.

The prevalence of worms in children throughout Indonesia aged 1-12 years is at a high level, 30% to 90%. There are approximately 13 million preschool-age children and 37 million elementary school-age children infected with intestinal worms (Lee & Ryu, 2019). According to data from the Health Research and Development Agency (Rahayu et al., 2019), in the South Kalimantan region in Banjar Regency, the prevalence rate was 1.07% positive for helminthiasis.

2. Literature Review

The species of intestinal helminthiasis that often infect humans are round worms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*), hookworms (*Necator americanus* and *Ancylostoma duodenale*), pinworms (*Enterobius vermicularis*) and dwarf tapeworm (*Hymenolepis nana*) and *Hymenolepis diminuta* as known as rat tapeworm (J. Lee & Ryu, 2019; Rahayu et al., 2019).

(Djuardi et al., 2021) their study found 58.8% STH infection in 393 Nangapanda subdistrict preschool children, predominated by *Ascaris lumbricoides*, and based on BAZ-score found that the younger children were found to have a higher risk of anemia and stunting. A previous study by (Rifqoh et al., 2023) shows that 19.76 % of 253 schoolchildren in four West Martapura are infected by soil-transmitted helminths.

The symptoms of children with intestinal helminthiasis vary depending on the species of helminth. It can be asymptomatic in mild infections and develop into other symptoms such as stomachache, nausea, vomiting, fever, dizziness, weakness, and loss of appetite. Besides its symptoms, the effects that often occur in children with helminthiasis include diarrhea, malnutrition or stunting, blood loss into anemia, enlarged stomach, and decreased cognitive and concentration (Djuardi et al., 2021; Fauziah, Ar-Rizqi, et al., 2022; Muhlisin, 2024; Olopade, 2022).

(Cahyono et al., 2023) revealed that EPG of STHs was associated with a hemoglobin level of 13.937 with prediction a -0.031 fold decrease in risk and with an eosinophil count of 140.204 with a 4.156 fold increase in risk. Other study by (Unnufus et al., 2024) shows a significant relationship between hemoglobin levels and STH worm infections in elementary school children at SDN Sungai Batang 1, Banjar Regency

The high incidence of helminthiasis in children is caused by the low level of knowledge of parents regarding worm infections. Lack of knowledge of parents in preventing and treating worm infections, especially mothers, generally still consider helminthiasis trivial. Therefore, effective preventive measures have not been fully implemented. Infective worm eggs can easily enter a child's body through food contaminated by the eggs or through contaminated water. Therefore, the importance of the mother's level of knowledge in educating children about a healthy and clean lifestyle is very necessary to prevent the incidence of helminthiasis in Indonesia (Geary & Haque, 2021; P. Lee et al., 2023).

3. Research Method

This study was an analytical survey with a cross-sectional design. The sample obtained by total sampling of the population was 237 students, 7-14 years old in two primary schools in the East and West Martapura riverbank area. Intestinal helminthiasis was obtained from quantitative helminth egg microscopic examination in no preservative feces specimens by the Kato-Katz method as Eggs Per Gram (EPG) (WHO, 2019). 237-thick smear preparation of school children's feces conducted in duplication for the parasitology examination by two expert medical laboratory technicians.

Participant weight and height were measured by GEA ZT-120. Body mass index (BMI) calculated a person's weight, in kilograms, divided by their height, in meters squared. BAZ Z-score was determined by comparing BMI to the BMI for Age Z-score (BAZ) table based on The Guideline of Children Anthropometry measurement in Health Ministry Regulation no. 2 2020, (Permenkes, 2020).

4. Results and Discussion

Table 1. Gender Characteristics of school children.

Genders	Number (N)	Percentage (%)
Male	132	55.7
Female	105	44.3
Total	237	100.0

Table 2. Ages Characteristics of School Children.

Ages	Number (N)	Percentage (%)
7 years old (84 – 95 months)	7	3.0
8 years old (96 – 107 months)	38	16.0
9 years old (108 – 119 months)	45	19.0
10 years old (120 – 131 months)	47	19.8
11 years old (132 – 143 months)	37	15.6
12 years old (144 – 155 months)	38	16.0
13 years old (156 – 167 months)	20	8.4
14 years old (168 – 179 months)	5	2.1
Total	237	100.0

Table 3. Intestinal Helminthiasis in school children.

Intestinal Helminthiasis	Number (N)	Percentage (%)
0 EPG	215	90.7
11.5 EPG	4	1.7
23 EPG	4	1.7
46 EPG	5	2.1
57.5 EPG	2	0.8
69 EPG	3	1.3
92 EPG	1	0.4
115 EPG	3	1.3
Total	237	100.0

Table 4. BMI for Age Z-Score (BAZ) of school children.

BAZ Category	Number (N)	Percentage (%)
Thinness	123	51.9
Normal	75	31.6
Overweight	28	11.8
Obese	11	4.6
Total	237	100.0

Table 5. Crosstabulation Intestinal Helminthiasis and BAZ of school children.

Intestinal Helminthiasis	BAZ Category				Total
	Thinness	Normal	Overweight	Obese	
	N	N	N	N	N
0 EPG	106	70	28	11	215
11.5 EPG	3	1	0	0	4
23 EPG	2	2	0	0	4
46 EPG	5	0	0	0	5
57.5 EPG	2	0	0	0	2
69 EPG	2	1	0	0	3
92 EPG	1	0	0	0	1
115 EPG	2	1	0	0	3
Total	123	75	28	11	237

Table 6. Spearman'Rho Correlation Test

Spearman'Rho Correlation Coefficient		N (%)	N (%)
Z Score	Correlation Coefficient	1.000	-.178**
	Sig. (2-tailed)	.	.006
	N	237	237
Z Score	Correlation Coefficient	1.000	-.178**
	Sig. (2-tailed)	.	.006
	N	237	237

The results showed that 23 respondents (9.7%) found intestinal helminth eggs of *Ascaris lumbricoides*, *Trichuris trichiura*, and *Hymenolepis nana* in their feces with 11.5-115 EPG and 214 respondents (90.3%) were negative (0 EPG). The nutritional status by BAZ-score shows 123 (51.9%), students are in the thinness category, 75 (31.6%) students are normal, 28 (11.8) students are overweight and 11 (4.5%) students are obese. The Spearman correlation test showed there was a significant negative correlation between intestinal helminthiasis and Z-score in primary school children with a p-value of 0.006 (<0.05).

Intestinal helminth infections in humans are transmitted through oral-fecal transmission. It could be transmitted by direct contact with contaminated soil, or by flies, fleas, and cockroaches as mechanical vectors contaminated food or waters with helminth's eggs or larvae. There are several species of intestinal helminthiasis that often infect humans like roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*), hookworm (*Necator americanus* and *Ancylostoma duodenale*), pinworms (*Enterobius vermicularis*), dwarf tapeworm (*Hymenolepis nana*), and *Hymenolepis diminuta* as known as rat tapeworm

Adult worms in the intestines will absorb nutrients so that influential to status nutrition. On worm mature *Ascaris lumbricoides*, If they present in amount Which Enough they can causes damage to humans, namely nutritional intake and negative effects absorption, Because worm mature from *Ascaris* No only take food from food Which digested in intestines Sir House but Also produce Toxicity metabolic, Which his presence bother digestion absorption protein, fat, carbohydrate, vitamin (A, B, C) and causes poor nutritional status especially in children with poor nutritional intake low (Cave et al., 2023; Dwivedi et al., 2023; Ferenc & Ikmi, 2023; Onyekwelu & Eze, 2024)

In mild *Trichuris trichiura* infections, no symptoms are found. Symptoms Gastrointestinal Which nonspecific can in complain about like nauseous, vomit, painful abdomen, diarrhea, And constipation, that is on infection Which more heavy.. On infection I a number of patient will cause *Trichuris* dysentery syndrome is characterized by abdominal pain and diarrhea with blood. Which due to Because the friction in intestines big so that cause the occurrence lack blood And lost nutrition. With dysentery heavy children develop weight loss and become thin (Fauziah et al., 2022; Raj et al., 2022; Scott & Koski, 2021)

Necator americanus and *Ancylostoma duodenale* infections at the stage Adult symptoms depend on the species and number of worms and conditions nutrition sufferer. Worm mine mature emit anticoagulants such as potent factor Xa inhibitors, which allow the worms mine to swallow blood. The most serious consequence of a severe infection is iron deficiency anemia, which can be worsened in patients who do not treated. Infection heavy chronic cause lack nutrition, hypoproteinemia and profound anemia resulting in growth retardation (Cassar & Dagenais, 2023; Tsuji, 2020)

The method of determining nutritional status that is often used is by WHO Z-Score interpretation. Body Mass Index (BMI) According to age, it is used to determine malnutrition, undernutrition, good nutrition, at risk nutrition

more And obesity. Status nutrition child in group in accordance with threshold limit Z-Score , child with threshold limit Z-Score -3 SD sd $<-2\text{ SD}$ are included in the category of undernutrition (thinness), children with a threshold Z-Score -2 SD sd $+1\text{ SD}$ enter in category Nutrition Good (normal), child with a Z-Score threshold of $+1\text{ SD}$ to $+2\text{ SD}$ is included in the Nutrition category more (overweight), children with a Z-Score threshold $>+2\text{ SD}$ are included in Overweight category , children with a BMI/U threshold $<-3\text{SD}$ at risk nutrition bad so that need handled more carry on For prevent the occurrence of malnutrition (Permenkes, 2020).

5. Conclusion and Implications

The Spearman correlation test showed there was a significant negative correlation between intestinal helminthiasis and Z-score in primary school children with a p-value of 0.006 (<0.05). This means the nutritional status will decrease in line with increasing intestinal helminth infections as shown by EPG. Intestinal helminthiasis infection has an impact on the Z-score of primary school children in riverbank areas. Further research is recommended to conduct helminthiasis factors and other parameters of nutritional status.

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