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EFICATION OF ZINC SUPPLEMENTATION ON DIFFERENCES OF WEIGHT AND HEIGHT IN SCHOOL CHILDREN POST INFECTED SOIL TRANSMITTED HELMINTH

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ABSTRACT The prevalence of STH in Indonesia in general is still very high at 60%, especially in the underprivileged population who have a high risk of contracting this disease. STH infection showed an association with zinc concentration. Factors influencing child growth differ between populations and may depend on prevalences of STH species and zinc deficiency. This study was a randomized, non-disguise clinical trial conducted to assess zinc effectiveness on differences of weight and height of children after infection with the Soil Transmitted Helminth (STH) in February-May 2017. All data is recorded in the status of the study, collected and then processed using SPSS 16.0 for Windows computer software. Of the 200 students, 70 met the inclusion criteria and 39 students were willing to measure their weight and height. Based on research using paired T test found significant differences in mean body weight and height at the beginning and end of the study in each group of zinc supplementation and without zinc supplementation. Based on this study there were significant differences in mean weight and height at the beginning and end of the study in each group of zinc supplementation and without zinc supplementation.

KEYWORDS : STH;Zinc; Height;Weight; children.

INTRODUCTION

Soil Transmitted Helminth (STH) is a worm infection that is transmitted through soil caused by five types of worms, Ascaris lumbricoides, Trichuris trichiura, Ancylostama duodenale, Necator americanus and Strongyloides stercoralis. The prevalence of STH in Indonesia in general is still very high at 60%, especially in the underprivileged population who have a high risk of contracting this disease. Report on the survey results on the prevalence of worm infections in 10 provinces in 2004, North Sumatra was ranked 3rd (60.4 %) in helminthiasis.[1,2,3]

The metaanalysis study states that deworming alone cannot treat the underlying nutritional deficits caused or exacerbated by worm infections, so additional energy is needed such as macronutrients and micronutrients.[7] One micronutrient that can be given is zinc, where zinc can directly affect intestinal epithelial transport and maintain intestinal epithelial cell tight junction, which can cause an inflammatory reaction in the intestinal mucosa.[9]

Zinc is a micro mineral (trace element) which is important in every cell of the body, plays a role in stimulating the activity of approximately 100 enzymes, substances that support biochemical reactions in the synthesis of DNA, RNA and proteins that occur during division, differentiation and cell growth in in the body. Zinc absorption is regulated by metalotionin which is synthesized in the cells of the gastrointestinal wall. When consumption of zinc is high, in the cells of the gastrointestinal wall, some are converted to metalotionein as deposits, so that absorption is reduced. This form of deposit will be removed with the cells of the small intestine wall, which are 2-5 days old. Metalotionein in the liver binds zinc until it is needed by the body.[21,22]

Cut off of zinc levels in children under 10 years is 9.9 μmol / L (for morning sampling) and 8.7 μmol / L for blood sampling at more than 12 noon. Zinc deficiency define if the serum zinc level is <65 μg / dl. Some parameters that can be used to determine the body's zinc status include internal zinc concentrations: plasma or serum, erythrocytes, leukocytes, hair, urine, saliva.[21]

There are several ways to assess nutritional status, one of which is anthropometric measurement. The principle of determining nutritional status by anthropometric examination is to determine the proportion of body weight (body weight) according to body length/height.[23]

METHODS

Study Design

This study was a randomized, non-disguise clinical trial conducted to assess zinc effectiveness in improving the enchancement of height and weight of children after infection with the Soil Transmitted Helminth (STH) in February-May 2017 and conducted at Sikapas Village, Muara Batang Gadis District,Mandailing Natal.

The demographic data of the research subjects were collected through direct interviews with the subject using a questionnaire about personal data, parent data recording weight and height of the subject and parents (biological father and mother), nutritional status of the subject.

Exclusion Criteria are 1.The presence of chronic systemic diseases (TB, etc.). 2. Use of food supplements within 3 months before research. 3. Bad nutrition. This study was approved by the Health Research Ethical Committee, Medical School, Universitas Sumatera Utara.

Sample recruitment

All children who fulfilled the inclusion criteria were enrolled in this study. Informed consent was approved by parents. The total number of elementary school students in the 384 Sikapas Public Of the 200 students, 180 students who were examined for feces were found all worm eggs in their feces. After deworming using albendazole 400 mg, a week later an examination was performed to check worm eggs in the stool and found 123 students without worm eggs in their feces. From 76 students met the inclusion criteria of this study, research and interview approval was conducted and 39 samples were available. Samples divided into two groups. Found 39 samples who were willing and the rest were unwilling to take part in this study. 39 samples were willing to be divided into 2 groups, namely the intervention group and the control group with a simple randomized randomization method using paper that had been previously marked. Then the height and weight measurements were carried out in each group. In the intervention group supplemented with zinc syrup of 10 mg for 3 months and then reassessing body weight and height 3 months later. Whereas in the control group after deworming, then repeated measurements of body weight and height after 3 months.

Statistical Analysis

All data is recorded in the status of the study, collected and then processed using SPSS (Statistical Package for the Social Analyzed) 16.0 for Windows computer software. Data were analyzed with statistical test using Chi Square to detemined the demography characteristic of the subject. To find out the difference in mean weight and height in each intervention group and the control we used a dependent T test. Meanwhile, T test independent and Mann-Whitney test to determined deviation in body weight and height in each group of zinc supplementation and without zinc supplementation. Subsequently, this study was intergrated confidence interval of 95% $p < 0.05$ being considered as statistically significant differences.

RESULTS

The research was held at SD Negeri 384 in Sikapas village, Muara Batang Gadis subdistrict, Mandailing Natal district. Seventy six students conducted research and interview approval. Found 39 samples who were willing and the rest were unwilling to take part in this study.

Body weight and height were not too much different between these 2 groups, 25.3 kg (SD = 5.64) and 23.2 kg (SD = 4.41), 125.3 cm (SD = 10.90) and 123.0 cm (SD = 10.80) each at intervention and control group (table 1).

Table 1 Demographic characteristics of subjects

Variable	Group		P
	Intervention (n=19)	control (n=20)	
Age, year, mean (SD)	8.3(2.05)	9.2(1.99)	0.111**
sex, *n* (%)			
Male	4 (21.1)	10 (50.0)	0.121*
Female	15 (78.9)	10 (50.0)	
Weight, kg, mean (SD)	25.3 (5.64)	23.2(4.41)	0.164**
Height, cm, mean (SD)	125.3(10.9)	123.0(10.8)	0.368**
Nutritional status, *n* (%)			
Less	2 (10.5)	5 (25.0)	0.498*
Good	16 (84.2)	14 (70.0)	
Excess	1 (5.3)	1 (5.0)	0.218*
Father's qualification, n (%)			
Primary grade	15(78.9)	18(90.0)	
Secondary Grade	4(21.1)	1(5.0)	
High school	0(0)	1(5.0)	0.487*
Mother's qualification, n (%)			
Primary Grade	18(94.7)	20(100.0)	
Secondary Grade	1(5.3)	0(0)	
High school	0(0)	0(0)	**0.043***
Father's occupation, n (%)			
Private employee	10(52.6)	17(85.0)	
entrepreuner	7(36.8)	1(5.0)	
Farmer/sailor	2(10.6)	2(10.0)	
unemployee	0(0)	0(0)	**0.008***
Mother's work, n (%)			
Private employee	2(10.5)	17(85.0)	
Entrepreuner	9(47.4)	1(5.0)	
Farmer/sailor	0(0)	2(10.0)	
Unemployee	8(43.1)	0(0)	**0.021***
Parents salary, n (%)			
<Rp.500.000	1(5.3)	1(5.0)	
Rp.500.000- Rp.1.000.000	8(42.1)	1(5.0)	
Rp.1.000.000-Rp.3.000.000	10(52.6)	18(90.0)	

*Chi Square test, ** T test independent

Based on this study there were significant differences in mean weight and height at the beginning and end of the study in each group of zinc supplementation and without zinc supplementation. Using the paired (dependent) T test the initial control weight value was 23.26 kg (SD = 4.41) and the final control weight after 3 months 23.71 kg (SD = 4.70) (P = 0.010; 95% CI = -0.77, -0.12). The initial intervention weight was 2 5.33 kg (S D = 5.64) and the final intervention weight

after 3 months of intervention was 26.25 kg (SD = 5.72) (P = 0,000; 95% CI = -1.23, -0.59). This study describes significant changes in weight in elementary school children after zinc administration compared to control data (table 2).

Table 2. Differences in body weight and height in each group of zinc supplementation and without zinc supplementation.

VARIABLE	EARLY		LATE		*P*	CI 95%
	Mean	SD	Mean	SD		
Control Weight	23.26	4.41	23.71	4.70	0.010 *	-0.77,-0.12
Intervention weight	25.33	5.64	26.25	5.72	0.000 *	-1.23, -0.59
Control Height	123.07	10.8	123.33	10.7	0.003 *	-0.41,-0.09
Intervention Height	125.39	10.9	126.08	10.8	0.000 *	-0.85,-0.52

*T test dependent

Using the paired T test also found that the initial height control score was 123.07 cm (SD = 10.8) and the final height control after 3 months was 123.33 cm (SD = 10.7) (P = 0.003; 95% CI = -0.41, -0.09) and Early intervention height 125.39 cm (SD = 10.9) and late height intervention after 3 months of intervention were 126.08 (SD = 10.8) (P = 0,000; 95% CI = -0.85, -0.52). This study showed a significant change in height after zinc administration in elementary school children compared to control data (table 3).

Table 3. Devition in body weight and height in each group of zinc supplementation and without zinc supplementation

VARIABLE	Control	Intervention	P	CI 95%
	Mean (SD)	Mean (SD)		
Deviation weight	0.50(0.66)	0.91(11.15)	0.058*	-0.01-0.84
Deviation height	0.20(0.30)	0.60(6.19)	0.001**	-

*T independent test, **Mann-Whitney test

Based on the results of the unpaired (independent) T test and the Mann-Whitney test, no significant deviation were found regarding weight gain in the group receiving zinc supplementation and those who did not receive zinc supplementation (P> 0.05). While the increase in height was found to be a significant difference in the group who received zinc supplementation (P <0.05).

DISCUSSION

STH infection generally interferes with absorption of food and causes less appetite, reduced micronutrients and anemia. Ascariasis causes a loss of 0.8 gram carbohydrates and protein loss of 0.035 grams per day. Hookworm infection causes blood loss of 0.2 cc, while Trichuris trichiura infection causes blood loss of 0.005 cc per day.[61]

Based on this study there were significant differences in mean weight and height at the beginning and end of the study in each group of zinc supplementation and without zinc supplementation.In 2009, Rosado et al. found that zinc supplementation increased height for age in Mexican infants, this effect was reduced by infection with Ascaris. KongSDak et al. found T. trichiura to be a significant predictor of serum zinc in Bangladesh populations where stunting is common. In this study, T. trichiura had a greater effect on serum zinc than A. lumbricoides. Osei et al. found no significant differences in the serum zinc of Indian children infected with STH and those who were not infected. Two recent meta-analyzes did not find a significant effect of zinc supplementation on STH infection rates. This study does not distinguish between the effects of different STH species.[58,59]

On a more fundamental note, it is currently unclear how long it will take for a reliable source of nutrition to become utilised for the building up of immune defenses and not for catching up on retarded growth. Many of the populations from the studies reviewed here have suffered from chronic undernutrition and high prevalence of soil-transmitted helminths and other infectious diseases, and hence, the treatment, nutritional supplementation given and the observation period might not be adequate or sufficient for the body to recover from the accumulated growth retardation, to wipe out infections and to strengthen the immune system at the same time. Such a situation might be more suitable for an accurate test of the impact of nutritional supplementation on (re-) infection with soil-transmitted helminths.[60]

CONCLUSION

Based on the results of this study, we recommend that STH infection and zinc status at the population level should be considered when assessing potential factors contributing to stunting. It is important to define a standard method and be reliable for measuring zinc and calculating the effects of inflammation to better explain the relationship between zinc, STH infection and growth. In populations living in STH endemic areas, a possible relationship between zinc and STH must be considered. This will increase the (evidence base) for interventions on child growth, for example by combining zin

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