

# Anthelmintic Intake on the Nutritional Status, Hemoglobin Content, and Learning Achievement of the Elementary School Student in Sukarami Palembang

Hartati\*, S Aryanti, S Y Muherman

Universitas Sriwijaya, Palembang, South Sumatera, Indonesia

\*tati\_unsri@rocketmail.com

**Abstract.** The main purpose study was to find out the effect of once a year of 400 mg albendazole on the nutritional status and learning achievement of elementary school students in Sukarami Palembang. Methods study used quasi experimental research with non -equivalent control group pretest-posttest design. This study was conducted in Palembang, South Sumatera for one year. Samples of this study were 1914 students deriving from a systematic stratified random sampling and divided into 2 groups: 986 students for the treatment samples were given 400 mg albendazole and 928 students for the controlled samples were given placebo. The result of this study found that there was a decrease in the prevalence of worm infection both in the treatment and controlled samples. However the number of infected students in the treatment samples decreased. The implication research is the drug albendazole worm declared as the most effective drug to treat intestinal worm infections.

## 1. Introduction

Worm infestation is still considered as a major health problem in the whole world today. Currently, there are more than two billion people in the world suffered the worm infestation. The biggest cause is roundworms that attack 1.2 billion people, followed by hookworms that strike 800 million people and whip worms that attack 600 million people [1]. In Indonesia, according to the early 2000 survey data from the Directorate General of Infectious Disease Control and Environmental Sanitation Department of Health, the prevalence range is from 40 to 60 percent.

Worm infections will lead to various health problems like itching, losing appetite, anemia, or the gastrointestinal tract clogging that requires operative action. Theoretically, worm infestation will cause anorexia, nutrients absorption disturbance and chronic destruction, which in turn will cause nutritional problems [1]. Worm infestation treatment will lead to the growth of children and can improve the quality of life of the children [2].

Palembang city, South Sumatra, in the research in the MITRA (Indonesia Partnership for the development of the child) scope of activities, carried out mass medication worm infestation by using Albendazole 400 mg once a year in all regions of Palembang city which includes eight districts [1]. The institution that appointed to implement the evaluation and monitoring of the research is the Health Department of South Sumatra. The purposes of the research are to study the effect of hemoglobin level improvement on the learning achievement of elementary school children who suffer from worms. The benefits of this research is to provide the information for relevant agencies about the outlook of the



infected elementary school children learning achievement and provide the alternative solutions to the problems.

## 2. Research Methods

The method used in this research is the study of non-equivalent experiment with control group pretest-posttest design approach. The research was conducted in the District Sukarame Palembang City for one year. The samples of the research consisted of 1914 children of primary school (SD) that selected through a process of sampling using the method of systematic multistage. 986 children were studying in the area that got mass worm infestation treatment (i.e. SDN 155, 156, 172, 191, 441, 442, 443, 444) in the form of provision of albendazole 400 mg once a year, and the rest were studying at the areas that did not get treatment, referred to as the comparison group (SD 01 and 02 Pulo Keto).

Kato-Katz method used to check the children worm infestation. Height measurement (TB) was performed using the plastic stadiometer who have the sensitivity up to 0.1 cm. Weight (BB) was measured by the sensitivity up to 100g, using digital bathroom scales, while the measurement of upper arm circumference (LILA) was performed with a plastic tape that has the smallest scale of 0.2mm. Capillaries of Lange, which affects the sensitivity up to 0.2mm, was used to check the fat under the skin on the triceps (TLBK). Anthropometric index used is the Unggi index by height according to age (TB/U) and weight according to age (BB/U), which was calculated based on the raw NCHS/WHO using Anthro software and were presented in units of standard deviations score. In addition, the software also calculated body mass index (BMI = Body Mass Index).

Hemoglobin (Hb) examination was implemented using a hemocue portable photometer in g/dl unit. Children learning achievement recorded on the original grades of the collective general test before the worm infestation, anthropometry and hemoglobin data collection implemented. The recorded grades were Mathematics, Indonesian Language and Natural Sciences with the unit of measurement to 1 digit after decimal. The data processed by using a computer and the analysis was performed by using a SPSS software for Window 7. The statistical test used was T group test as long as the data condition was enable. If the data did not meet the requirements, the test used Mann-Whitens' non-parametric. Prevalence difference test performed using  $\chi^2$ . The data was presented in the form of tables and graphs.

## 3. Research Result

### 3.1. Worm Infestation Prevalence Changes

The changes in the size and anthropometric index from the beginning and end of the test happened on the treatment and the comparison area. A decrease in the prevalence of intestinal could be found in the children's cohort, both in the treatment and the comparison area. In general, the prevalence of worm infestations at the end of the study in the area of treatment dropped to 70% at the starting prevalence. Meanwhile in the comparison area, the prevalence of worm infestation dropped from 50.1% to 37.5% (Table 1.)

**Table 1.** Prevalence (o/o) of children that infected worm infestation at the beginning and the end Of Research in the treatment area (n=986) and in the comparison area (n=928)

Worm Name	Initial Research		Final Research			
	T	C	T	T	C	T
Roundworm	6.3	11.1	0.000	1.6	7.8	0.000
Hookworm	22.9	26.9	0.003	4.5	16.0	0.000
Whipworm	12.9	28.8	0.000	5.7	24.2	0.000
All kinds of worm	37.3	49.1	0.000	11.6	36.5	0.000

The same symptoms can be seen in the changes of the prevalence on each type of observed worms. A great reduction of prevalence occurred on the roundworm infection in the treatment area, followed by a decrease of prevalence on the hookworm and the whipworm. The decrease of prevalence also occurred in the comparison area, although it was not as great as in the treatment area. there were a significant difference the prevalence of worm infestation in general as well as for all kinds of worms in the treatment area and in the comparison area, either at the beginning of the study (before treatment) and at the end of the study (after treatment). The significant differences before treatment complicates the interpretation that the Albendazole 400mg treatment once a year may help reducing the prevalence of worm infestation. The only clue of the benefits of the treatment was the great reduction of the prevalence in the treatment area. While in the comparison area, despite there was a decrease of prevalence, it was not as great as in the treatment area. Then information that all anthropometry sizes (BB, TB, LILA, TLBK) and anthropometric index (H / A, W / A and BMI) which were observed rising high and evenly from the beginning to the end of the study throughout the observation area, both in the treatment area as well as the comparison area. The level of the increasing number was approximately the same in primary school per year. A significant difference between treatment and comparison area were shown at the change of the size of TLBK at the end of the study, but because there were differences that already exist in the beginning of the study, it cannot be stated that there was a treatment that effect the TLBK size changes. The only clue to the effect of the treatment on the anthropometric index can be seen in the index BB / U. At the start of the study the BB / U index in comparison area significantly better than in the treatment area, but at the end of the study this difference was not significant.

Analysis to study the differences in the rate of increase / change in anthropometric size and index before and after treatment. The change differences (delta) of the anthropometric size and index in the beginning and the end of the research among the treatment group and the comparison group.

### *3.2. The Changes of Hemoglobin Content*

Treatment effect was observed after one year of research that there were also changes in the hemoglobin level and the children learning achievement in the treatment and comparison area and the results level of hemoglobin in the beginning of the study was high and there was no difference in the two areas of research. In the following year, both at the treatment and the comparison area, there was an increase in hemoglobin level with an average of 1 g / dl. At this time, the hemoglobin level in both areas were no different. Then hemoglobin level and the learning grades in the early year and the end of the study in the treatment and the comparison area. Shows no significant difference in the change of hemoglobin levels, so this study cannot prove the treatment effect on the increasing hemoglobin level.

### *3.3. The Changes of Learning Achievement*

Data of learning achievement on the Indonesian Language grades, there are no significant differences from the learning grades between children in the treatment and the comparison area at the beginning of the study. Changes in the grades do not show a specific pattern. The Mathematic grades were increased these two areas of research, but the IPA grades equally decreased. Indonesian Language grades in the treatment area were decreased, but in the comparison area were increased. To be more specific, it can be seen in Table 2 which illustrates the differences in the rate of change of these variables from the beginning to the end of the study.

**Table 2.** The change differences (delta) of the hemoglobin level and learning grades at the beginning to the end of the research between the treatment and the comparison areas

Variable	Group	N	Average	SD	P
Hemoglobin	Treatment	502	0.86	1.47	0.641
	Comparison	453	0.90	1.348	
Mathematic	Treatment	502	-1.44	12.564	0.052
	Comparison	453	0.34	13.743	
Indonesian Language	Treatment	502	-0.52	10.347	0.018
	Comparison	453	1.26	10.785	
Natural Science	Treatment	502	-0.08	0.981	0.709

Data in the Table 5 Show no significant differences in changes of the children learning grades except the Indonesian Language. On these subjects, the grades in the comparison area were even better that cannot be explained why it could happen.

#### 4. Discussion

The implication that can be drawn from the research is among the various anthelmintic, albendazole and mebendazole declared as the most effective medicine to treat intestinal worm infections [3]. This is shown on a very high decrease in the prevalence of worm infestation in the treatment area that got Albendazole 400mg, primarily in the prevalence of ascariasis and hookworm infection. A great reduction in prevalence in the treatment area is the same with the findings [4] that uses a single Mebendazole 500 mg dosage in Karang Anyar, Central Java. In this study, the comparison area experienced a reduction in the prevalence as well, although it was not as great as the treatment area. Meanwhile [5], which uses 400 mg Abenldazole got a very satisfactory result compared to the placebo group. Albendazole high effectiveness in roundworms and hookworms infection, but not as high on the trichuriasis. The same result also found by [2] in Ujung Pandang, that worked on an similar experiment on a location with a high prevalence of worm infestation but more than half of the children moderately infected, did not found the difference in the growth of the treatment group and the placebo group. Only after controlling with multiple confounding variables, a significant relationship between the decrease lumbricoides roundworm infection with increase of height previously through the cross sectional approach.

The findings in this study is similar with [4] that although a significantly reduced worm infestation prevalence were found, he can't prove that the treatment group experienced better growth. He suspects many other variables that make the benefits of treatment against the growth are veiled. Under expected results also obtained by KP [6] that uses Mebendazole for the treatment of decreased prevalent worm infestation but can't prove its influence on the improvement of the nutritional status of children. Similar findings were also obtained by Michaelsen [7] who conducts a research at the school with the high prevalence of hookworm infection, but in a mild degree has gained a significant decrease in prevalence, but the hemoglobin level and nutritional status showed no significant difference. In this study, the inability to prove the effect of treatment on the growth of intestinal worm probably because of the prevalence is not high and the degree of infection is generally almost light at the beginning of the observed public schools, which must be proven by observation and further analysis using secondary data regarding the development of the area at all schools at the beginning to the end of the study.

Related to the relationship between worm infestation and hemoglobin level [8] found a significant negative correlation between ferritin level and the number of hookworm eggs in the feces, but found no similar correlation between hemoglobin level and the number of hookworm eggs. Meanwhile [9] in his research on Aboriginal people in Australia found a very close relationship between hookworm infection with anemia and iron deficiency at children above 14 years old. The magnitude of the prevalence and the level of worm infestation, mainly the hookworm infection, seem to play a major role to show the

relationship between worm infestation and hemoglobin levels. [10] Finds significant negative correlation between the intensity of hookworm infection with hemoglobin level in his research on the areas with moderate prevalence of hookworm infection. Meanwhile [11] states that the treatment of worm infestation in hookworm endemic areas is an important part in controlling the anemia of elementary school children.

The findings of this research are similar with the findings of [12], which explain that the worm infestation treatment had no extra effect in the hemoglobin content in the mass treatment of pre-school children of the areas that were not hookworm endemic. The average hemoglobin level, that was quite high at the beginning of the study, caused no visible effect of the treatment of the increasing hemoglobin level. Hemoglobin level significantly increased (approximately 1 g / dl) in the two areas of this research that draws similar conclusions with the changing symptoms of anthropometric size and index. A significant improvement may have occurred in various aspects of life, which hides the effect of treatment. This assumption needs to be proven by carrying out further analysis on changes in socio-economic variables and other variables that are closely related to the general welfare. As a comparison of the relationship between worm infestation and cognitive function and learning achievement can be seen at the results of the study as follows: [13] states that intensity- ascariasis correlated with verbal skills and other cognitive functions. The infection load also affects the performance of the neuropsychological primarily on the language skills, problem solving, and other dimensions of inhibition control. While [14] mentions that *Trichuris* infections are associated with a lower degree of achievement of children's learning and growth. After controlling the socioeconomic status, gender, and age, the not infected groups have better learning achievements in reading and counting. In this study, if the effect of the treatment of biological variables such as the size of anthropometry and hemoglobin are hard to be proven, the unclear patterns in the changes in the learning grades are natural. Some factors that influenced the difficulty of proving the impact of Albendazole are:

- The low prevalence of infection and the degree of mild infection at the beginning of the research.
- The presence of vomit from the treatment to the comparison area that encourages parents to give other kind of medicine to their children.
- The learning grades, although theoretically related to nutritional status and hemoglobin levels, also affected by many other variables, such as the differences in teaching, learning and environment / school's quality. More analysis details about changes in learning achievement by involving other variables are needed to explain the effects of a better treatment.

## 5. Conclusions And Recommendations

Based on the explanation above, it can be summarized as:

- There were reduction on the prevalence of worm infestation both in the treatment area, as well as the comparison area. The most noticeable reduction of the prevalence is on the roundworm infection, followed by the hookworm and whipworm infections. The reduction of the prevalence in treatment area is greater than in the comparison area.
- There was a significant increase in the anthropometric size and index in both the school of research, but there is no difference significant between the treatment and comparison schools.
- An increase in haemoglobin levels happened in both observed schools. The increased haemoglobin level has no significant difference between the treatment and comparison school.
- There were no clear pattern regarding the changes of the learning grades after treatment. This is allegedly due to the low prevalence of worm infestation at the beginning of research, the vomit effect and other factors that are not included in the study.

## References

- [1] Satoto. Studi Evaluasi PMT A5 Sumatera Selatan, Semarang Nusa Tenggara Barat, Kelompok Studi dan Peminat Kesehatan Komunikasi Fakultas Universitas Diponegoro. 2002.

- [2] Hadju V, Abadi K. Intestinal Helminthiasis, Nutritional Status, and Their Relationship; A Cross Sectional Study in Urban Slum School Children in Indonesia, Southeast Asian . J Trop Med Publik Health. 2002.
- [3] WHO. Epidemiological Data of Intestinal Parasites, WHO Website, [http://www:WHO.int/et.al/html/intest/htm](http://www.WHO.int/et.al/html/intest/htm). 2003.
- [4] Rousham EK. A 7B-month Study of The Effect of Periodic Anthelmintic on The Growth and Nutritional Status of Pre School Children in Bangladesh. Ann Hum Biol. 2003.
- [5] Adam E.J, Stephenson LS. Physical Activity and Growth of Kenyan School Children With Hookworm, Trichuris Tricula and Roundworm Lumbricoides Infections Are Improved After Treatment With Albendazole. 2002.
- [6] Lai KP, Kaur H. Roundworm and Trichuris Do Not Contribute to Growth Retardation in Primary School Children Southeast Asian J Trop Med Public Health Awal Penelitian. 2003.
- [7] Michaelsen KG. Hookworm Infection in Kweneng District Botswana, A prevalence Survey and A Controlled Treatment Trial, Trans R. Soc. Med HYG. 2004.
- [8] Bakta IM, Wijana. Hookworm Infection and Iron Stores; A Survey in an Rural Community in Bali, Indonesia Southeast Asian J Trop Med Public Health. 2002.
- [9] Hopkin RM, Gracey MS, Hobbs RP, Spargo RM, Yates M, Thompson RC. The Prevalence of hookworm Infection, Iron Deficiency and Anemia In An Aboriginal Community in North West Australia. Med J Aust. 2003.
- [10] Alleman A, Benerfriend P. Prevalence of Cacing Tambang Infection, Anemia and Fecal Blood Loss Among The Yupno People of Papua New Guinea. 2005.
- [11] Stoltzfus RJ, Chwaya HM, Tielsch JM, Schuize KJ, Alboniko M, Sacioli L. Epidemiology of Iron Deficiency Anemia In Zanzibar School Children The Importance of Hookworm, Am J Clin Nutr. 2003.
- [12] Palupi L, Schultin Kru. Effective Community Intervention to Improve Hemoglobin Status in Preschoolers Receiving Once Weekly Iron Supplementation. Am J Clin Nutr. 2002.
- [13] Levav M, Minsky AF. Parasitic Infection in Malnourished Children Effect on Behavior and EEG, Parasitology. 2003.
- [14] Simeon D, Callender J, Wong M, Grantham McGregor S, Ramdath DD. School Performance, Nutritional Status and Trichuriasis in Jamaican School Children. Arch Pediatr. 2002.