

Single-dose Albendazole 400 mg Effectiveness in *Ascaris lumbricoides* and *Trichuris trichiura* Infections

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ABSTRACT— Soil-Transmitted Helminthiasis is caused by nematode worm infections, namely *Ascaris lumbricoides* (round worm), *Trichuris trichiura* (whipworm) and *Necator americanus* or *Ancylostoma duodenale* (hookworm). At present, the prevalence of Soil-Transmitted Helminthiasis in Indonesia is still high. To reduce the prevalence of Soil-Transmitted Helminthiasis in Indonesia, the Ministry of Health of the Republic of Indonesia holds a mass worm treatment program for pre-school age children and school-aged children. The drug given is albendazole 400 mg single dose. This study aimed to determine the effectiveness of a single dose of albendazole 400 mg against infections of *Ascaris lumbricoides* and *Trichuris trichiura*. This study used a Pre-Experiment research design (One Group Pretest-Posttest). The research subjects were 66 people. Subjects positive for *Ascaris lumbricoides* were 37 people (mild infection 67.57%, moderate infection 27.03% and severe infection 5.41%). After giving a single dose of albendazole 400 mg to 37 people who were positive for *Ascaris lumbricoides*, 37 people had not found eggs of *Ascaris lumbricoides* on faecal examination after treatment. Positive subjects *Trichuris trichiura* were 54 people (mild infections 51.85%, moderate infections 44.44% and severe infections 3.73%). After giving a single dose of albendazole 400 mg to 54 positive people *Trichuris trichiura*, in severe infections, the percentage of eggs dropped was 100%. In moderate infections, the percentage of the number of eggs dropped is 95.83%. In mild infections, the percentage of total recovery was 7.14%, and the percentage of eggs dropped was 39.29%. The results of the Wilcoxon test on *Ascaris lumbricoides* obtained a significance value of <0.05, which means that there are significant differences in the examination before treatment and after treatment. The results of the Wilcoxon test on *Trichuris trichiura* obtained a significance value of 0.05, which means there were no significant differences in the results of the examination before treatment and after treatment. Albendazole 400 mg single dose is effective against *Ascaris lumbricoides* infection and is not effective against *Trichuris trichiura* infection.

Keywords— *Ascaris lumbricoides*, *Trichuris trichiura*, Albendazole 400 mg

1. INTRODUCTION

More than 5 billion people in the world run the risk of being infected with Soil-Transmitted Helminth (1). At present, it is estimated that more than 2 billion people are infected (2,3). Generally, it comes from poor people in developing countries (3,4), the majority in pre-school children and in school-age children in Asia, Africa and Latin America (2,4).

Soil-Transmitted Helminthiasis is caused by nematode worm infection (5), namely *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm) and *Necator americanus* or *Ancylostoma duodenale* (hookworm) (2,4,6,7).

Infection occurs through contamination of food containing infective eggs *Trichuris trichiura* and *Ascaris lumbricoides* or through skin penetration by hookworm larvae (2). Hookworm infection is more common in adults (4).

Mild worm infections are generally asymptomatic. Moderate and severe worm infections cause intestinal obstruction, stunted growth, cognitive and intellectual disorders, malnutrition, and iron-deficiency anaemia (3,4,8–10). The target of WHO is in 2020 the prevalence of moderate infections and severe infections by the Soil-Transmitted Helminth in pre-school children and school-age children is reduced to below 1% (4). Many species of worms have been reported to cause infection in Indonesia. Only a few were found in a wide and high prevalence distribution (11), namely *Ascaris lumbricoides* and *Trichuris trichiura*.

Four antihelminthics for treating Soil-Transmitted Helminth according to WHO are albendazole, mebendazole, levamisole and pyrantel pamoate (11). Albendazole (ALB) and Mebendazole (MBZ) are recommended for infections of *Ascaris lumbricoides*, *Trichuris trichiura*, *Necator americanus* and *Ancylostoma duodenale* (12). The Ministry of Health

of the Republic of Indonesia has provided antihelminthic for free for several years in pre-school children and school-aged children. The antihelminthic given is a single dose of albendazole 400 mg.

The prevalence of helminthiasis in Indonesia is still high. One area that has a high prevalence of Soil-Transmitted Helminth infections is Kilasah Serang Timur Banten village. Hygiene and sanitation of the residents of Kilasah Serang Timur Banten Village are very low so that infections by *Ascaris lumbricoides* and *Trichuris trichiura* are high. The aim of this study was to determine the effectiveness of a single dose of albendazole 400 mg against infections of *Ascaris lumbricoides* and *Trichuris trichiura* in the village of Kilasah Serang Timur Banten.

2. METHODS

This study used a Pre-Experiment research design (One Group Pretest-Posttest). Sampling was carried out in the village of Kilasah Serang Timur Banten. Laboratory tests were carried out in the parasitology laboratory of the Medical Laboratory Technology Department of the Ministry of Health Jakarta III Health Polytechnic. The study was conducted in August-October 2017. The population in this study were all residents of Kilasah Serang Timur Banten village. The sample in this study was the faeces of toddlers and village children in Kilasah Serang Timur Banten.

This study consists of 3 stages. The first stage is the examination of worm eggs in faeces pre-treatment with katokatz method, the second stage is the administration of single-dose albendazole 400 mg. Albendazole 400 mg was obtained from the Banten Provincial Health Office. Albendazole 400 mg single dose was given to the study subjects and taken in front of the research team. The third stage is examination of worm eggs in faeces after treatment with the katokatz method. The third stage is carried out two weeks after administration of the drug. Albendazole effectiveness was obtained from the differences in the number of worm eggs before treatment and after treatment. The research subjects who received treatment were 66 people.

3. RESULT

Table 1. Data on Results of Examination of *Ascaris lumbricoides*

No	Code	Number of Eggs / gr faeces	
		Pre Treatment	Post Treatment
1.	01	76.450	0
2.	02	50	0
3.	04	9.100	0
4.	05	100	0
5.	13	2.900	0
6.	15	50	0
7.	18	3.300	0
8.	21	250	0
9.	22	38.600	0
10.	23	3.300	0
11.	24	5.850	0
12.	27	1.450	0
13.	33	50	0
14.	36	7.800	0
15.	44	17.750	0
16.	48	11.300	0
17.	50	100	0
18.	54	100	0
19.	68	9.800	0
20.	69	50	0
21.	73	150	0
22.	79	50	0
23.	82	25.950	0
24.	85	4.350	0
25.	90	2.450	0
26.	96	1000	0
27.	97	50	0

28.	98	16.150	0
29.	101	2.200	0
30.	103	550	0
31.	105	2.950	0
32.	112	38.200	0
33.	120	275	0
34.	123	300	0
35.	124	200	0
36.	125	100	0
37.	126	516.600	0

Table 2. Classification in Infection Intensity of *Ascaris lumbricoides* (13)

Classification	Number of Eggs
Mild	1 - 4.999
Moderate	5.000 – 49.999
Severe	≥50.000

The subjects of the study positive for *Ascaris lumbricoides* eggs at pre-treatment were 37 people (56.06%). Based on the classification of the intensity of *Ascaris lumbricoides* worm infection, mild infections were 25 people (67.57%), moderate infections were 10 people (27.03%) and severe infections were 2 people (5.41%). On the results of post-treatment faeces examination no eggs of *Ascaris lumbricoides* were found. Albendazole 400 mg single dose effectively cure *Ascaris lumbricoides* in mild, moderate and severe infections.

Table 3. Data on Results of Examination of *Trichuris trichiura*

No	Code	Number of Eggs / gr faeces	
		Pre Treatment	Post Treatment
1.	01	13.600	4.100
2.	02	600	100
3.	05	750	250
4.	10	150	500
5.	12	150	150
6.	13	1.150	400
7.	15	1.900	350
8.	16	150	50
9.	17	50	8.700
10.	18	1.300	50
11.	19	100	450
12.	22	4.650	2.300
13.	23	43.250	4.850
14.	24	350	5.900
15.	27	650	50
16.	33	100	0
17.	35	750	50
18.	36	2.200	1.350
19.	39	350	150
20.	43	2.750	200
21.	44	2.400	150
22.	48	1.200	19.550
23.	50	100	750
24.	51	4.250	100

25.	53	150	3.350
26.	54	1.900	100
27.	66	200	250
28.	69	150	150
29.	73	4.800	7.200
30.	79	2.300	0
31.	82	1.250	1.300
32.	83	3.200	2.550
33.	85	300	950
34.	90	1.650	100
35.	92	200	0
36.	93	1.400	500
37.	94	350	100
38.	96	9.200	700
39.	97	450	200
40.	98	1.800	300
41.	99	1.200	3.100
42.	101	550	2.000
43.	103	400	100
44.	104	100	50
45.	105	200	150
46.	108	8.450	1.300
47.	112	600	200
48.	120	1.500	250
49.	122	2.100	150
50.	123	350	1.000
51.	124	200	950
52.	125	1.350	150
53.	126	7.400	850
54.	129	50	50

Table 4. Classification in Infection Intensity of *Trichuris trichiura* (13)

Classification	Number of Eggs
Mild	1 – 999
Moderate	1.000 – 9.999
Severe	≥10.000

Positive research subjects were *Trichuris trichiura* eggs at pre-treatment were 54 people (81.82%). Based on the intensity classification of *Trichuris trichiura* worm infection, 28 people (51.85%) had mild infections, 24 people had moderate infections (44.44%) and 2 people had severe infections (3.73%).

In severe infections, the percentage decrease in the number of eggs is 100%. In moderate infections the percentage of eggs fell by 95.83% and 4.17% the number of eggs did not go down. In mild infections the percentage of total recovery was 7.14%, the percentage of eggs fell by 39.29% and 53.57% the number of eggs did not go down.

To find out whether there were statistically significant differences in the results between post-treatment with pre-treatment on *Ascaris lumbricoides* and *Trichuris trichiura* the Wilcoxon test was performed.

Table 5. Data Normality Test Results

Tests of Normality
Shapiro-Wilk

	Statistic	Df	Sig.
<i>Ascaris lumbricoides</i> Pre Treatment	.176	66	.000
<i>Ascaris lumbricoides</i> Post Treatment	.189	66	.000
<i>Trichuris trichiura</i> Pre Treatment	.351	66	.000
<i>Trichuris trichiura</i> Post Treatment	.476	66	.000

a. Lilliefors Significance Correction

Table 6. Wilcoxon Test Result of *Ascaris lumbricoides*

Test Statistics ^b	
Z	-5.217 ^a
Asymp. Sig. (2-tailed)	.000

Table 7. Wilcoxon Test Result of *Trichuris trichiura*

Test Statistics ^b	
Z	-1.958 ^a
Asymp. Sig. (2-tailed)	.050

The results of the Wilcoxon test on *Ascaris lumbricoides* obtained a significance value of <0.05, which means that there are significant differences in the examination before treatment and after treatment. No eggs of *Ascaris lumbricoides* were found on the subject after treatment. This means that Albendazole 400 mg effectively treats *Ascaris lumbricoides* infections.

The results of the Wilcoxon test on *Trichuris trichiura* obtained a significance value of 0.05, which means there were no significant differences in the results of the examination before treatment and after treatment. The results of the *Trichuris trichiura* examination after being given treatment were mostly still found worm eggs *Trichuris trichiura*. This shows that Albendazole 400 mg is not effective in treating *Trichuris trichiura* infections.

4. DISCUSSION

Albendazole is a broad-spectrum anthelmintic of the benzimidazole group that works by way of inhibiting vermifugal, ovicidal and larvicidal activity. Albendazole is used for the treatment of helminthiasis, single or mixed infections caused by *Ascaris lumbricoides*, *Trichuris trichiura*, *Enterobius vermicularis*, *Ancylostoma duodenale*, *Taenia spp*, *Strongyloides stercoralis*, and *Necator americanus*. The usual dosage for adults and children over 2 years is 1 single dose (400 mg).

Based on the results of the study, albendazole provided 100% cure for the study subjects infected with *Ascaris lumbricoides*. This was indicated by the absence of *Ascaris lumbricoides* worm eggs in the post-treatment. This can be caused because albendazole can kill adult worms and larvae in the lungs.

In the positive subjects of the study *Trichuris trichura* on the pre-treatment examination, most *Trichuris trichura* eggs were found on the post-treatment examination. It shows that a single dose of albendazole 400 mg is not effective in *Trichuris trichiura* infection.

The effectiveness of albendazole on *Trichuris trichiura* has been proven through several studies, namely 1) Adam, V. J., et al (2004) examined the cure rate and decreased the number of eggs *Trichuris trichiura* after being given various doses of albendazole. The results obtained were a cure rate of 23% (400 mg), 56% (800 mg) and 67% (1200 mg), with a decrease in the number of eggs in a row 96.8%, 99.3% and 99.7%; 2) Speich, B., et al (2012) found that the cure rate of *Trichuris trichiura* with nitazoxanide-albendazole was 16%, albendazole was 14.5% and nitazoxanide was 13.4%; 3) Mekonen, Z., et al (2013) examined the efficacy of albendazole and mebendazole have given for 1 and 2 days. The reduction in the number of eggs in

albendazole 1 day was 29.3%, albendazole 2 days was 73.5%, mebendazole 1 day was 60% and mebendazole 2 days was 87.1%; 4) Lubis, A. D., et al. (2013) examined the comparison of the anti-Trichuriasis effect of albendazole 400 mg which was carried out every day for 5 days and 7 days. The results obtained were albendazole for seven days more effective in curing *Trichuris trichiura* compared to five consecutive days; 5) Research conducted by Speich, B., et al. (2014) found that the cure rate with oxantel pamoate-albendazole was 31.2%, oxantel pamoate-mebendazole 11.8%, oxantel pamoate 26.3%, mebendazole 11.8%, albendazole 2.6%, at the level of reduction in the number of eggs obtained by oxantel pamoate-albendazole 96%, oxantel pamoate 93.2%, mebendazole 75%, albendazole 45%; 6) research conducted by Jouybari, T.A., et al (2016) concluded that the administration of single-dose albendazole gave unsatisfactory results

Based on the results of the study, albendazole 400 mg single dose was effective against *Ascaris lumbricoides* infection but was not effective against *Trichuris trichiura* infection. Based on several research results, the effectiveness of albendazole will increase if additional doses are given on the second, third and so on. However, the increase in dosage has not made *Trichuris trichiura* a cure to 100%.

Albendazole 400 mg single dose is not appropriate to be used as a mass drug in eradicating national helminthiasis in Indonesia because it is not effective in eradicating *Trichuris trichiura* infection. Giving the same medication with additional doses will increase costs, reduce compliance and make it difficult for health service officials and health centres. Further study needs to be done to obtain the more appropriate type of medication

5. CONCLUSION

On pre-treatment examination, the subjects found mild *Ascaris lumbricoides* worm infection 67.57%, moderate infection 27.03% and severe infection 5.41%. After giving a single dose of albendazole 400 mg, no eggs of *Ascaris lumbricoides* were found in all study subjects. In the pre-treatment examination, the subjects found mild *Trichuris trichiura* worm infections 51.85%, moderate infections 44.44% and severe infections 3.73%. After being given a single dose of albendazole 400 mg in a study subject with severe infection, a decrease in the number of eggs was obtained by 100%. In the study subjects with infections, the number of eggs decreased by 95.83% and 4.17% the number of eggs remained. In mild infections, a negative percentage was 7.14%, a decrease in the number of eggs was 39.29% and 53.57% the number of eggs remained. The Wilcoxon statistical test showed that there were significant differences between the results of post-treatment with pre-treatment in *Ascaris lumbricoides* infection but there were no significant differences between the results of post-treatment with pre-treatment in *Trichuris trichiura* infection. Albendazole 400 mg single dose is effective against *Ascaris lumbricoides* infection and is not effective against *Trichuris trichiura* infection.

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