

## ORIGINAL ARTICLE

# Determining the Efficacy of Albendazole Against STH Infection Among Orang Asli

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## ABSTRACT

**Introduction:** According to WHO, soil-transmitted helminth (STH) infections could infect up to 90% of children from deprived communities with unhygiene and improper sanitation lifestyle. In West Malaysia, commonly the aboriginal people (Orang Asli) is prone to be infected with STH infections. Albendazole (400mg) is an anthelmintic drug that has been used for more than 30 years to cure STH infections. Hence, the main objective of this project was to evaluate the efficacy of single-dose albendazole (400mg) against STH infections among Orang Asli. **Methods:** Stool samples were collected in Hulu Langat, Semenyih, Malaysia. Who had not previously undergone deworming treatment. The parasites were concentrated by floatation technique (using the standard salt-sugar solution) to extract the amount of helminths' egg before and after the albendazole treatment (400mg). **Results:** There were 44 participants after one-month post-treatment. The cure rate (CR) for *Trichuris trichiura* and *Ascaris lumbricoides* was 11.6% (n=5) and 35.0% (n=14), respectively. Moreover, there was no heavy infection for both STHs during the post-treatment of albendazole. **Conclusion:** The results indicated that the chosen anthelmintic showed higher cure rate efficacy in *A.lumbricoides* than *T.trichiura*. However, both species had decreased egg burden post-treatment with albendazole.

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**Keywords:** Efficacy; Albendazole; *Trichuris trichiura*; *Ascaris lumbricoides*; Soil-transmitted helminths

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## INTRODUCTION

Soil-transmitted helminth (STH) infection, one of GIP infections, pervaded in ten Southeast Asia (SEA) countries [1]. In West Malaysia, this infection mainly occurred among indigenous people (Orang Asli), who were said to be the original resident of Malaysia (~179,000, 0.6% of Malaysia). This community was reported with poverty and lack of hygiene facilities as a prior study reported about 80% of Orang Asli people live in poverty, compared to 1.4% of all people in the country. [2]. The most prevalent STHs among this community are *Trichuris trichiura*, *Ascaris lumbricoides*, and hookworms [3]. The common risk factors for these infections were open defecation, not using footwear, poor hand hygiene, and close contact with domestic animals [4–6].

Anto & Nugraha (2019) suggested that public health programs using anthelmintic drugs, mainly albendazole, followed by levamisole, mebendazole and pyrantel pamoate were commonly carried out to control STH infections [7]. Other than that, Malaysian government efforts to uplift the orang asli lifestyle like the Ministry of Education and the United Nations Children's Fund (UNICEF) is working closely to enhance the education issue among the indigenous community and to improve the quality of life. However, they are still prone to STH infections due to the lack in implementing the required measures as instigated by the government. Hence, this work was conducted to evaluate the cure rate of single-dose albendazole (400mg) as a public health approach to Orang Asli in Malaysia.

## MATERIALS AND METHODS

The cross-sectional project has been done in determining the efficacy of single-dose albendazole against STH infections, especially *Trichuris trichiura*

and *Ascaris lumbricoides*. The project was conducted from 5 April 2019 to 10 January 2020.

**The ethical approval and samples collection**

The project has been given consent by the Human Ethical Committee of UniKL [UNIKL REC /2020/003] and the Department of Aboriginal Affairs of Malaysia (JAKOA) [ref: JAKOA/PP.30.032.Jld 46(95)]. Written permission was provided from all participants and the parents one week before the stool collection date. A 60ml stool container was given to every participant to collect the fecal sample within a week. After collection, the stool samples were processed and observed by the McMaster counting technique at Research Laboratory of Universiti Kuala Lumpur MESTECH, Kajang, Selangor. The positive samples with STH were administered single-dose albendazole and randomized as the study subjects for albendazole treatment.

**Participant requirements**

**Inclusion criteria:** The head of household whom shall be able to communicate in either English or Malay language; or any adult family member that who was 18 years and above as representative.

**Exclusion criteria:** Unoccupied houses, those who do not agree to participate, pregnant women and baby (one year and below).

**Drug treatment administration**

The drug treatment used for this project was Albendazole tablets (GlaxoSmithKline-GSK). For children aged two and above, a dose containing 400 mg of Albendazole syrup was orally administered, while for children aged two and below, 200 mg of Albendazole syrup was administered. For kids, they consumed with a clean spoon or a syringe. In some occasions, the parents assisted the researcher for the drug administration. The pregnant women were not included for drug treatment and any infant below one year. All participants with positive parasite infection were permitted the drug and took the tablets under direct observation of the researcher. The efficacy rate of albendazole was calculated using the formula as follows:

$$\text{Cure rate (\%)} = \frac{\text{Total negative post-treatment}}{\text{Total positive pre-treatment}} \times 100$$

**Statistical analysis**

The study used descriptive statistics, which was summed the total frequencies and percentages of sociodemographic data like gender. Also, the prevalence of STHs, the total of cured participants, and the intensities of STHs were calculated using descriptive statistics. The intensity of *T. trichiura* and *A. lumbricoides* were classified into light, moderate and heavy infection in Table I, based on WHO guidelines [8].

**Table I : WHO classification on the severity of infection for *T. trichiura* and *A. lumbricoides* according to eggs per gram of feces (epg)**

Infection	Light	Moderate	Heavy
<i>Trichuris trichiura</i>	1-999 epg	1,000-9,999 epg	>10,000 epg
<i>Ascaris lumbricoides</i>	1-4,999 epg	5,000-49,000 epg	>50,000 epg

**RESULTS**

**Prevalence of soil-transmitted helminth (STH) infections**

The most prevalent soil-transmitted helminths (STHs) found were *T. trichiura* and *A. lumbricoides*, which the overall participants were 67 (100%). Besides, the prevalence of a single infection of *T. trichiura* and *A. lumbricoides* were 64.2% (n=43) and 66.7% (n=40), respectively. The majority of participants with positive STHs were children aged 3-16 years old [9].

**The morphology of STHs**

Table II shows the figures of the STHs; *T. trichiura*, and *A. lumbricoides*. These STHs were examined under the light microscope (Olympus CX21, Japan) and differentiated using the floatation technique.

**Cure Rate (CR) of *T. trichiura* and *A. lumbricoides* observed one month after treatment**

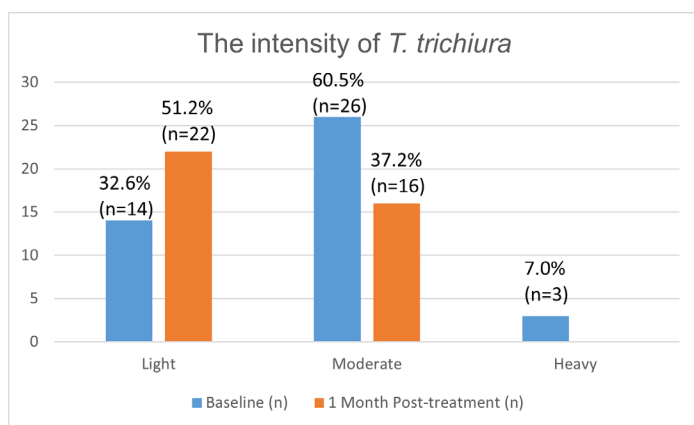
Table III and Table IV show the overall cure rate (CR) of *T. trichiura* and *A. lumbricoides*, respectively, observed at one month after albendazole treatment. The CR for *T. trichiura* and *A. lumbricoides* were 11.6% and 35.0%, respectively.

**The burden load of STHs observed in stools of 1-month post-treatment**

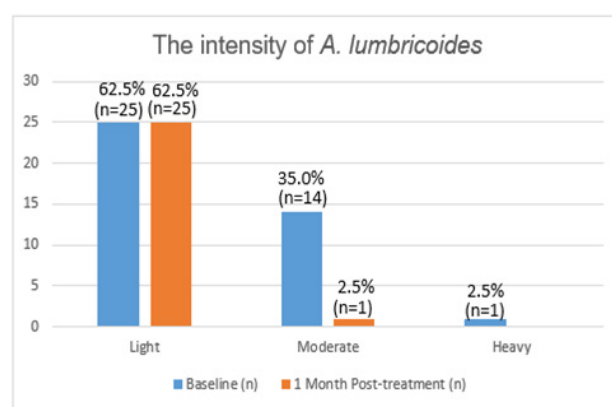
In general, the intensity post both helminths' eggs reduced post-one-month treatment among all the participants. Both STH had no heavy infection at post-albendazole treatment (Fig. 1 and Fig. 2).

**DISCUSSION**

Soil-transmitted helminth (STH) infections have still been the major public health problem in Malaysia, especially among indigenous community (Orang Asli) due to poor hygiene and lack of education and awareness of cleanliness in their habit [10]. Besides, the most common species reported were *Trichuris trichiura*, *Ascaris lumbricoides*, and hookworms like *Necator americanus* and *Ancylostoma duodenale* [7]. WHO recommends reating with single-dose albendazole (400mg) and mebendazole (500mg) are the recommended method


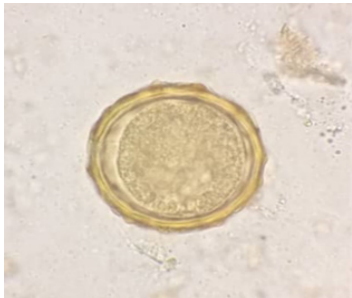


**Fig. 1 :** The intensity of *T. trichiura* among infected participants after one-month post-treatment .



**Fig. 2 :** The intensity of *A. lumbricoides* among infected participants after one-month post-treatment.

**Table II :** The morphology of STHs observed under the light microscope (\*scale bar=50µm)

Types of parasites	Figures	Description
<i>Trichuris trichiura</i>		Note prominent bipolar plugs at both ends (arrows). The measurement of an egg is 50-55 microns in length. Floatation technique. 40x magnification.
<i>Ascaris lumbricoides</i>		Note outer layer mamillated (thin arrow). Undeveloped unicellular embryo (Thick arrow). The measurement of the egg is 50 microns. Floatation technique. 40x magnification.

**Table III :** The CR for *T. trichiura* after treatment with a single dose of albendazole

Age group (years) <sup>a</sup>	Positive at pre-treatment (n)	One-month post-treatment	
		Cured (%)	Not cured (%)
Toddlers (0-2)	4	2 (50.0)	2 (50.0)
Children (3-16)	21	2 (9.5)	19 (90.5)
Young adults (17-30)	6	0 (0.0)	6 (100.0)
Middle-aged adults (31-45)	6	0 (0.0)	6 (100.0)
Adults (Above 45)	6	1 (16.7)	5 (83.3)
<b>Total</b>	<b>43</b>	<b>5 (11.6)</b>	<b>38 (88.4)</b>

a. All are the same subjects who participated in pre and post sampling

**Table IV : The CR for *A. lumbricoides* after treatment with a single dose of albendazole**

Age group (years) <sup>a</sup>	Positive at pre-treatment (n)	One month post-treatment	
		Cured (%)	Not cured (%)
Babies (0-2)	4	0 (0.0)	4 (100.0)
Children (3-16)	20	6 (30.0)	14 (70.0)
Young adults (17-30)	5	3 (60.0)	2 (40.0)
Middle-aged adults (31-45)	5	3 (60.0)	2 (40.0)
Adults (Above 45)	6	2 (33.3)	4 (66.7)
<b>Total</b>	<b>40</b>	<b>14 (35.0)</b>	<b>26 (65%)</b>

a. All are the same subjects who participated in pre and post sampling

to control STH infection [11]. Resolution 19 of the 54th World Health Assembly (WHA-54.19) encouraged member countries to develop prevention, assure medication, and allocate support for elimination of soil-transmitted helminthiasis and schistosomiasis (STH) [12]. Also, the resolution has reported the preschool-aged children, school-aged children and women at child-bearing age were at high-risk of STH infections due to poor sanitation and unable safe-water supply in which recognized by WHO as essential [13]. Hence, this study was conducted in the area of Selangor with the objective of determining the efficacy of single-dose albendazole among STH positive villagers in Hulu Semenyih.

There were 67 participants from Kg. Donglai Baru and 44 stools were collected after a month of post-treatment with albendazole. The decreasing number of participants after a month post-treatment due to relocating to other villages and unwillingness to participate in post-treatment. In this study the number of sample was similar to the previous research in Banten, Indonesia, in which just 66 pre-treatment samples as well as post-treatment samples collected with the prevalence of *T. trichiura* and *A. lumbricoides* were 81.8% and 56.1%, respectively [14]. The majority of the participants with positive STHs were children aged between 3-16 years old [9]. This finding was supported by past STH study in terms of participation of children in which the majority of the total sample size [15]. Besides, several studies have focused on children, like preschool children and primary school children [16-18].

Post administration of single-dose albendazole showed a curing effect for for both STHs infection. Based on Table III and Table IV, the treatment with single-dose albendazole (400mg) on *T. trichiura* and *A. lumbricoides* showed a cure rate of 11.6% and 35.0%, respectively. This study is supported by

a report in 2019 in which the *T. trichiura* treatment rate was 28% [15]. This scenario suggests a single dose of albendazole (400mg) was less effective against *T. trichiura*. Out of 43 positive samples, only five participants were cured based on the treatment. These results are quite similar to the past study in which the only one of the 90 participants was cured from *T. trichiura* (observed CR 1.1%) [18]. For *A. lumbricoides*, a single dose of albendazole showed a better curing effect when compared to *T. trichiura*, as 14 participants were cured among 40 were positive cases. This finding was similar to a study in Indonesia in which the single dose of albendazole was more effective against *A. lumbricoides* than *T. trichiura* [14].

According to a study in Ghana, albendazole may have a varied cure rate that ranges from 0% to 70%, and suggested albendazole and ivermectin to be used as an anti-helminthic drug [19]. In addition, an association of albendazole with levamisole reported higher cure rate for mild trichuriasis (95.8%) [7]. The study suggested in combination of two anti-helminthic drugs may yield a better curing efficacy towards STH infection and single-dose albendazole could decrease the burden of STH infection post-treatment. However, a study in People's Republic of China suggests both albendazole (400mg) and mebendazole (500mg) are genuinely effective against *A. lumbricoides* while for *T. trichiura*, mebendazole (39.7%) is slightly better efficacy than albendazole (33.8%). Besides, the recommendation period to assess the efficacy of these drugs is within three to four weeks after treatment given. Steinmann et al. (2011) added that triple dosage therapy should be taken into consideration in increasing the efficacy of these drugs [20]. Moreover, the WHO recommended observing within three weeks for the efficacy of albendazole [21].

## CONCLUSION

This study showed variation in the curing effect of *Ascaris lumbricoides* and *Trichuris trichiura* using single-dose albendazole. Higher curing effect was observed in *Ascaris lumbricoides* compared to *Trichuris trichiura*, however both showed decrease in egg burden post treatment. Future study can be conducted using multiple doses on albendazole to study the STH curing effect using this data as baseline observation.

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